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NZQA

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 1 Agricultural and Horticultural Science 2025

91930 Demonstrate understanding of how soil properties are managed in a primary production system

Credits: Five

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of how soil properties are managed in a primary production system.	Explain how soil properties are managed in a primary production system.	Evaluate how soil properties are managed in a primary production system.

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 2–12 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 16

INSTRUCTIONS

Read **ALL** instructions before answering.

You must answer **ALL** parts of this assessment.

Ensure reference to a **relevant** Māori concept or value, related to soil management, is included in your responses. One or more concepts may be appropriate.

Note: 'soil properties' refer to physical, chemical, and biological properties of soil.

QUESTION ONE: Fertiliser application

Name a primary production system of your choice.

Primary production system: Dairy Farming

(a) How is fertiliser applied in your named primary production system?

Fertiliser is applied by a ~~quad~~ minispreader or the back of a quad or by tractor, as a base dressing or side dressing. It can also be applied as a top dressing by plane. A base dressing is before seeds are planted, side dressing is after the seeds are planted and a top dressing, on top of the seeds.

(b) Explain how fertiliser impacts soil properties.

Fertiliser only impacts the chemical properties of soil, as it increases the nutrient availability within the soil. This means plants will be able to grow better as they are being supplied with nutrients. However if too much is applied it can harm living organisms.

(c) Justify why soil tests should be carried out before applying fertiliser.

In your answer consider:

- chemical and biological soil properties
- how applying fertiliser after a soil test can improve plant growth.

Soil tests should always be carried out before applying fertiliser. This is so the right amount of fertiliser, and the right types are applied. If too little is applied then it will not work as effectively, if too much is applied it will do the opposite effect as what was intended and poison the soil organisms and plants. The main fertilisers that are applied is NPk (Nitrogen, Potassium and phosphorus) These all help the plants with leaves, stems and roots, ensuring the grow optimally. When soil testing you should make sure to do a pH test as well

A pH test tests how acidic the soil is and this determines how available the nutrients are. So the farmer's problem could be his soil pH level, rather than ~~his~~ the nutrients within his soil. ~~Then~~ This relates back to the Māori concept, Manaakitanga. By applying fertiliser you are caring for your land and respecting the plants by providing them with the nutrients they ~~need~~ need. This is to make sure the ~~plants~~ soil doesn't get stripped of all its ~~nutrients~~ nutrients.

Ensure reference to a **relevant** Māori concept or value, related to soil management, is included in your responses. One or more concepts may be appropriate.

Note: 'soil properties' refer to physical, chemical, and biological properties of soil.

QUESTION TWO: Compost

A vegetable grower has sandy soil and is using compost to improve their soil.

(a) Describe how compost is made.

Compost is made with food scraps and organic matter (once-living). It is usually then put in a compost bin ~~to make a it~~ with ~~microbes,~~ living organisms, such as earthworms. This is so it breaks down into a nutrient rich substance which can be dug into soils to help the vegetable grower's soil.

(b) How can adding compost increase nutrient levels in the soil?

Compost can add nutrients back into the soil because it is incorporating organic matter into the soil. Compost is rich in nutrients, as the microbes have broken down the matter and turned it into humus. This is filled with nutrients, therefore increasing the nutrient levels in the soil.

The grower is considering replacing compost with a combination of fertiliser and irrigation.

(c) Evaluate the application of compost, compared to irrigation and fertiliser application.

In your answer consider:

- the long-term effects on the soil
- vegetable growth.

Application of compost is a more natural way of putting nutrients into the soil than a combination of fertiliser and irrigation. Fertiliser is artificial and not as good for the soil as compost is.

Compost has many beneficial effects on soil properties.

Physically, it will increase the WHC because the organic matter acts as a sponge and secondly the dark colour of humus attracts heat and increases the soil temperature.

