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NZQA

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Level 1 Agricultural and Horticultural Science, 2018

90919 Demonstrate knowledge of soil management practices

9.30 a.m. Thursday 22 November 2018
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate knowledge of soil management practices.	Demonstrate in-depth knowledge of soil management practices.	Demonstrate comprehensive knowledge of soil 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 2–11 in the correct order and that none of these pages is blank.

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

Excellence

TOTAL 21

ASSESSOR'S USE ONLY

QUESTION ONE: SILT SOILS

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Soil texture refers to the size of the particles that the soil is made up of.

(a) Describe the particle and pore size of a silt loam soil, and explain how these influence the physical properties of that soil.

Silt loam soil has fine particles and some macro pores, providing with good water retention but maybe poor drainage. Aeration is average as there are air in soil but not lots enough for plants to respire.

(b) Constant or continuous cropping in the same soil can lead to over-cultivation. Describe what happens to soil structure when it is over-cultivated, and explain how this affects soil properties and plant growth.

When the soil is over cultivated the drainage becomes poor as the soil peds have been constantly crushed to such a fine state that there is hardly any macro or micro pores meanly not much air for respiration or for water to drain away. This will also impact soil temperature as Air heats up faster then water so there will be more water in soil providing for cold temperatures. and lowered plant growth as the soil can become to wet and soaked, so there is no air for plants to respire.

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When a grower needs to irrigate their paddocks, they can use either a centre pivot irrigator or a gun irrigator.

Centre pivot irrigator

Source: www.southernwatercompany.com/products-services/irrigators-pivots.

Gun irrigator

Source: http://www.rainer.co.nz/assets/Uploads/SAM4.jpg.

(c) Select either a centre pivot irrigator or a gun irrigator as the most suitable method of irrigating.
Justify your selection by comparing and contrasting it with the other method.

Selected method: Centre pivot irrigator//

In your answer, consider:

- the efficiency of application
- the effect each one has on the physical, chemical, and biological properties of soil
- the effect on plant growth.

I would choose centre pivot irrigator because It is self efficient so it drives on its own. own And because It is able to water such a wide range of land all at once and because it moves at such a slow rate it ensures that all paddock can have water put on it. Whereas gun irrigator has to be moved manually so some areas of paddock may be missed or not watered as much as others making it not as efficient as the centre pivot. Both of them add water to the soil and //

More space for this answer is available on the next page.

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both may have a negative impact on soil as both compact soil depriving air from soil but centre pivot can have specially designed ~~roads~~ gravel paths for wheels to run along whereas gun irrigator needs to be moved by some sort of machine across to different areas of paddock. ~~Thus~~ a Centre pivot may give the right amount of water equally across the paddock so no nutrients run leach through soil. Whereas with the gun some areas may be over watered meaning that the ~~soil~~ the excess water has leached nutrients but overall both will dissolve nutrients. Both add water to soil so encourage organic matter to grow and that means that it encourages microbes and worms ~~to~~ to thrive in soil. Centre pivot irrigator has a larger and better effect on overall plant growth as the whole paddock is equally recieving enough water and, thus giving the perfect amount for plants to photosynthesise. Whereas with a gun irrigator you would need quite a few to water a paddock and still there will be spots missed and some areas more watered then others, providing with an uneven plant growth and the farmer unable to utilise the full pasture in paddock as some areas will have had to much or no water so growth is very small and that feed is ~~then~~ wasted. //

E7

QUESTION TWO: SOIL TESTING

ASSESSOR'S USE ONLY

A soil drop test is when a spadeful of soil is dug up and then dropped onto the ground. The soil then breaks into peds, which are clumps of soil.

Soil drop test

(a) Explain how the size and shape of the soil peds show what the drainage and aeration of that soil will be like.

If the soil structure is more ped sized and shaped, this would be most ideal structure as it creates enough macropores for good drainage but also enough air for plants to respirate. The finer the soil, the less aeration and more water ~~retention~~ holding capacity. The bigger the grains the more space and for air and water to drain through.

After completing a soil drop test, a grower noticed that the soil had very little organic matter.

(b) Describe a management practice that could be carried out on soil to improve its organic content, and explain how adding organic matter will affect soil properties.

Composting will improve organic content. adding organic matter will increase ~~ph~~ biological as it encourages worms and microbes to thrive and ~~the~~. This will impact physical properties as the worms will tunnel in soil ~~as~~ creating more aeration and space for drainage. More organic matter will increase chemical properties by the increase in nutrient retention because of the more roots ~~and~~ from growing in soil.

