2024 VCE Agricultural and Horticultural Studies external assessment report

General comments

In the 2024 examination for VCE Agricultural and Horticultural Studies, many students demonstrated a strong understanding of the subject matter and its application to real-world situations. A change in the structure of some of the questions this year provided additional ways for students to organise their responses, offering further opportunities for all students to gain marks and be rewarded for their knowledge. It was particularly rewarding to see the diversity of contexts from which students applied their understanding, ranging from urban vertical farming systems to large-scale cropping and everything in between, with high-scoring responses unrestricted to a single context. Future students are continued to be encouraged to explore new and familiar contexts for food and fibre production, particularly as they explore the past and future of agriculture and horticulture in Australia.

The 2024 examination offered substantial scope for students to apply their knowledge across a variety of questions. A range of responses was accepted for most questions due to the diverse ways students approached them and demonstrated their understanding.

Vocabulary and unclear sentence structures occasionally made it difficult for assessors to interpret the intent of responses. Additionally, many lower-scoring responses also incorrectly used high levels of modality to demonstrate cause and effect relationships (i.e. if *x* happens, it will cause *y*). Responses that used a lower modality to explain the effect of one thing on another tended to demonstrate deeper understanding of the subject area, also highlighting the importance of research in agriculture. Students are encouraged to write responses carefully, ensuring their writing is cohesive and directly addresses the requirements of questions.

Many students effectively identified and responded to command verbs at the beginning of questions (e.g. outline, explain, discuss), aligning their written answers with the specific demands of the task prompted by this verb. Care needed to be given to distinguish between the phrasing of questions such as ‘explain with two examples’ and ‘explain two examples’. Students should take time to read each question carefully, considering the verb (if relevant), the context of the question (e.g. does the question ask about industry-level or business-level effects, or about animal or plant production?), the relevant key knowledge and key skills from the current VCAA study design the question is targeting, and the number of marks allocated to the question. They should also ensure that responses succinctly address the question being asked rather than embedding key phrases into vague responses that do not relate to the question.

More specifically, students are advised to review the difference between prevention and treatment strategies for disease, and the difference between prevention and rehabilitation techniques for environmental degradation. Students should take the time to understand the different meaning of the words ‘prevention’, ‘treatment’, ‘control’ and ‘rehabilitation’ in the context of the strategies/actions/techniques with which they are familiar. Also, students should review the relevant government legislation prescribed in the current study design, and ensure that they know how these could affect agricultural and/or horticultural businesses specifically.

Further specific feedback has been included for most questions on the examination. Students are encouraged to read the feedback for this examination carefully.

Specific information

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

The statistics in this report may be subject to rounding, resulting in a total of more or less than 100 per cent.

Question 1a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 5 | 38 | 57 | 1.5 |

Full marks were awarded to responses that included both:

* a generalised statement about how a technological innovation or example of technological innovation affects people working in farming
* a specific statement about how the technological innovation benefits/challenges/improves/affects the lives of people working in farming.

To be awarded full marks, responses needed to address each part of the question, providing comment on an impact of technologies on people working in farming. Full marks were awarded to responses that specifically outlined the impact of technological innovations on people working in farming.

An example of a mid-scoring response was:

Implementing drones in farming and similar technological innovations allow farmers to monitor the entire expanse of their property and operations, through cameras and remote sensing increasing their productivity when managing their business, making their job easier.

Examples of high-scoring responses included:

* Drones are an autonomous technology that do not require humans to operate. They are able to observe and scan paddocks as well as treat weeds, pests and diseases through a targeted approach. In some cases this replaces the need for people on the farm, thus reducing job security to some employees, impacting people on the farm.
* Drones reduce the need for manual labour on farm as drones can be automated. However they also change what areas a farm worker may be trained in requiring more specialist technician training.

Question 1b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 18 | 43 | 39 | 1.2 |

Full marks were awarded to responses that included both:

* a generalised statement about how a technological innovation or an example of technological innovation increases yield
* a specific statement about how the technological innovation increases or could increase yield (a mechanism of action for improvement).

To be awarded full marks, responses needed to address each part of the question, providing comment on a clear role of technologies on yield/productivity. Full marks were awarded to responses that specifically outlined how technological innovations increase yield, demonstrating an understanding of what ‘yield’ is.

Examples of mid-scoring responses included:

* Allow for variable rates of inputs which focuses them, such as fertiliser, where they are needed which increases overall yield for land.
* Technological innovation such as drones can improve monitoring and inspection on farms. Therefore farmers can be alerted quickly of potential risks in their crops such as excessive weed growth much quicker than if they had personally inspected the crop from ground level.

