

## Assessment Schedule – 2012

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

#### Evidence Statement

#### Question One – Drainage

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 <b>comparing and contrasting</b> or <b>justifying</b> management practices.	
N1	N2	A3	A4	M5	M6	E7	E8
Describes ONE idea at the Achievement level.	Describes TWO ideas at the Achievement level.	Describes THREE ideas at the Achievement level.	Describes FOUR ideas at the Achievement level.	Explains THREE ideas at the Merit level.	Explains FOUR ideas at the Merit level.	Justifies the method chosen.	Fully justifies the method chosen by comparing and contrasting.

N0 = No response; no relevant evidence.

#### Examples of evidence for answers

<p>In (a) (i) draws a diagram of an underground drain (Achievement), then in (ii) explains (Merit) what the various components do. Should link structure to function:</p> <ul style="list-style-type: none"> <li>• Diagram should show a cross-section of an underground pipe system, with gravel above and below the piping. Diagram showing gravel, piping and soil above the gravel, labelled. (Achievement).</li> <li>• Gravel prevents soil particles from seeping into the drain and blocking it, or from clogging the holes in the pipes. (Merit)</li> <li>• The water can drain through the soil and then quickly through the gravel into the pipe. (Merit)</li> <li>• Pipe has holes in it, so that water can drain down from the surface into the pipe, and is then carried away. (Merit)</li> <li>• Soil above the gravel/the drain filled in means that there is soil for pasture to grow in above the drain. (Merit)</li> </ul>
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In (b) describes (Achievement) or explains (Merit) how drainage will affect the physical properties of soil, and why it will improve plant growth:

- Drainage allows for a better soil water to soil air ratio/better aeration (Achievement), which means oxygen is available for root respiration (Merit).
- The water drains away, leaving room for air in the pore spaces (Achievement). Less water means more oxygen is available for root growth, which will increase plant growth (Merit).
- The soil will be warmer because the air heats up faster than water (Achievement), which speeds up plant chemical reactions, increasing growth (Merit).
- Increased growth due to warmer soil could mean crops can be harvested earlier. (Merit)

In (c) (i) describes mole drainage (Achievement):

A mole plough with a ripper blade and a cylindrical foot/expander is dragged through the soil behind a tractor. The ripper cracks the soil structure, while the expander forms a channel, creating underground tunnels that soil water drains into. The clay soil is dense and sticky enough that the channels stay open for a number of years.

In (c) (ii) describes /explains/justifies why one drainage system is preferable to the other:

- Drains need to be level with the water table, not the topography, otherwise they will undulate through the soil, and water will not drain away.
- Drains need to have a slight angle of fall, so that water is drained away from the paddock.
- Drain into open drains.

<b>Mole drains</b>	<b>Underground pipes</b>
<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>• It is the cheaper option.</li> <li>• It is faster.</li> <li>• Needs to be redone after a few years.</li> </ul>	<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>• Water drains quickly through the gravel and into the drain, once it hits the gravel.</li> <li>• Long-lasting/durable.</li> <li>• Can be done with a GPS mapping system, so it is easy to access later.</li> </ul>
<p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>• It is possible that the soil above the channel will not crack, and then water will not drain through easily.</li> <li>• Can be compacted if heavy machinery constantly goes over it.</li> </ul>	<p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>• Costly and time-consuming to install.</li> <li>• Soil particles can move through the gravel and clog some of the holes in the pipe.</li> </ul>

**Question Two – Garden vegetable plot**

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 <b>comparing and contrasting</b> or <b>justifying</b> management practices.	
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**N0** = No response; no relevant evidence.

**Examples of evidence for answers**

In (a) describes (Achievement)/explains (Merit) how irrigation affects the properties of soil, and how these affect plant growth:

- Irrigation increases soil water available to the plant (Achievement), which increases photosynthesis for improved plant growth (Merit).
- Increased water means that nutrients will be dissolved (Achievement) and readily taken up by the plant, which will improve growth (Merit).
- Water is available for soil organisms (Achievement), which help break down organic matter and make more nutrients available (Merit).
- Water/moist soil encourages worms (Achievement), which improve/help maintain soil structure to provide a good growing environment (Merit), and cycles nutrients (Merit).

In (b) describes (Achievement) how compost is made, and explains (Merit) why each action is done this way:

- Waste plant material is placed in bins (Achievement) to break down and recycle nutrients (Merit).
- The bin structure has gaps/holes for aeration (Achievement) to allow air to circulate and aid microbial breakdown of organic matter (Merit).
- Lime is added (Achievement) to prevent the compost from becoming too acidic (Merit).
- Lime is added (Achievement), which encourages microbes and worms because it is not too acidic for them (Merit).
- The lid is left off sometimes, to allow water to enter (Achievement), helping to speed up decomposition by microbes/microbes need a moist environment to thrive (Merit).
- Compost is left undisturbed to heat up (Achievement). This helps to denature seed enzymes, so that unwanted plants do not grow when it is used (Merit).

