

Assessment Schedule – 2018

Agricultural and Horticultural Science: Demonstrate knowledge of soil management practices (90919)

Assessment Criteria

Not Achieved		Achievement		Achievement with Merit		Achievement with Excellence	
Describes how soil management practices are carried out.				Links ideas to explain why soil management practices, or steps within practices, are carried out.		Applies knowledge of soil management practices to given situations. This may involve comparing and contrasting or justifying management practices.	
N1	N2	A3	A4	M5	M6	E7	E8
Describes ONE idea at Achievement level.	Describes TWO ideas at Achievement level.	Describes THREE ideas at Achievement level.	Describes FOUR ideas at Achievement level.	Explains THREE ideas at Merit level.	Explains FOUR ideas at Merit level.	Justifies the method chosen.	Fully justifies the method chosen by comparing and contrasting.
N0 = No response; no relevant evidence.							

Question One: Silt soils

Examples of evidence for answers	
(a)	<p>Describes (Achievement) the particle and pore size / Explains (Merit) how these influence the properties of that soil.</p> <ul style="list-style-type: none"> • Average particle size and pore spaces allow for free-draining soil that holds water/has a high field capacity (Achievement), which allows water to move through, but leaves enough to be taken up by plants (Merit) and used for plant processes such as photosynthesis and respiration (Merit). • Also allows for minimum leaching (Achievement), so there is little or no loss of nutrients/nutrients are available for plant processes (Merit). • Good drainage means good aeration, so there is air in the soil (Achievement) for root respiration (Merit). • An even mix of air and water means there is less chance of the soil becoming saturated or too dry in extreme weathers (Achievement); also means that the soil is faster to warm up, so root reactions are sped up (Merit). Drainage and aeration are optimised (Merit).
(b)	<p>Describes (Achievement) the soil structure of over-cultivated soil / Explains (Merit) how this affects soil properties and plant growth.</p> <ul style="list-style-type: none"> • Over-cultivation destroys soil structure (Achievement), as the pore spaces are collapsed/reduced (Achievement), leading to erosion (Merit). This can cause loss of organic matter (Merit), which reduces the presence of soil organisms (Achievement), which in turn reduces nutrient recycling (Merit) through tunnelling activity (Merit). Overall plant growth is reduced (Achievement). • Can result in a clay pan (Achievement), which would reduce the ability of roots to grow through soil (Merit) to obtain water and nutrients (Merit). A clay pan could result in poor drainage/waterlogging (Achievement), which could lead to poor root respiration (Merit).

Examples of evidence for answers

(c) **Describes / Explains / Justifies** why one method is more suitable than the other.

Gun irrigator	Centre pivot irrigator
<p><i>Advantages</i></p> <ul style="list-style-type: none"> • Supplies water, which is needed for plant processes (Achievement) such as respiration, photosynthesis, or cell turgidity (Merit). • A gun is cheaper and requires less maintenance (Achievement). • Good for smaller areas or irregularly shaped paddocks (Achievement), because it can get into corners (Merit). • Easy to move from one paddock to another. 	<p><i>Advantages</i></p> <ul style="list-style-type: none"> • Supplies water, which is needed for plant processes (Achievement) such as respiration, photosynthesis, or cell turgidity (Merit). • Covers more ground, so there are fewer passes and less crop damage (Achievement). • Can deliver water at variable rates and with greater precision (Achievement), and can therefore provide optimum quantities of water to a larger area in a shorter time (Merit). • Variable rates mean that soil water is kept at field capacity (Merit).
<p><i>Disadvantages</i></p> <ul style="list-style-type: none"> • Uses more water, as it cannot be as easily regulated / not variable (Achievement); therefore, more water passes through the crop / paddock, damaging soil and increasing the likelihood of ponding (Merit). • Could also lead to nutrient leaching, run-off, and / or topsoil erosion (Merit). 	<p><i>Disadvantages</i></p> <ul style="list-style-type: none"> • More expensive, and has more parts to maintain (Achievement). • Fixed position, so cannot be moved.