Examples of high-scoring responses included:

* Drones for misters or herding cause less stress to livestock, which leads to a more productive yield for dairy cows as well as young lambs or calves being grown for meat and need to put on weight where stress situations like mustering may reduce the weight put on.
* Implementing technological innovations such as drones with remote sensing technology allows farmers to scout for areas where crops are affected by land degradation or pest, weeds, and diseases and therefore allows farmers to provide early control strategies, reducing how much of a crop is effected and therefore increasing yield.

Question 1c.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | 5 | 6 | Average |
| % | 6 | 11 | 20 | 22 | 23 | 12 | 6 | 3.1 |

Full marks were awarded to responses that included two of:

* a generalised statement about how a technological innovation or example of technological innovation affectsany aspect of environmental sustainability
* a specific statement about how the technological innovation increases or could improve any aspect of environmental sustainability (a mechanism of action for improvement)
* specifically detailing the link between technologies’ interaction with the environment (e.g. reduced greenhouse gas emissions) and the improvement of an aspect of environmental sustainability (e.g. reduced contribution to climate change, improved biodiversity, reduced pollution of natural waterways).

Responses awarded full marks could have included two different technological innovations or one technological innovation used in two different ways.

To be awarded full marks, responses needed to address each part of the question, providing comment on both technologies and environmental sustainability. Full marks were awarded to responses that specifically outlined how technological innovations improve specific aspects of environmental sustainability, demonstrating an understanding of environmental sustainability and the impact of technologies on the environment.

Examples of mid-scoring responses outlining one way technology improves environmental sustainability included:

* Technological innovation may play a role in the reduction of greenhouse gas emissions and consequential improvement of environmental sustainability. Technology such as drones with remote sensing technology can allow farmers to fully monitor all their operations without using a ute or tractor to travel around farm, resulting in a reduction of carbon dioxide.
* Technological innovations such as drones can reduce the chance of degradation issues occurring. Drones will reduce compaction issues and therefore salinity and wind erosion as they do not compress the ground.

Examples of high-scoring responses outlining oneway technology improves environmental sustainability included:

* One way technologies/drones contribute to improved environmental sustainability is that they reduce reliance on machinery and vehicles to check crops, livestock, cotton and flower growing. The reduced vehicle use reduces emissions of CO2 which reduces carbon footprint on the environment as drones are electric. Which improves environmental sustainability because it reduces the enhanced effect on climate change.
* Technological innovation that uses sensors to detect weeds will use less herbicides as it sprays only individual weeds. This can prevent toxic chemicals from having a negative impact on native flora and fauna and killing them as there is less off-target spray drift, thus protecting native biodiversity.

Question 2

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | 5 | 6 | Average |
| % | 10 | 7 | 16 | 19 | 23 | 14 | 12 | 3.3 |

Full marks were awarded to responses that included two of:

* an example of a solution to food waste at a producer level
* a statement about how the example solution reduces food waste at a producer level
* a reference to why the wasted product exists on farm (e.g. discoloured / bruised / does not meet supermarkets’ requirements for sale).

Most responses included at least one suitable example of a solution to food waste, and were awarded marks for suggesting how this solution helps to solve a scenario of food waste. Lower-scoring responses tended to provide descriptions of how food waste could be used, but did not contain the detail of higher-scoring responses that had suggested how the example would actually reduce a specific type of food waste product (e.g. olive leaves harvested during olive oil harvesting).

Examples of mid-scoring responses about oneway for food waste to be reduced included:

* Primary producers can partner with groups such as Woolworths to sell imperfect yet edible and healthy fruit and vegetables under their Odd Bunch label.
* Use unsold fresh produce for composting to increase soil carbon and structure to increase yields.

Examples of high-scoring responses about oneway for food waste to be reduced included:

* Imperfect fruits that don’t meet the aesthetic standards of supermarkets can be value-added and processed to produce jam. This prevents the food being wasted and can instead be sold as an additional product.
* Introducing sensors which distinguish between ripe and unripe fruit. For example, the mango infrared sensor distinguishes when mangoes are ripe or nearly ripe. This allows them to be picked at the correct time and prevents wastage of fruit that has gone off before it reaches consumers.

Question 3a.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | 5 | 6 | Average |
| % | 6 | 9 | 17 | 20 | 19 | 18 | 13 | 3.4 |

Full marks were awarded to responses that included two of:

* a strategy suitable for preventing footrot
* a statement about how the prevention strategy prevents footrot
* additional detail demonstrating understanding (e.g. timing of the prevention strategy / refers to a change at a host, environment or pathogen level / chemical active names).

