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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.

Merit

TOTAL 17

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	Dairy farming can have a negative impact on waterway because manure from paddocks can run off into waterways	This has reduced overall water quality because the manure contains nutrients which may cause algal growth an an unsafe environment for other living things, and unsafe for drinking and swimming ect.
Impact 2	Dairy farming can have a negitive impact on waterway because cows may step on river banks or waterway edges, causing soil to fall into the water and cause pollution.	The soil falling into the waterways ~~may~~ will also effect water quality because it also contains nutrients which when in water ways, may cause algal growth and so it is not suitable or safe.

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

Management practice: Fencing water ways

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

Fencing water ways is the practice of creating a fence around the edges of waterways so that animals and machenary can not go close enough to cause polution in the waters. The farmer will create a fence along the waterways, by placing sturdy posts and fencing to keep out unwated animals and machines. This practice has a positive impact on water ways because it reduces the posibility of runoff of manure and soil evosion into the water way which would of caused polution because of the nutrients in soil and manure, showing manaakitanga for the water ways and living organisims in them.

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

Alternative management practice: ~~Ripa~~ Riparian planting

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.

Raiperian planting is the practice of planting native plants along the edges of water ways, to ~~red~~ reduce pollution through runnd manure or soil erosion, caused by machinery or animals. Riparian planting and fencing waterways are both effective management practices, and are often used together. Riparian planting is used to improve water quality because the roots of the plants secure the bank of the water way inplace, reducing erosion. Riparian planting is also great because the plants shelter and shade the water ways, which reduces algal and bacteria growth because the water is cooler, which bacteria and algae do not thrive in. Fencing water ways improves water quality because it reduces the risk of cows eroding the waterway edge, causing soil and manure to fall in the water, which will cause algal and bacterial growth because of the nutrients added to the water. I think that riparian planting is more sustainable in dairy farming because the plants

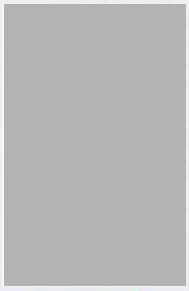
planted are native and good for the ecosystem, aswell as securing the ~~bank~~ bank to reduce erosion, and will be ~~longer~~ more effective in the long term because they will continue to grow and become more effective with time because of root growth and plant height increasing, which shelters waterways and reduces erosion. Fencing water ways is a quicker fix than raiperian planting, however the fence may get damagged, have large enough holes to not reduce runnoff and does not contribute to the ecosystems bio diversity or shelter waterways, or secure banks. Riparian planting is the most effective of ensuring long term sustainability of the waterways on a dairy farm. This shows Kaitiakitanga of the farmer because they are protecting and guarding their lands health for future generations.

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 Inorganic fertilizer can reduce air quality by releasing harmful chemicals into the air, which pollutes the air and decreases air quality, expecially if not applied correctly and the soil isn't able to absorb it all.

Water Inorganic fertilizer can harm water quality by releasing harmful chemicals and nutrients into the waterways if not applied correctly. this can be leached or runoff into waterways, causing algal and bacteria growth that is harmful.

Biodiversity Inorganic fertilizer can be harmful to biodiversity because if applied incorrectly, the chemicals can burn living things in the environment, causing serious harm or death. They also might move from the area because of incorrect conditions, reducing biodiversity.

Soil tests are often carried out before fertiliser is applied.

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

Soil tests allow the grower to reduce negative environmental impacts ~~[illegible]~~ of fertilizer use because when a soil test is done, it lets the farmer know what specific nutrients the soil is lacking, or too high on, so that the farmer can ajust and monotor the amount of fertilizer they need to apply to their soil, reducing the risk of leaching, runoff, and harm to plants and soil organisims.

Name an environmentally sustainable alternative to inorganic fertiliser application.

Alternative management practice: applying effluent.

(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.

The practice of applying effluent is when the farmer uses organic manure to spread over their paddocks, instead of fertilizer. The effluent usally comes from milking sheds, and stored to then be spread over pasture. This practice increses nutriant levels organicly. Strengths of effluent application is that it reduces costs spent on inorganic fertilizer, expeshily when fertilising

a large amount of land. It also doesnt contain harmful chemicals like inorganic fertilizer. Applying effluent instead of inorganic fertilizer has a positive impact on air, water, and soil quality because it doesnt relase harmful chemicals into the air or water, and wont harm living organisims, and instead feed them. This practice of applying effluent will have a better long term impact on the enviroment because of the reduced chemicals in the environment, and the reduced waste of effluent/manure. One weakness of effluent application is that it may smell, but should not cause any harm to the environment. Overall, Applying effluent instead of inorganic matter will save the farmer money, and reduce harms to the enviroment, and ensure long term sustainability.

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 have a negative impact on the soil because if overdone, it can destroy the soil structure, which decreases the amount of pore spaces to hold air and water, which are essential for plant and living organisim's life processes to keep the soil healthy and fertile.

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

Cultivating in a sustainable way has a positive impact on soil because cultivation can reduce compaction of the soil, improving aivration which overall helps plants and living organisims to carry out desperation, which they need to work in the soil and increase soil fertility. Reducing compaction also helps soil to not get welterlogged, or cause nutriants to runnoff the top of the compacted soil and cause polution.

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: Crop rotation

(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.

Crop rotation is the practice of growing different crops in a specific order ~~in the~~ annually, to improve soil fertility, structure, and overall soil health. Crop rotation can reduce the negative impacts of soil health because it improves and rebuilds soil structure, reducing erosion, and allowing the soil to rebuild its self before cultivated again. or the next crop is planted. Direct drilling also improves soil sustainability because it reduces the need for cultivation all together, ensuring that soil structure remains and soil ~~fertility~~ stays fertile, if done correctly. Crop rotation may take longer to see results, because you have to wait for each crop to grow, and the farmer wont have as much freedom with the crops they want to grow. Direct drilling may be more cost effective than crop rotation. and more time efficient because of

the reduced passes of machineary over the soil. I think that both practices will ensure the long term sustainability of the soil, but Direct drilling may be more effective because of the reduced passes of machinerary over the soil, overall ensuring soil sustainability in the long term. This practice shows kaitiakitanga from the farmer, because they are guarding and protecting their land and lands health for the future generations.

Merit

Subject: Agricultural and Horticultural Science

Standard: 91931

Total score: 17

Q	Grade score	Marker commentary
One	E7	The candidate has justified the use of riparian planting as the best way to improve water quality. They have explained the benefits of both fencing waterways and riparian planting and have explained how riparian planting will shade the water and secure the riverbanks to reduce algal and bacteria growth in the water. For a more solid excellence the candidate could have linked riparian planting to reduced runoff, and therefore less nutrients entering the water.
Two	M5	The candidate has explained how fertiliser can have a negative impact on water by adding nutrients that will increase algal and bacterial growth. They have also explained how soil testing can reduce the risk of leaching and runoff. Including an explanation of how toxic algae can reduce water quality in more detail could have enhanced the response.
Three	M5	The candidate has explained how sustainably cultivating the soil leads to better soil quality and linked this to reduced runoff and better water quality. For a more solid merit, more detail of how cultivation can positively and / or negatively impact the soil is expected.