- Left undisturbed, compost heats up, providing a warm, moist environment for microbes (Achievement), which break down nutrients and aid nutrient recycling (Merit).
- Compost is taken from the bottom (Achievement), so that it is well broken down / nutrients are released / seeds are dead (Merit).

In (c) describes / explains / justifies why one practice is preferable to the other.

<b>Compost</b>	<b>Fertiliser</b>
<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>• Low in nutrients / not nutrient-specific.</li> <li>• Improves water-holding ability of soil, so that more water is available for plant processes.</li> <li>• Breaks down slowly to gradually provide its nutrients to the soil, which are then available for plant growth.</li> <li>• Encourages earthworms and microbe activity to aid with nutrient recycling.</li> <li>• Encourages earthworm activity, which improves structure, drainage, and aeration, due to their burrowing.</li> <li>• Soil is darker, so heats up faster.</li> <li>• Soil is warmer, which speeds up chemical reactions and therefore plant growth.</li> <li>• Productive use of waste products.</li> <li>• Low cost.</li> </ul>	<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>• Can get the exact nutrients you want.</li> <li>• Instant effect, as you apply it when you want.</li> <li>• Can get slow or fast release to suit your needs.</li> <li>• Can be selective about which nutrients you apply.</li> <li>• Easy to get in large or small amounts.</li> <li>• Easy to apply.</li> </ul>
<p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>• Takes time to make.</li> <li>• Seeds can survive and germinate when you use it.</li> <li>• Need a lot of waste to make a relatively small amount of compost.</li> <li>• Not all nutrients are readily available.</li> <li>• Can be acidic.</li> </ul>	<p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>• Costly.</li> <li>• Not always a sustainable product.</li> <li>• Easy to under- or over-apply.</li> <li>• Can be acidic / acidify soil.</li> </ul>

**Question Three – Cultivation**

Not Achieved		Achievement		Achievement with Merit		Achievement with Excellence	
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**Examples of evidence for answers**

<p>In (a) describes how (i) (Achievement)/explains why (ii) (Merit) cultivation affects soil properties:</p> <ul style="list-style-type: none"> <li>• Cultivation is the process of using machinery (plough, rotary hoe, spade, fork) to break the soil into smaller peds/turn the soil over. (Achievement)</li> <li>• Breaks up a hard pan, allowing improved air and water movement (Achievement) which increases water and oxygen availability to the roots for respiration (Merit).</li> <li>• Turns in organic matter (Achievement), thereby increasing soil nutrients available to plant, which increases plant growth (Merit).</li> <li>• Turns in organic matter (Achievement), increasing soil water-holding ability and number of soil organisms, which helps to hold soil particles together and cycle nutrients, all of which provides a good growing environment (specifics) (Merit).</li> <li>• Creates a fine tilth for sowing seeds (Achievement); improves germination and emergence (Merit).</li> <li>• Soil temperature can be influenced (Achievement) which effects chemical reactions, increasing or decreasing growth rate (Merit).</li> <li>• Breaks up soil structure by collapsing the pore spaces (Achievement), which leads to compaction and reduced air/water flow for photosynthesis/respiration (Merit). (A disadvantage)</li> </ul>
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In (b) describes / explains / justifies why one practice is preferable to the other.

Both place seed in an ideal environment for germination and don't have compacted soil to prevent seedling emergence.

<b>Direct drilling</b>	<b>Ploughing a seedbed</b>
<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>• Less soil disturbance means less compaction / structure remains intact.</li> <li>• Less erosion of topsoil.</li> <li>• Less compaction means good soil air and water movement ratio, which means oxygen is available for respiration and water for photosynthesis.</li> <li>• Places seed at ideal depth, often with only a small amount of fertiliser.</li> <li>• Only have to purchase one piece of machinery.</li> <li>• Reduced loss of water from soil.</li> <li>• Less loss of C and N from soil.</li> <li>• Fuel and time effective. (only 1 mark)</li> </ul>	<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>• Breaks up any compacted soil.</li> <li>• Creates a fine tilth.</li> <li>• Helps to level the topsoil, so that all seeds are sown at the correct depth.</li> <li>• Light compaction after sowing means that water is in contact with seed to begin germination.</li> <li>• Can add fertiliser and / or lime when preparing the seedbed.</li> <li>• Previous crop / pasture is turned in, so it does not compete with new pasture.</li> <li>• Previous crop / pasture is turned in, adding organic matter.</li> </ul>
<p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>• Only disturbs a thin topsoil layer, so will not break up a pan.</li> <li>• Does not incorporate into the soil.</li> <li>• Existing / residual plants could compete with new pasture.</li> </ul>	<p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>• Can cause compaction / destruction of structure.</li> <li>• Costs of purchasing many pieces of machinery.</li> <li>• Loss of fine topsoil to erosion.</li> <li>• Loss of C and N from soil.</li> </ul>