Common incorrect responses included the use of chemical drenches and/or calcium supplementation as prevention strategies. Students need to recognise the different strategies for prevention and control of the prescribed common pests and diseases outlined in the study design.

Most responses were awarded marks for correctly identifying at least one prevention strategy, such as paddock rotation or footbaths. However, many responses lacked additional information that demonstrated deeper understanding of the prevention strategy, such as the reduction of warm, muddy favourable conditions for footrot bacteria (paddock rotation) or chemical footbaths directly killing the bacteria that cause footrot.

Examples of mid-scoring responses about one method included:

* Quarantining newly arrived stock to reduce the risk of pathogen transmission to the remainder of herd/flock that may have carried on from previous properties.
* Run sheep through footbath with zinc sulphate which will prevent the disease among animals.

Examples of high-scoring responses about one method included:

* Footbathing new livestock entering the property. By running the animals through a footbath as they get off the truck, it ensures that all bacteria is killed and mitigates the risk of rest of animals contracting it.
* Keep livestock off of wet, muddy areas as moist soil is the ideal breeding ground for the Dichelobacter nodosus bacterium which is the primary cause of the footrot disease.
* When purchasing new stock, producers should always look for a Vendor Declaration. This is a legal piece of documentation that records past health of farm animals. Producers should not purchase animals with a past history of footrot as they may infect the entire population of animals on the property.

Question 3b.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Average |
| % | 5 | 7 | 9 | 16 | 22 | 14 | 15 | 6 | 7 | 4.2 |

Strength of strategy:

* full marks were awarded to responses that included each of the following for the strategies provided in Question 3a:
* a benefit or strength relevant to the strategy provided
* a statement detailing how the strategy would be beneficial.

Weakness of strategy:

* full marks were awarded to responses that included each of the following for the strategies provided in Question 3a:
* a weakness or shortfall relevant to the strategy provided
* a statement detailing how the strategy would be challenging.

Note: Responses could be awarded a mark if their strength or weakness was not specific to a strategy for preventing footrot but was specific to the strategy in part a. For example, responses that specifically outlined the occurrence of bacterial resistance resulting from the misuse of chemical agents could be awarded marks as a weakness, even if they had misnamed the chemical prevention strategy in part a.

Examples of high-scoring responses included:

|  |  |
| --- | --- |
| **Strengths** | **Weaknesses** |
| Inspecting stock when conditions become favourable to footrot allows the farmer to potential catch symptoms early and intervene with treatment before infestation become severe. | Inspecting may be too weak of a course of prevention as when conditions are wet, cold, and slurry footrot is highly likely to occur anyway and may have already spread to other stock. |
|  | Might not have enough land to run an effective rotational grazing system, which could cause the animals to be susceptible to footrot with overgrazing unavoidable. |
| Quarantining new stock means farmers can identify if new stock have footrot and can therefore treat them (footbath through zinc sulphate) before releasing with their own, healthy mobs. | Due to footrot’s infection size being microbial and it cannot be seen with the naked eye, the farmer can’t see it, only the effect it has on the stock’s hoof when bad. Therefore, farmer might release stock from quarantine with footrot with their herd, because the infection is only new and small.  |
| If livestock still get footrot even after vaccination, they can still be sent to the abattoirs [and be culled] once the vaccine has reached its withholding period. | The vaccine can be costly for the producer causing livestock to be potentially sold at a loss, decreasing financial sustainability if cost of vaccine outweighs risk of footrot.  |

Question 4a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 25 | 66 | 9 | 0.9 |

Full marks were awarded to responses that included:

* a statement that genetically modified organisms (GMOs) can reduce chemical use in agriculture (e.g. resistance to disease, pests, herbicides)
* additional detail outlining how GMOs can reduce herbicide/pesticide/other chemical use at an industry level.

Lower-scoring responses included a possible reason why the introduction of GMOs could result in a reduction in chemical use in an agricultural context, and in doing so demonstrated an understanding of the role of some specific GMOs in agriculture. Responses that then related the reduction of chemical use to an industry-wide effect rather than a farm-level effect could be awarded full marks as they addressed all aspects of the question.

A number of responses used Roundup Ready Canola as an example of a genetically modified crop to explain reduced chemical use, incorrectly stating that this particular GMO would lead to a reduced use of herbicides. Some responses suggested confusion over the difference between Bt-Cotton and Roundup Ready Canola as GMO examples. While these two crops are examples of GM agricultural products, they have different modifications that serve different purposes.