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Question Two: Soil testing

Examples of evidence for answers	
(a)	<p>Describes (Achievement) / Explains (Merit) how soil peds show what the drainage and aeration will be like.</p> <p>Shows soil structure – a crumbly, loose soil has good structure, whereas soil that stays in one hard clump or shatters completely has poor structure (Achievement). Crumbly, loose soil has good aeration and drainage (Merit), and vice versa. Soil that does not break up indicates poor structure and/or potential for waterlogging (Merit). The larger the peds, the more clay that is present (Merit).</p>
(b)	<p>Describes (Achievement) / Explains (Merit) how to increase organic matter and the effect of this on soil properties.</p> <p>Add green manure/dig in crop stubble, or add compost (Achievement). Organic matter improves the water-holding ability of soil (Achievement) so that more water is available for plant processes (Merit), and breaks down slowly to gradually provide its nutrients to the soil (Achievement), which are then available for plant growth (Merit); encourages earthworms and microbe activity (Achievement) to aid with nutrient recycling (Merit), which improves structure, drainage, and aeration, due to their burrowing (Merit). Soil is darker, so heats up faster (Achievement), which speeds up chemical reactions and therefore plant growth (Merit).</p>
(c)	<p>Describes / Explains / Justifies the use of lime on paddocks.</p> <ul style="list-style-type: none"> Lime is applied to the soil in powdered form from a mini-spreader – truck or quad bike – or from an aeroplane/top-dresser (Achievement). Liming reduces soil acidity (Achievement), which increases the availability of nutrients in the soil for increased plant growth (Merit). A higher pH (Achievement) leads to increased earthworm activity (Merit) and tunnelling, which provides oxygen to plant roots (Merit) and improves water movement (Merit); this, in turn, speeds up the decomposition process that provides nutrients to plants (Merit). It unlocks soil nutrients (Achievement) and makes them available to plants (Merit). Lime can flocculate clay particles together (Achievement) and improve soil structure (Merit), leading to increased respiration and plant growth. Lime encourages activity by microbes and worms, by making soil less acidic (Achievement). Microbes and worms go on to break down organic matter (Merit), which also increases nutrient levels (Merit).

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Question Three: Soil nutrients

Examples of evidence for answers	
(a)	<p>Describes (Achievement) / Explains (Merit) the effects that excess nutrients can have on soil properties and plant growth.</p> <ul style="list-style-type: none"> • Salts / minerals build up in the soil (Achievement), which can be toxic to plants and soil organisms (Merit). • Leaching due to excess nutrients (Achievement), which means they are not available to plants for plant processes (Merit) and can pollute waterways (Merit). • Can cause the soil to become acidic (Achievement), which deters soil organisms (Merit) and may damage plant roots (Merit).

Examples of evidence for answers

(b) **Describes / Explains / Justifies** the better management practice.

- Fertiliser is usually applied in powdered form, by a mini-spreader or from an aerial top-dresser.
- Effluent is applied from an effluent spreader-truck, or piped out to the paddocks.

Fertiliser	Effluent
<p><i>Advantages</i></p> <ul style="list-style-type: none"> • Provides the exact nutrients required (Achievement). • Instant effect, as it can be applied whenever desired (Achievement). • Control over rate of nutrient release, according to needs (Merit). • Can be selective about which nutrients are applied – specific for each crop (Merit). • Easy to get in large or small amounts (Achievement). • Easy to apply (Achievement). 	<p><i>Advantages</i></p> <ul style="list-style-type: none"> • Increases nutrients in the soil (Achievement), which are therefore available for plants to uptake and use for growth (Merit). • Nutrients are already dissolved in water (Achievement), so they are readily available to the plant (Merit). • Water is also added, increasing soil water availability (Achievement), and so water is available for plant processes (Merit). • Effluent contains organic matter, which will help to glue soil peds/ particles together (Achievement), and therefore improve/maintain soil structure (Merit). • Increased levels of moisture and organic matter could lead to an increase in biological activity (Achievement), further breaking down organic matter and releasing nutrients (Merit), and improving structure (drainage and aeration) through tunnelling (Merit). • Increased number of macro pores (Achievement), which will improve drainage and aeration (Merit). • Increased organic matter (Achievement), and therefore increased water-holding capacity (Merit).
<p><i>Disadvantages</i></p> <ul style="list-style-type: none"> • Costly (Achievement). • Not always a sustainable product (Merit). • Easy to under- or over-apply (Achievement). • Can be acidic/acidify soil (Achievement). • Should do a soil test before application (Achievement). • Over-fertilising could lead to run-off/leaching (Merit). 	<p><i>Disadvantages</i></p> <ul style="list-style-type: none"> • Can be acidic (Achievement), so could lower pH (Merit). • Can add excess water to soil (Achievement), especially in winter, which leads to leaching into waterways (Merit). • Over-application can also cause leaching (Achievement), as the soil exceeds saturation point/becomes saturated (Merit). • Can have unpleasant odour (Achievement).

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 6	7 – 12	13 – 18	19 – 24