

Assessment Schedule – 2020**Agricultural and Horticultural Science: Demonstrate understanding of techniques used to modify physical factors of the environment for NZ plant production (91290)****Assessment Criteria**

Achievement	Achievement with Merit	Achievement with Excellence
Describes how management practices are used in market gardens to manage soil erosion.	Explains how management practices are used in market gardens to manage soil erosion.	Justifies the use of a management practice used in market gardens to manage soil erosion in terms of economic and environmental factors.

Evidence

Question ONE	Evidence
(a) <i>Demonstrates understanding of how management practices are used in market gardens to manage soil erosion.</i>	<p><i>These are potential examples. Other methods to manage erosion can be accepted.</i></p> <p>Cover crops Crop planted to protect the soil from raindrop impact and sheet / rill / wind erosion between rotations and ploughed into the soil before planting of a new crop. Cover crops can be used between successive crops to avoid leaving a bare soil surface, or within wheel tracks. Potential cover crops are oats, sorghum, mustard, phacelia and annual ryegrass, amongst others.</p> <p>Strip cropping Strips of permanent or erosion-resistant vegetation retained between crops to break up slope length, and reduce water and wind erosion. It alternates strips of closely-sown crops such as hay, wheat, or other small grains with strips of row crops, such as corn, oats, barley, or ryecorn. Strip cropping helps to stop soil erosion by creating natural dams for water, helping to preserve the strength of the soil. Certain types of plants will absorb minerals and water from the soil more effectively than others.</p> <p>Cultivation techniques (Strip tillage / minimum tillage / no-tillage). Used to manage soil structure and organic matter, increase infiltration, and reduce runoff and erosion. Includes minimum tillage, no-tillage and stubble retention. No-tillage seeds are directly sown into pasture / vegetation with no cultivation carried out. This means soil is not broken up and exposed, protecting it from rain and wind.</p>

<p>(b) <i>Demonstrates understanding of how a management practice is used in market gardens to prevent soil erosion in terms of economic and environmental factors.</i></p>	<p><i>Evidence given for no-tillage cultivation.</i></p> <p>While no-tillage farming cannot be used for all market garden crops, it is suitable for some varieties. No-tillage farming is the planting of seeds with a seed drill without tillage (i.e. turning over the soil). No-tillage farming can greatly reduce, if not eliminate, soil erosion. The fields to be planted are generally first treated with a herbicide such as glyphosate, and the seeds are planted in the residue of the previous crop and dead weeds. Using no-tillage farming greatly reduces labour, fuel and equipment costs, while also reducing soil erosion and increasing soil health. No-tillage cultivation can see a decrease in yield, depending on the method used, due to reduced germination and greater risk of pests. How the no-tillage method affects crop quality in market gardens depends on the crop. It cannot be used for crops such as carrots, as it would produce bends, while for other crops such as grains and corn, it can lead to an increase in quality. This is due to better soil health and soil moisture. In areas like Hawke's Bay, which is subject to wind erosion, no-till systems prevent crop damage caused by this.</p> <p>Economic</p> <ul style="list-style-type: none"> • Reduces labour and fuel costs due to not having to till the soil first. • Reduces machinery cost due to not needing such a powerful tractor. • Reduces irrigation requirements, due to having a greater amount of organic matter in the soil, while the residue of the previous crop acts as a mulch. <p>Environmental</p> <ul style="list-style-type: none"> • No-till farming sees a greatly reduced rate of erosion. • Increased rates of carbon sequestration. • Improved soil biodiversity.
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N1	N2	A3	A4	M5	M6	E7	E8
Some writing but does not describe how a management practice is used in market gardens to manage soil erosion.	Partial or insufficient description of how a management practice is used in market gardens to manage soil erosion.	Describes how ONE management practice is used in market gardens to manage soil erosion.	Describes how TWO management practices are used in market gardens to manage soil erosion.	Explains how ONE management practice is used in market gardens to manage soil erosion.	Explains how TWO management practices are used in market gardens to manage soil erosion.	Justifies the use of a management practice used in market gardens to manage soil erosion in terms of economic <i>OR</i> environmental factors. Clear evidence for superiority in ONE aspect, with the other aspect well supported.	Justifies the use of a management practice used in market gardens to manage soil erosion in terms of economic <i>AND</i> environmental factors. Clear evidence for superiority in BOTH aspects.

N0 = No response; no relevant evidence.

Assessment Criteria

Achievement	Achievement with Merit	Achievement with Excellence
Describes how management practices are used in outdoor plant production to manage temperature.	Explains how management practices are used in outdoor plant production to manage temperature.	Justifies the use of management practices used in outdoor plant production to manage temperature in terms of environmental and economic factors.