Examples of mid-scoring responses included:

* GMOs reduce reliance on chemicals because they mutate the organisms to grow differently to the original organism in a way that they don’t rely on chemicals such as fungicide/pesticide/herbicide because due to the modifications, the organism isn’t susceptible to said fungus/pest/disease.
* GMOs can reduce the amount of chemicals required to kill pests and weeds as the crop itself can become resistance to chemical, allowing weed or pest to be treated, and so less chemical needed to treat it specifically.

Examples of high-scoring responses included:

* Genetically modified organisms can reduce the amount of chemical use within the industry by planting GMOs. Pesticide, herbicide and fungicide use would be reduced due to the plants/crops being genetically modified to be more tolerant to the different pests and disease. Meaning that within the horticultural industry less spraying would occur, reducing the amount of chemical required.
* Genetically modified plants and broadacre crops can be engineered with resistance to disease and pest infestations, thereby reducing the need for chemical controls like pesticides and fungicides in Ag Hort industries.

Question 4b.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | 5 | 6 | Average |
| % | 6 | 13 | 25 | 21 | 22 | 8 | 5 | 2.9 |

For one argument in favour of using GMOs, full marks were awarded to responses that included:

* a viewpoint or perspective supporting the use of GMOs for agricultural production
* a statement that detailed how GMOs can be used to improve agricultural production
* additional specific detail that demonstrated understanding of the use of GMOs to improve agricultural production (e.g. increased yield, product quality/grade, reduced contamination).

For one argument against using GMOs, full marks were awarded to responses that included:

* a viewpoint or perspective against the use of GMOs for agricultural production
* a statement that detailed how GMO use could challenge agricultural production
* additional specific detail that demonstrated understanding of the use of GMOs that challenge agricultural production (e.g. increased yield, product quality/grade, reduced contamination).

Most responses were awarded marks for including a stakeholder viewpoint on the use of GMOs in agricultural and/or horticultural production. High-scoring responses tended to include detail that demonstrated an understanding of both how people view GMO use, and how they impact agricultural product quality/yield (productivity).

Examples of mid-scoring responses included:

|  |  |
| --- | --- |
| **For**  | **Against** |
| They can increase yields for producers, helping food and fibre industries meet increasing consumer demands and sustaining food security for a growing population.  | GMOs can cause cross-pollination. Cross-pollination from GM plant to a non-GM plant can cause the non-GM plant to be contaminated. This could severely affect the operation of organic food and fibre growers as they would then no longer be completely organic.  |

Examples of high-scoring responses included:

|  |  |
| --- | --- |
| **For**  | **Against** |
| Currently, climate change acts as a threat to many farming enterprises. It sees reduced rainfall and increased growing temperatures which often causes decreased yields. GMOs could provide tolerance to climate change, and the implication thus as the climate change worsens, farmers using GMOs can remain productive and profitable. | GMOs are a new technology that some grain receival sites do not accept thus if a producer is growing GM-canola for example, they may get rejected at a local receival site and may have to travel directly to grain ports to get paid but these may be hours away, therefore reducing the profitability of the grain business. |
| GMOs can increase crop yields by being resistant to certain chemicals. For example, ‘Round-Up Ready Canola’ is a GMO that is resistant to the non-selective herbicide glyphosate. This meant that when weeds or invasive plants grow amongst the crop, farmers can spray glyphosate and remove weeds without damaging the crop, thus improving production. | The long-term health effects are still unknown resulting in many people holding negative perceptions about GMOs. People argue that in the long term, GMOs could cause health problems, and without further research, GMOs should not be consumed as they may pose a health and safety risk.  |

Question 5a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 6 | 26 | 67 | 1.6 |

Full marks were usually awarded to responses that included:

* a possible biosecurity risk on an agricultural property as a result of trespassing
* a statement detailing how the biosecurity risk would occur as a result of trespassingor how the biosecurity risk would impact the agricultural property.

Lower-scoring responses outlined an example of an impact to agricultural properties as a result of trespassing. Responses that included additional detail about how the risk occurred or how it would impact the property were awarded higher marks.

Examples of high-scoring responses included:

* Pests or disease can be introduced to farms on or via trespassers as they don’t use proper biosecurity such as footdips.
* Trespassers can carry diseases from other farms they have visited to the farm / processing plant / abattoir or livestock transport ships. This can cause the disease to spread through animals likely causing mass death amongst livestock.
* People, animals and vehicles that trespass on farms pose the risk of carrying weeds and pests from shoes or wheels. By trespassing they may introduce weeds such as gorse and the farmer would then have to eradicate them.