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After a laboratory had carried out a soil test on samples taken from a farm, it was recommended that lime be applied to the paddocks.

(c) Justify why a grower would apply lime to the paddocks.
In your answer, consider:

- how lime can be applied to soil
- how lime affects the physical, chemical, and biological properties of soil
- the effects on plant growth.

Lime can be applied by a plane spreading over soil or by a truck and a spreader on back. Affects physical properties as Liming may flocculate soil if it is clay, making the soil to have increased aeration and drainage abilities. Lime also unlocks nutrients in the soil making them readily available for the plants to uptake. It also increases the pH which ~~encourages~~ means it decreases acidity of soil. This also increases microbes and worm life as the pH level is not acidic which would burn the microbes and worms, because of increase in biological activity in things such as worms, they may also increase aeration in soil as they tunnel through soil, this would create more air for plants to respire. Overall Lime would increase plant growth as it is going to unlock nutrients to make them readily available to plants but also increases pH so that the soil is not to acidic. ~~Because the increase in biological~~ And the plants can grow to their best capability. Because of the increase in chemical it creates more microbes to make the soil have better aeration and drainage by burrowing, so it increases respiration and also gets the right levels of water to

E7

QUESTION THREE: SOIL NUTRIENTS

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The nutrient status of soil is very important. Nutrients in the form of fertilisers need to be applied to the soil in specific ratios.

(a) Explain the effects that applying excess (too much) nutrients can have on soil properties and plant growth.

If too much of the one nutrient is applied It can then cause the acidity of soil to increase which will impact biological life as they will die from this. To much of nutrients in soil will leach through into waterways. To much nutrient can kill the plant or roots system because of the strength

In order to improve plant growth on a dairy property, a farmer can apply either dairy shed effluent or fertiliser.

(b) Select the better method, and justify your selection by comparing and contrasting it with the other management practice.

Selected management practice: ~~dairy shed effluent~~ fertiliser

In your answer, consider:

- how each method is carried out
- the effect on the physical, chemical, and biological properties of soil
- how application rates can be managed.

dairy shed effluent is carried out by on the back of a truck through a muck Spreader or through irrigation pipes and sprinklers etc. fertiliser can be done by a tractor and a spreader or quad bike or a plane all of them Spread fertiliser out. ~~I chose fertiliser as it is more accurate and manageable.~~ Instead I chose dairy shed effluent. Because it has more positives that outweigh the negatives. It adds organic matter into the soil which encourages the lifes of

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microbes and worms. Whereas fertiliser actually harms Biological life because of its acidity. Because of the microbes and worms addn in soil as a result of effluent they improve the ~~physical~~ physical properties of the soil by tunneling through soil creating more air ~~and~~ and drainage so the plants can respirate and grow more. ~~Fertiliser has no effect on plants~~ and also while adding effluent it also adds water in soil so the plants can grow more by increase in photosynthesising. Whereas fertiliser has no effect on physical properties of soil as it is only adding very strong fertiliser that will have no effect on air in soil or water (unless liquid fertiliser) — but is very expensive. Chemically effluent adds some nutrients like Nitrogen that ~~nacty~~ enhances leaf growth of plants but mainly fertiliser is better here as you can give the exact nutrients required to improve growth. But Because of all the other positives from effluent it outweighs the slight negative chemically and overall effluent will enhance the growth of plant more than fertiliser because of its wide range of qualities. effluent can be managed by spreading it across a wide range of paddocks not in one ~~spot~~ paddock so that it doesnt cause any environmental problems. fertiliser needs to be exactly done in correct ratios otherwise its detrimental to health of soil and plants it needs to make sure not too much is going in of

E7

Excellence Exemplar 2018

Subject	Level 1 Agricultural and Horticultural Science	Standard	90919	Total score	21

Q	Grade score	Annotation
1	E7	They understand the effects of over-cultivation on plant processes. They have recognised that both irrigation systems are beneficial but also there are differences that effect the growth of plants and plant processes. There is a little confusion in some parts but have an overall good comparison.
2	E7	Although they have misunderstood soil peds, they have shown a good understanding of the effects of applying lime to a soil, in its effects on soil organisms, nutrient availability, and effect on clay soils.
3	E7	The student shows good understanding of fertilizer application and comparison to effluent, linking plant processes and a distinction between targeting fertilizer. They also show some understanding about the effect of excess nutrients being applied.