Evidence

Question TWO	Evidence
(a) <i>Demonstrates understanding of how management practices are used in outdoor plant production to manage temperature.</i>	<p><i>These are potential examples. Other methods to manage temperatures can be accepted.</i></p> <p>Site selection Planting on a north-facing slope. North-facing aspects will get sun throughout the day and so will have warmer soil temperatures, promoting growth. Locating orchards and plantings on north-facing slopes will mean better growth in most seasons. There is the risk of crops on north-facing slopes having reduced growth in summer, due to being too hot or dry.</p> <p>Black plastic mulches Black plastic mulches, such as those used in strawberry growing, serve a dual purpose in suppressing weeds and increasing soil temperature. This increase in soil temperature promotes growth in roots, stems, leaves and fruit, bringing the production of fruit forward to earlier in the season.</p> <p>Use of helicopters When inversion layers form, cold air can be trapped at lower levels while the air above is warmer. Crop growers can use helicopters to draw down air from a warmer inversion layer. This air movement warms the atmosphere around the plants and prevents frost from forming on the buds, leaves and fruit. This prevents damage in the fruit and buds caused by expanding ice crystals.</p>
(b) <i>Demonstrates understanding of how a management practice is used in outdoor plant production in terms of environmental and economic factors.</i>	<p>Site selection – north-facing slope An orchard is expensive to establish, and decisions made at the beginning will affect the orchard's performance for life. When first setting up an orchard, selecting the right site is crucial to maximise outputs while minimising inputs. Choosing a sheltered north-facing slope maximises the light and warmth the trees receive throughout the day, which allows the trees better growing conditions throughout the year. North-facing slopes will also have fewer and less severe frosts. An orchard located on a north-facing slope will see crops ripen earlier in the season with higher brix levels. As orchards are difficult, if not impossible to relocate, the initial site selection is crucial, otherwise the orchard will have ongoing yield and quality issues.</p> <p>Environmental impact</p> <ul style="list-style-type: none"> • North-facing slopes will require less frost protection, reducing the need for helicopters, water use or smoke pots. • Orchards located on north-facing slopes will have a greater water demand, due to higher growth rates and warmer temperatures. <p>Economic impact</p> <ul style="list-style-type: none"> • North-facing slopes will have higher yields with higher-quality fruit, due to increased warmth and light levels. • Fruit will ripen earlier in orchards located on north-facing slopes, allowing growers to achieve higher returns in the shoulder seasons. • North-facing slopes suitable for orchards will have a higher land value than corresponding south-facing slopes.

N1	N2	A3	A4	M5	M6	E7	E8
Some writing but does not describe how a management practice is used in outdoor plant production to manage temperature.	Partial or insufficient description of how a management practice is used in outdoor plant production to manage temperature.	Describes how ONE management practice is used in outdoor plant production to manage temperature.	Describes how TWO management practices are used in outdoor plant production to manage temperature.	Explains how ONE management practice is used in outdoor plant production to manage temperature.	Explains how TWO management practices are used in outdoor plant production to manage temperature.	Justifies the use of a management practice used in outdoor plant production to manage temperature in terms of its environment <i>OR</i> economic factors. Clear evidence for superiority in ONE aspect, environmental or economic, with the other aspect well supported.	Justifies the use of a management practice used in outdoor plant production to manage temperature in terms of its environment <i>AND</i> economic factors. Clear evidence for superiority in BOTH aspects.

N0 = No response; no relevant evidence.

Assessment Criteria

Achievement	Achievement with Merit	Achievement with Excellence
Describes how hail netting modifies the environment.	Explains how hail netting improves yield and quality.	Justifies the use of hail netting in terms of social and economic impacts.

Evidence

Question THREE	Evidence
<i>Demonstrates understanding of how hail netting can modify the physical environment and improve yield and quality in terms of social and economic impact.</i>	<p>Hail netting, either fixed or as a removable drape, is a physical barrier used to prevent hail from damaging the fruit or buds. Hail can cause severe damage to fruit such as apples, causing the flesh to be physically damaged, resulting in bruising. Holes left in the skin can also lead to insect damage. This damage makes it unsuitable for table fruit for both the export and domestic markets, meaning it needs to be juiced, dramatically reducing returns to the grower.</p> <p>Hail netting modifies the growing environment of the trees under the netting in a number of ways. It acts as shelter, reducing wind and branch rub, which can damage trees and fruit. Hail netting slightly reduces light levels, reducing sunburn in fruit, but also slightly reduces levels of photosynthesis. Hail netting has no effect on temperature, but due to its wind suppressing effects, it lowers the rate of transpiration. Hail netting also reduces bird and insect damage.</p> <p>Hail netting is expensive to install (\$20,000–\$30,000 per hectare), but the investment has a positive return. While growers can get insurance against hail damage, in years of severe hail damage, they are not able to ensure a consistent supply to their export markets. Hail netting may be considered an eyesore by some, especially in tourism areas.</p> <p>Social</p> <ul style="list-style-type: none"> • In some years, hail can damage a large proportion of crops, which effects employment and spending in rural communities. The use of hail netting allows for a consistent harvest from year to year. • Hail netting can have a large visual impact which some people object to. <p>Economic</p> <ul style="list-style-type: none"> • Hail netting comes with a large initial investment of between \$20,000–\$30,000 per hectare. • Reduces the need for expensive insurance policies. • Allows growers to have a consistent harvest from year to year, which is needed for the high-value export market.

N1	N2	A3	A4	M5	M6	E7	E8
Some writing but does not describe how hail netting modifies the environment.	Partial or insufficient description of how hail netting modifies the environment.	Describes ONE way in which hail netting modifies the environment.	Describes TWO ways in which hail netting modifies the environment.	Explains how hail netting improves yield <i>OR</i> quality.	Explains how hail netting improves yield <i>AND</i> quality.	Justifies the use of hail netting in terms of social and economic impact. Clear evidence for superiority in ONE aspect, with the other aspect well supported.	Justifies the use of hail netting in terms of social and economic impact. Clear evidence for superiority in BOTH aspects.

N0 = No response; no relevant evidence.

Cut Scores

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