Question 5b.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | Average |
| % | 7 | 14 | 40 | 27 | 11 | 2.2 |

Full marks were awarded to responses that included two of:

* an economic implication as a result of trespassing at an agricultural property
* a statement detailing how the trespassing breach would affect either a local or export market.

Most responses were awarded marks for identifying economic implications that might occur as a result of a trespasser, such as a biosecurity breach. While some responses also included explanations for why the breach would affect a farming business, the second part of this question asked specifically about the impacts on local and/or export markets and therefore these responses could not be awarded full marks. Many correct responses appeared to have drawn on the stimulus provided, and described the impact of biosecurity breaches on agricultural properties as a possible loss of Australia’s disease-free status, which currently enables Australian producers access to many export and local market opportunities, particularly in the case of livestock. Students are encouraged to read each question carefully and ensure that their responses reflect their understanding of both the content and the question being asked.

Examples of mid-scoring responses about oneimplication included:

* If disease breaks out products won’t be able to be exported decreasing the global export market [access] and decreasing economic activity in the export market.
* Can lead to the introduction of pest and diseases that can lead to reduced produce available on local markets as producers would have a reduced capacity.

Examples of high-scoring responses about oneimplication included:

* If trespassers leave weeds on a farm, and they get into the food or crop and contaminate it, it reduces the quality and grade of the produce, possibly reducing the availability of an export market that is willing to import contaminated food or crops.
* A biosecurity breach could lead to a disease spreading from trespassers and causing death amongst livestock. This can cause production to significantly decrease due to a reduction in herd size, meaning there is less product available to be sold to local or export markets.
* A biosecurity breach could lead to images of animal cruelty gaining public attention, thus causing a decrease in demand for animal products globally and domestically. Thus this would lead to a decrease in prices, reducing income and revenue in the local and export markets.

Question 5c.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | 5 | 6 | Average |
| % | 9 | 8 | 16 | 26 | 22 | 13 | 5 | 3.0 |

Full marks were awarded to responses that included:

* two examples of a supply chain disruption that could occur as a result of trespassing
* an identification of the location of the disruption within the supply chain for each of the two examples of disruptions provided (e.g. on-farm, during transport)
* further information detailing the impact of an example of disruption on the overall supply of agricultural products
* detail about how an example of disruption would affect other aspects of the supply chain.

Many responses were awarded marks for correctly identifying two examples of supply chain disruptions caused by trespassing, with most also providing accurate locations within the supply chain (e.g. on-farm, during transport). Further marks were awarded to the portion of responses that also included descriptions of the impacts of disruptions on agricultural product supply, demonstrating an understanding of the broader implications.

Lower-scoring responses did not include an explanation of how disruptions affected another aspect of the supply chain, which was critical for demonstrating an understanding of the interdependence of the food and fibre supply chain. A number of lower-scoring responses also lacked specificity in linking disruption scenarios to locations and/or stages within the supply chain (i.e. where did the trespassing occur?). Students are advised to take their time reading and responding to questions, paying particular attention to systematically addressing all question components with sufficient detail.

An example of a mid-scoring response was:

It could see disruption of transport. This could be seen if protestors are refusing to let trucks leave and therefore products are unable to leave the farm, disrupting the supply chain. Another example of this is when trespassers come on farm and release products. This was seen on a farm in the Wimmera, Lovaduck, where protestors came on farm and released ducks. This saw product loss and possible biosecurity threats as trespassers could possibly bring diseases onto the farm, therefore disrupting the supply chain.

An example of a high-scoring response was:

The supply chain refers to the journey goods such as food and fibre undertake from the farm to the consumer. Trespassing could disrupt production as farmers are forced to spend time and energy removing the trespassers from their property. This could delay transportation of the products as the farmer has had to manage these other time-consuming matters, thus increasing the time it takes for the product to reach consumers. Similarly, trespassing is a biosecurity risk and could cause disease to spread through livestock causing death. The resulting reduction in herd size reduces the products the farmer has available to sell, causing a decrease in overall production that ultimately disrupts the entire supply chain, especially if the producer is very large.

Question 6a.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | Average |
| % | 22 | 17 | 37 | 14 | 10 | 1.8 |

Full marks were awarded to responses that included two of:

* a statement related to any principle of sustainable land management
* additional detail that demonstrated a relationship between land management and sustainability, or a related ability to use the land and resources in the future.

