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91930





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Mana Tohu Mātauranga o Aotearoa New Zealand Qualifications Authority

Level 1 Agricultural and Horticultural Science 2024

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 2–11 in the correct order and that none of these pages is blank.

Do not write in the margins (1/1/1/2). 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

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INSTRUCTIONS You must choose a different soil management practice to answer each question. Ensure reference to a **relevant** Maori concept or value, related to soil management, is included in your response. One or more concepts may be appropriate. Note: 'Soil properties' refers to physical, chemical, and biological aspects of soil.

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QUESTION ONE: Soil water

Choose a primary production system.

Primary production system: Dairy Farming

(a) (i) Name and describe a soil type that would require management to remove excess water during periods of high rainfall.

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A soil type that would need water to be removed after lots of rainfall is clay soil. Clay soil has very small soil particles which causes its pore spaces to be very small, this makes it difficult for water to drain freely. which means when there is lots of rain clay soils get waterlogged easily.

(ii) What impact can excess water have on soil properties and plant growth?

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Excess water impacts the aeration of the soil. Because the water can't drain it fills up the pore spaces in the soil, this causes pore aeration in the soil. Aeration is crucial for plant growth because the oxygen in the air is required for respiration. If there is no oxygen availabe to the plants the can't respire causing very slow plant growth.

(b) Evaluate a soil management practice that is used to remove excess water from a soil in your chosen primary production system.

In your answer you should consider how the management practice:

- · modifies conditions for plant growth and productivity
- improves soil conditions
- cares for the soil.

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A management practice used in dairy farming to remove excess water is drainage. dairy farms will often dig trenches next to or through their paddocks, this causes the water to be pulled into these trenches and out of the soil. With less water in the soil aeration is improved, this means there is a better supply of oxygen in the soil which increases the rate of respiration therefore improving grass growth. More aeration in soils also causes the soil to warm up. Cold soils cause plant growth to slow, this means soil also helps increase plant growth by raising the soil temprature. Good sustainable grass growth is crucial in dairy farming as the amount and quality of the grass that the cows eats has a direct link to the quantity and quality of their milk. Therefore by carrying out drainage grass is able to grow better and then causes the cows to produce more good quality milk to be harvested.

A Maori concept that relates to drainage is Manakitanga which refers to caring for the soil. this applies to drainage as by improving drainage you are making the soil into a better enviroment so it can grow healthy crops. for example by improving drainage the soil has more oxygen for plants to use and it makes the soil into a warmer environment for plant roots.

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QUESTION TWO: Soil nutrients

Choose the same or a different primary production system to answer this question.

Primary production system: Dairy Farming.

(a) How are nutrient levels tested in soil in your chosen primary production system?



(b) Evaluate a soil management practice for your chosen primary production system that can increase the level of nutrients in the soil. This practice must be **different** from the one discussed in Question One.

In your answer, you should consider how the management practice:

- alters the properties of soil
- cares for the soil
- · helps optimise plant growth.

B I U E v E v ☆ ⑦

A soil management practice in dairy farming to improve the nutrient content of the soil is fertilisation. Fertilisation consists of applying a mix of nutrients to the soil. there are two types of fertiliser Solid which is applied in the form of granuals or powder, or liquid which is sprayed on. solid fertiliser is good of applying to all topographies as it doesn't run of steeper hills; However, because it is solid it has to be disollved by water before the plants can use it making it slower acting. Liquid fertiliser on the other hand is already dissolved therefore it is much faster acting which causes faster plant growth, but if applied directly above a crop it can burn and damage the leaves of that crop so it is best to use liquid fertiliser as a base dressing before planting crops. Fertilisers are very efficient as the mix of nutrients in them can be altered so if your soil is deprived of one nuitrient more than the other for example if there is less nitrogen than potassium the nitrogen can be applied in a higher concentration causing a more even amount of nutrients. having good nutrient content in soil is very important for optimised plant growth as it supplies the plants with the correct amount of nutrients to sustain healthy and consistant growth.

A Maori concept that relates to to this is Manakitanga which refers to caring for the soil. fertilising applies nutrients to the soil which can then be used by plants for growth. therefore by applying fertiliser you are caring for the soil so it can promote healthy plant growth.

Exam Overview

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QUESTION THREE: Soil organisms

Choose the same or a different primary production system to answer this question.

Primary	production	system:	Dair	y Farming
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(a) What benefits do living organisms have on soil properties and plant growth in your chosen primary production system?

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• helps optimise plant production.

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A management practice in dairy farming that promotes living organisms is effluent application. Effluent application consists of spraying a mix of cow faeces, urine, and water over a paddock, this mix is collected from the cow shed during milking. By spraying effluent in paddocks it increases the amount and activity of earthworms this is because effluent has organic matter in it. The earthworms break down this organic matter releasing nutrients into the soil to then be used by the grass. the increase in activity from the earthworms also causes them to move around more creating more burrows and improving soil aeration. The organic matter in the effluent also improves soil structure by causing flocultation in the soil causing aggregates to form and improving soil drainage and aeration. Over all effluent application improves many different aspects of soil such as nutrient content, and soil structure which all work together to provide the crop with a healthy enviroment for optimum growth.

A Maori concept that relates to this is Tuhononga which describes the connectedness between things, this applies to effluent application as it describes how it improves different aspects of soil and how those improvements work together to sustain healthy plant growth. For example the earthworms help put nutrients in the soil to be used by plants as well as improving the soil structure and increasing aeration. The extra nutrients and aeration then work together to support different aspects of plant growth.

Merit

Subject: Agricultural and Horticultural Science

Standard: 91930

Total score: 15

Q	Grade score	Marker commentary
One	M5	The candidate has explained that draining the soil using a trench will remove excess water from the soil. The have explained that with improved aeration, plant respiration will increase, and the soil will be warmer. They have linked increase grass growth to improved productivity and demonstration of Manaakitanga towards the soil. For a more solid merit, the candidate should have explained why warmer soil will increase plant growth.
Two	M5	The candidate has explained how adding fertiliser will increase soil nutrients. They have explained the use of solid and liquid fertilisers and the pros and cons of each. They have also explained how fertiliser can apply different nutrients as required by the plants. For a more solid Merit, the candidate should have explained why the plant needs individual nutrients.
Three	M5	The candidate has shown an understanding of the multiple benefits of soil organisms. They have explained that applying effluent encourages soil organism activity, and the benefit this will have on releasing nutrients and improving soil aeration. For a more solid Merit, the candidate would have linked effluent application to benefiting multiple soil organisms (bacteria, fungi etc) and not just earthworms.