Biologically, the organic matter will attract microbes, as they want to break down the organic matter to make humus. the humus makes the soil warmer and therefore makes the soil a better living environment for the microbes. Lastly, chemically, it increases the nutrients within the soil, helping the vegetables grow, ~~over~~ increasing overall yield and ~~quantity~~ quality. All of this cannot be achieved by irrigation and fertiliser. Thinking long term, the compost is natural and fertiliser is artificial. Over time the natural option is the better option. This relates to the Māori

concept of ~~kaitiakitanga~~ manaakitanga, respecting the land. Caring for it by protecting it for generations to come. Caring for it by providing it with all the beneficial effects on soil properties.

Ensure reference to a **relevant** Māori concept or value, related to soil management, is included in your responses. One or more concepts may be appropriate.

Note: 'soil properties' refer to physical, chemical, and biological properties of soil.

QUESTION THREE: Soil structure and water

Name a primary production system.

Primary production system: Dairy Farming

For your primary production system, choose a management practice from the list below that may help to improve drainage of the soil.

- Installing a drainage system
- Cultivation
- Application of lime
- Application of effluent
- Using a multi-species sward

Chosen management practice: Application of lime

(a) With reference to your chosen primary production system, describe how this management practice is carried out.

Lime is applied ~~throug~~ by a ~~mini spreader~~ mini spreader or a quad or by a spreader on a tractor. It can be done by a truck or a plane as well. It is applied as a fine powder onto the soils. It is best suited to clay soil as it flocculates the particles. This shows Tiakitanga by showing guardianship for your land and ~~protectt~~ protecting it ~~from what~~ from harm.

(b) How does this management practice improve one physical and one biological property of soil?

Physical property: It improves the physical properties on a clay soil. It flocculates the particles, making for better drainage and more aeration. It decreases water-logging, which will in turn increase soil temperature. It also decreases pugging (by letting water drain) which helps with soil structure.

Biological property: By creating drainage, this allows for better aeration within the soil. This creates a better living environment for the microbes by allowing them to respirate.

Choose a second management practice from the list on page 8.

Second management practice: Installing a drainage system.

(c) For your chosen primary production system, which of your two management practices is more effective in improving soil structure and drainage?

Justify why the grower should use this management practice with reference to plant growth.

One type of drainage system is a mole drain, this is best suited to clay soils. It is done by putting a mole plough on the back of a tractor and ploughing a hole through the soil and into a drain. This helps with drainage. By increasing drainage you are increasing soil temperature. As too much water in pore spaces will make the soil cold. This will help the plants grow as it ensures they have microbes in the soil to break down organic matter and so the plant doesn't drown. The nutrients being provided by the break down of organic matter will help the plants thrive.

This management practice is better for improving soil structure and drainage. It is cheaper than lime and drains the water more directly. It will help with structure by decreasing pugging. This relates to the Maori value of manaakitanga by caring for the plants and microbes,

by making sure they don't drown and continue to thrive.

Merit

Subject: Agricultural and Horticultural Science

Standard: 91930

Total score: 16

Q	Grade score	Marker commentary
One	M6	The candidate has explained that adding fertilisers to the soil will increase the plant growth by linking nutrients to specific roles within the plant. They have also explained that soil testing is important to ensure the current nutrients are applied and to ensure the pH of the soil wont limit how available the nutrients are. Discussing the negative impacts of over-application of fertiliser would have taken the response to excellence.
Two	M5	The candidate has explained that compost is made from broken down food scraps and organic matter. They have explained the role of microbes in the production of humus and that this provides the soil with nutrients. For a more solid Merit, they could have given more detail about the role of specific soil organisms, e.g. bacteria, fungi, worms etc.
Three	M5	The candidate has explained that adding lime to the soil will flocculate soil particles and will aid soil drainage and aeration. They have linked this to increase soil temperature and increase biological respiration. For a more solid Merit, an explanation of the role that respiration has in increasing plant production would have been necessary.