A range of responses were awarded marks for this question, recognising the diversity of ways in which the principles of sustainable land management can be explained. To successfully address this question, responses were awarded marks if they drew on key knowledge and key skills from Unit 4 Area of Study 1 (Sustainable land management) to provide examples of generalised principles, including related varied strategies or approaches. Examples of some sustainable land management principles that were awarded marks included, but were not limited to:

* climate change mitigation strategies
* environmental degradation prevention strategies
* sustainable resource use
* appropriate land use
* biodiversity conservation
* environmental rehabilitation
* regular environmental health monitoring
* sustainable property management
* environmental control and modification practices.

Examples of high-scoring responses included:

* To ensure the environment is being used appropriately. This includes using it within its limits and reducing land degradation to maintain the natural ecosystems whilst still maintaining a profitable business on the land. [Also] to maintain biodiversity of the land. This will see producers using the land as it is and promoting the natural ecosystems, including by planting native trees and multispecies pastures.
* Caring for the land in a way that ensures it will be healthy and productive for future use. For future generations too. Not just removing nutrients from the land, ensuring that nutrients such as phosphorus, nitrogen and phosphate are returned to the soil as required to maintain balance for the future.

Question 6b.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | 5 | 6 | Average |
| % | 4 | 6 | 23 | 22 | 31 | 11 | 4 | 3.2 |

Full marks were usually awarded to responses that included two of:

* an identification of a practice, or related aspect, described in the stimulus that was environmentally sustainable
* a statement about how the practice could be considered environmentally sustainable
* further specific detail that demonstrated an understanding of the environmentally sustainable business and/or agricultural practices statement in the context of the stimulus.

Many examples of environmentally sustainable practices could have been identified from the stimulus. Common examples of environmentally sustainable practices included, but were not limited to:

* managing grazing intensity and land degradation through strip grazing
* managing soil nutrient levels with natural cycles, such as when chickens scratch at manure to promote soil microbes to break down and return nutrients to the soil
* reduced applications of traditional synthetic agricultural chemical products that could pollute nearby waterways.

Responses that repeated information from the stimulus without evidence of a relationship with environmental sustainability were not awarded full marks. Many lower-scoring responses were awarded marks for identifying environmentallysustainable practices from the stimulus but lacked detail about how one or more of these was environmentally sustainable.

Examples of mid-scoring responses about one practice included:

* Due to no need for fertiliser, there is no run-off of excess NPK into natural waterways which could increase acidity and cause nutrient imbalances. Without fertiliser, this doesn’t happen and therefore environmental sustainability is prioritised.
* The farmer doesn’t use chemicals and fertilisers which can cause environmental damage by entering waterways causing eutrophication.

Examples of high-scoring responses about one practice included:

* By incorporating organic matter through manure into the soil, on-farm biodiversity is increased. This is through the increased attraction of microorganisms, fungi and bacteria introduced in the soil, thus increasing soil fertility and structure and preventing soil degradation.
* This farmer grazes cattle on paddocks and then follows with chickens. Rotational grazing is environmentally sustainable by reducing compaction from stock continuously grazing in the same place. It also allows the pasture and native vegetation cover to recover in between.

Question 7a.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark | 0 | 1 | Average |
| % | 44 | 56 | 0.6 |

Full marks were awarded to responses that included, but were not limited to, the following Victorian government legislation:

* *Occupational Health and Safety Act*
* *Environmental Protection Act.*

Responses did not need to include the year of the Act to demonstrate understanding. While familiarity with the full name of the legislation is expected as part of the study design, knowledge of the relevant year is not required for this question. Many students did not respond to this question or incorrectly named the legislation: for example, naming the legislation as Official Health and Safety Regulations, which was not awarded marks.

Question 7b.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | Average |
| % | 4 | 11 | 32 | 28 | 25 | 2.6 |

Full marks were awarded to responses to ‘improve lighting’ that included:

* an improvement in the packing shed as a result of improved lighting
* an identification of a negative outcome/risk/hazard that could be reduced by improved lighting in a lettuce-packing shed.

Full marks were awarded to responses to ‘safely store chemicals’ that included:

* an improvement in the packing shed as a result of safely storing chemicals
* identification of a negative outcome/risk/hazard that could be reduced by safely storing chemicals in a lettuce-packing shed.

