

Assessment Schedule – 2020

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

Assessment Criteria

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.

Evidence

Question ONE	Evidence
(a) <i>Demonstrates knowledge of how soil cultivation is carried out.</i>	<p>Describes (Achievement) / Explains (Merit) Aim: to achieve a fine, firm, weed-free seed bed.</p> <ul style="list-style-type: none"> • Spraying with a herbicide – to remove weeds in the soil (Achievement). Weeds will compete with the carrot crop for water, sunlight and nutrients (Merit). • Ploughing – to turn the soil (Achievement). Mixes in organic matter or topsoil (Merit). Remove soil pan, which can impact drainage or root penetration (Merit). • Disking – to break up the large clumps of soil (Achievement). Gives uniform particle size or fine soil (Merit). Less gaps mean the seed will be in contact with the water in the soil (Merit), allowing for greater germination rates (Merit). • Harrowing – to break up soil peds or clumps (Achievement). Fine soil in the seed bed means carrots will grow more easily through the soil (Merit), the seedlings will be able to easily emerge (Merit). Roots will be longer and more uniform in shape (Merit). • Rolling – to lightly compact the soil (Achievement). Seed is in contact with water (Merit), ensuring faster germination (Merit).
(b) <i>Demonstrates knowledge of the physical properties of silt loam soils and how they affect plant growth.</i>	<p>Describes (Achievement) / Explains (Merit)</p> <ul style="list-style-type: none"> • Silt loam is a medium particle size (Achievement), a mixture of clay (small), sand (large) and silt (medium) particles (Achievement). • Free-draining soils (Achievement) allow for a good amount of air and water to be held in pore spaces (Merit). • Good water holding capacity (Achievement). Particle size allows for soil to hold water (Achievement). Plants need to dissolve nutrients and carry out photosynthesis (Merit). • Aeration refers to how much air is introduced into the soil (Achievement). Air is needed for root respiration (Merit), so having enough will allow the plant to grow at a faster rate (Merit). • Temperature is connected to the amount of air in the soil, which allows it to warm up faster (Achievement). This increases growth due to the increasing reaction rate (Merit) of photosynthesis and respiration.

<p>(c) <i>Demonstrates knowledge of why a grower should practice crop rotation.</i></p>	<p>Describes (Achievement) / Explains (Merit) / Justifies (Excellence)</p> <ul style="list-style-type: none"> • Crop rotation – changing the crop you plant in a paddock each year or planting the same crop in a different paddock each year. • Monocropping – planting a crop in the same paddock year after year. 		
	Crop Rotation		Monocropping
	<i>Differences</i>	<i>Similarities</i>	<i>Differences</i>
	<ul style="list-style-type: none"> • Reduces the number of pests and diseases in soil by removing the host plants (Achievement). Pests and diseases can reduce plant growth by damaging plant roots, stems or leaves (Merit), which affects the ability to carry out photosynthesis and respiration (Merit). • Better utilises the nutrient status of the soil (Achievement). Different crops have different roots depths and changing the crop can mean that the new crop will be able to access nutrients in different levels (Merit) and grow faster (Merit). 	<ul style="list-style-type: none"> • Both will require cultivation as the new seed is planted each year (Achievement). This can lead to reduced organic matter in the soil and reduced nutrient levels (Merit). • Over-cultivation can lead to reduced soil structure / smaller peds / smaller pore sizes (Achievement), which reduces aeration, drainage, and / or the number of microorganisms in the soil (Merit). • Both could be done with minimum tillage as new seed is planted each year (Achievement), which can lead to improved soil structure (Merit) and improved nutrient status (Merit). 	<ul style="list-style-type: none"> • Large numbers of pests and diseases (Achievement) due to the numbers being provided with a host plant yearly (Merit). Reduces overall crop performance (Merit). • Nutrients deplete from the same level in soil profile (Achievement) and require more fertiliser application to keep the nutrient status in that area high, and to maintain plant growth (Merit). This can be costly. • Less cultivation required annually. It can help protect the soil from erosion or over-cultivation, which decreases soil fertility and can cause erosion of top soil.
<p><i>Allow credit to be gained from discussing relevant physical properties of soil.</i></p>			

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 by comparing and contrasting.	Fully justifies the method by comparing and contrasting.

N0 = No response; no relevant evidence.