Generally, most responses included either an improvement in safety conditions, a reduction in food safety risks, or an economic risk to the business (e.g. a fine), or were able to identify how the improvement in either lighting or chemical storage could improve one of these aspects. Many responses only addressed one of the above points in very few non-specific words. Responses that only identified the hazard (i.e. potential negative outcome) in each situation (e.g. ‘Because she could bump her head,’ or ‘Because she could inhale chemical fumes’) lacked sufficient detail to address the question and were not awarded marks.

A common incorrect response for improving the light in the packing shed was to provide the light energy required for photosynthesis for growing lettuces, and not packing them as was outlined in the question.

An example of a high-scoring response was:

Improve Lighting: An improvement in lighting in Amy’s packing shed decreases risk of accident as workers can see their surroundings better.

Safely Store Chemicals: Decreases risk of spillage that would injure workers and contaminate lettuce and other things in the shed as well as ensuring chemical quality is not compromised.

Question 7c.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | 5 | Average |
| % | 12 | 16 | 27 | 24 | 14 | 8 | 2.4 |

Full marks were awarded to responses that included:

* an example scenario of an agriculture business’ compliance or non-compliance with government legislation
* a statement detailing how compliance or non-compliance with government legislation would affect the business or its practices
* a discussion of the business practice that was clear and considered. This may have included, but was not limited to:
* the name of a specific government legislation directly relating to the example compliance scenario within the response
* benefits or challenges to the business as a result of the business’ compliance or non-compliance
* further detail about how the business’ practices, as influenced by compliance regulations, would affect other aspects of the supply chain.

Most responses demonstrated an understanding of how compliance regulations influence business decisions within agriculture and/or horticulture in Australia, with the highest scoring responses also successfully providing a discussion of the economic impact on a business as a result of non-compliance. Higher marks were awarded to responses that provided a clear discussion that identified the specific impacts on the business. While many responses included a description of how business practices might be shaped by the threat of a fine, those that also provided further discussion of the included example (e.g. the impact on overall profitability, market access or the ability to reinvest capital into the business) were more likely to be awarded higher marks.

An example of a mid-scoring response was:

Compliance with state legislation such as the Occupational Health and Safety Act 2004 positively influences Australian agriculture and horticulture as workers and employers are emphasised to have a shared responsibility over safety mechanisms and correct training when on site. This business practice results in a reduction of work safety accidents. Furthermore, making working/operating machinery or with chemical or testing on farm without certification business practise offence, farm owners are more likely to acts in parameters of the legislation. However, training may be made difficult due to knowledge and technological disparity between more successful farmers and more isolated farmers who don’t have access to training material.

An example of a high-scoring response was:

State and Federal legislation influences business practices of a horticultural or agricultural business because an act like the Occupational Health and Safety Act requires employers to have staff trained properly to use all equipment in say a nursery for example. In order to comply with legislation, businesses may be influenced to incorporate new and updated staff training courses for safe machinery use to ensure all staff are highly skilled within the nursery and if an OH/S incident were to arise, they wouldn’t be left as accountable and liable if they’d taken all of the precautions like staff appropriately trained to complete their tasks safely in the nursery.

# Question 8a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 4 | 8 | 88 | 1.9 |

Full marks were usually awarded to responses that named two types of soil degradation.

Accepted responses included, but were not limited to:

* erosion (wind, tunnel, rill, gully and/or sheet)
* salinity (dry land and/or irrigation salinity)
* compaction
* acidity
* waterlogging
* nutrient depletion.

Question 8b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 11 | 40 | 49 | 1.4 |

Full marks were awarded to responses that included:

* an impact on a farm as a result of a type of soil degradation
* a statement that detailed how a type of soil degradation would cause that impact on the farm.

A range of impacts were awarded marks for this question, but full marks were not awarded to responses that were vague and/or did not demonstrate an understanding of a type of soil degradation and/or how it might cause an immediate/long-term impact on a farm. Impacts could have included, but were not limited to, specific examples of economic, social or environmental implications. One specific example of an impact could have been the increased input costs for fertiliser so that soils missing their fertile top layer as a result of wind erosion can achieve yields similar to previous seasons.

Examples of high-scoring responses included:

* Compaction refers to the compressing of soils leading to reduced porosity. It can increase waterlogging as well which drowns crops, reducing production (yield), as the soil cannot effectively infiltrate the water to reach the roots of crops.
* Salinity can cause plant wilting and reduced growth that limits final yields of crops and reduces a farm’s profitability.
* Soil acidity is seen after intensive stocking rates or increased nitrogen-based fertiliser application such as urea. This degradation stunts plant growth and causes significant yield and profit losses to the farm business.