Question TWO	Evidence
<p>(a) <i>Demonstrates knowledge of how pugging affects soil properties.</i></p>	<p>Describes (Achievement) / Explains (Merit)</p> <ul style="list-style-type: none"> • Pugged soils have less aeration (Achievement) and less air means that microorganisms will be fewer as they cannot survive in waterlogged soils (Merit). • Poor drainage means a greater water-holding capacity (Achievement). Compaction leads to smaller particle size and less pore space (Merit), which reduces soil drainage (Merit). Waterlogged soils can have increased numbers of pests and diseases (Merit). • Colder temperature, i.e. less air (Achievement) means a slower breakdown of organic matter (Merit). Slower respiration of plants, animals and microbes in the soil (Merit).
<p>(b) (i) <i>Demonstrates knowledge of a suitable drainage system for pugged soil and how it improves soil properties.</i></p> <p>(ii) <i>Demonstrates knowledge of how adding drainage would improve soil properties.</i></p>	<p>Describes (Achieved) / Explains (Merit)</p> <p>Subsurface drainage system such as:</p> <ul style="list-style-type: none"> • clay tiles – farmers dig a trench and lay the clay tiles under the soil surface (Achievement). • mole drains – formed by using a mole plough pulled behind a tractor. As it is dragged through the soil, it makes a series of channels and cracks that the water can flow through (Achievement). • Novaflo – perforated plastic piping buried under the soil. Usually covered with a layer of gravel or coarse sand to promote drainage into the Novaflo piping (Achievement). <p>Improves soil properties by:</p> <ul style="list-style-type: none"> • increasing drainage and reducing water holding capacity (Merit), allowing more water to drain through the soil. This stops waterlogging (Merit), and allows the soil temperature to warm faster (Merit). • increasing microorganism numbers (Achievement). Microbes cannot survive in waterlogged soils, as they need air to respire (Merit). This increases the breakdown of organic matter and the nutrient status of the soil (Merit).
<p>(c) <i>Demonstrates knowledge of why a farmer would carry out a soil test before applying fertiliser.</i></p>	<p>Describes (Achievement) / Explains (Merit) / Justifies (Excellence)</p> <ul style="list-style-type: none"> • Soil Test – done by taking a sample of soil from a paddock using a soil probe, and sending it away to be tested for pH and availability of key nutrients, e.g. N, P, K, S. • Fertiliser application – applying fertiliser to a paddock using a mini-spreader towed behind a quad bike. <p><i>The following statements are to be used to give judgment between justifies and fully justifies. Achievement and merit grades will be awarded based on any linking between the statements.</i></p> <ul style="list-style-type: none"> • A soil test allows you to determine the nutrient level and pH in your soil before fertiliser is applied. • Identifying the nutrients that are deficient in soil allows farmers to apply the correct fertiliser needed to increase nutrient status. • The pH of soil is measured on a scale of 0–14. When soil is too acidic (less than 5.5), the amount of nutrients available to the plant decrease and can slow plant growth. • Doing a soil test first, and determining the pH, means that plants are able to access the nutrients available in the soil for growth. • Farmers can soil test different paddocks and apply different rates of fertiliser accordingly. • Soil tests take time and cost money, and farmers have to wait for the results to return before fertiliser can be applied. • However, this allows for accurate fertiliser application. If too much fertiliser is applied, it can leach through into water sources. • It also means that if soil is too acidic, or too basic, the plants cannot use the nutrients even if they are in the soil.

<ul style="list-style-type: none"> • Although it costs money to have a soil test done, the overall costs of fertiliser application are reduced. 							
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 TWO methods by comparing and contrasting.	Fully justifies the TWO methods by comparing and contrasting.

N0 = No response; no relevant evidence.

Question THREE	Achievement	Achievement with Merit	Achievement with Excellence
(a) <i>Demonstrates knowledge of the texture of sandy soils.</i>	<p>Describes (Achievement)</p> <ul style="list-style-type: none"> Sandy soils have a large particle size (Achievement), which means there are large pore spaces between the particles (Achievement). <i>Allow credit for giving relative particle size.</i> Particle size 0.02 mm–2.0 mm / larger than clay or silt. 		
(b) <i>Demonstrates knowledge of how compost is made.</i>	<p>Describes (Achievement) / Explains (Merit)</p> <ul style="list-style-type: none"> Waste plant material is placed in bins (Achievement) to break down and recycle nutrients (Merit). The bin structure has gaps or holes for aeration (Achievement) to allow air to circulate and to aid microbial breakdown of organic matter (Merit). Lime is added (Achievement) to prevent the compost from becoming too acidic (Merit), which encourages microbes and worms because it is not too acidic for them (Merit). The lid is sometimes left off to allow water to enter (Achievement), helping to speed up decomposition by microbes (Merit), which need a moist environment to thrive (Merit). Left undisturbed, compost heats up, providing a warm, moist environment for microbes (Merit), which break down plant matter and aid nutrient recycling (Merit). Compost is taken from the bottom of the compost bin (Achievement), so that the material is well broken down, nutrients are released (Merit), and seeds are dead (Merit). 		
(c) <i>Demonstrates knowledge of why a farmer would apply compost to sandy soils.</i>	<p>Describes (Achievement) / Explains (Merit) / Justifies (Excellence)</p> <p>Advantages of compost</p> <p>Sandy soils are free draining (Achievement) and have limited water holding capacity, which can reduce the rate of plant growth (Merit). Water is needed to dissolve nutrients (Merit) and for plant processes, such as photosynthesis, respiration and cell turgidity (Merit).</p> <p>Physical properties:</p> <ul style="list-style-type: none"> Organic matter acts like a sponge and absorbs water (Achievement), increasing the water holding capacity of soil (Merit). This means the soil becomes less free draining (Merit). More water remaining in soil means that more is available to dissolve nutrients (Merit), so plants can absorb them to assist with plant growing processes such as photosynthesis (Merit). Organic matter is often darker in colour (Achievement). This means it will hold more heat, increasing the soil temperature (Merit), which is useful when the temperatures cool down in winter and the soils lose heat rapidly (Merit). Plants will have improved growth rates as the rate of reaction for both photosynthesis and respiration speed up (Merit). <p>Biological properties:</p> <ul style="list-style-type: none"> Greater organic matter increases the number of microorganisms (Achievement), which increase aeration and temperature in the soil by tunnelling (Merit), which increases root respiration rate (Merit). Introduces unwanted pests and diseases (Achievement), which could have a negative impact on plant growth by causing stem or root damage (Merit). <p>Chemical properties:</p> <ul style="list-style-type: none"> Compost contains organic matter (Achievement), which adds nutrients to the soil (Merit). This is broken down by microorganisms, such as worms (Achievement), increasing the nutrient status in soil (Merit), meaning more is available for plant growth (Merit). 		

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 by comparing and contrasting.	Fully justifies the method by comparing and contrasting.

N0 = No response; no relevant evidence

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 18	19 – 24