Question 8c.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | 5 | 6 | Average |
| % | 9 | 12 | 18 | 26 | 20 | 11 | 4 | 2.9 |

Full marks were awarded to responses that included two of the following:

* an action suitable for rehabilitation of soil that has been degraded
* a generalised statement about how the action works to improve soil structure / nutrient composition / pH etc.
* further specific detail that demonstrated an understanding of how the action is implemented on farm, or how the action specifically works to improve the type of soil degradation.

Most responses included an identification of at least one type of soil rehabilitation strategy, and a generalised explanation of how this strategy would improve soil that has been degraded. To receive full marks, responses did not necessarily need to refer to the same types of soil degradation identified in Question 8a. A range of possible rehabilitation strategies were awarded marks. These included, but were not limited to:

* applying lime to increase soil pH
* planting trees with deep roots to reduce the level of the water table
* incorporating a legume phase into the crop rotation
* reducing evaporation with mulch or crop residue
* spreading manure or another organic alternative on nutrient-depleted soils to promote improved soil microbial biodiversity, and eventually assist in the return of nutrients from organic matter to the soils.

Responses that included actions that would prevent further soil degradation were not awarded marks as the question specifically asked for a soil rehabilitation technique. Only actions that could lead to the rehabilitation of soil were awarded marks. For example, a common incorrect response was to reduce the stocking rate on a property in order to target compacted soils. Students should note the difference between techniques used to prevent and rehabilitate degraded soils.

Examples of mid-scoring responses about oneaction included:

* Soil acidification can be rectified through the application of lime or calcium based fertilisers to balance out pH.
* Plant deep rooted salt-tolerant trees or shrubs that help to remove salts from the water, and lower the groundwater table.
* Compacted soil can be rehabilitated by deep ripping to mix soils and aerate soil.

Examples of high-scoring responses about one action included:

* Plant salt-loving plants e.g. Tall Wheat Grass, around salinity-affected areas so that plants can help to discharge the water and cause the groundwater to decrease in height away from the ground level.
* A farmer may wish to apply lime on their soils. Lime is a fertiliser that contains calcium. The presence of the lime in the acidic soil will neutralise the soil pH, returning it closer to a 7 (neutral pH), thus rehabilitating the soil after time.
* Using an aerator can be effective. Aerating soil is the turning over of soil to increase porosity and water permeability. This allows soil to redevelop its structure and improve soil health, thus rehabilitating the degraded soil.

Question 9a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 42 | 25 | 32 | 0.9 |

Full marks were awarded to responses that included:

* a statement outlining a value adding strategy
* an example of a value-added product.

A range of descriptions of value-adding were awarded one mark, including, but not limited to, increasing the economic value of a raw product by processing, selling at a farm gate or targeting a niche market. While most responses included examples of value-added products and were awarded this mark, higher marks were not awarded to responses that included a vague description of value-adding, such as adding value to something. Such responses did not demonstrate an understanding of what a value-adding strategy is, or could be, for a farmer and therefore were not awarded marks.

Marks for a value-added product were awarded to responses that included examples of how a producer could use value-adding, and not for value-added products made later in the supply chain (e.g. at a retail supermarket). Other common incorrect responses included descriptions and examples of diversification rather than value-adding.

Examples of high-scoring responses included:

* Value adding is the process of altering a product to make it more appealing to a certain group of customers, creating a product that is different from the competitors. An example is selling straw or hay in small amounts for pets where it is usually only available on mass.
* Value adding is where an individual increases the overall value of a raw material by creating a product that can be sold for a higher price. An example if making beer from barley grown on farm.
* Value adding is the process in which a product is further made into another product to increase the producer’s profitability. An example of this is a strawberry farmer making strawberry jam as a value-add.

Question 9b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 40 | 22 | 38 | 1.0 |

Full marks were usually awarded to responses that identified the key responsibility and/or characteristic of two stages in the food and fibre supply chain.

While most responses demonstrated an understanding by outlining the role of the stages of the supply chain, responses that only listed the names of the stages (e.g. farming / primary production or transportation) did not address the question asked and therefore were not awarded marks. Students needed to note the verb at the beginning of this question and ensure that responses met its requirements. For example, a response such as ‘Transportation systems move food and fibre products from primary producers (e.g. growers growing crops) to the next stage in the supply chain (e.g. processing)’ would have been awarded full marks, while no marks would be awarded to a response of ‘transportation systems and primary producers’.

Question 9c.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | Average |
| % | 36 | 27 | 30 | 7 | 1.1 |

Full marks were awarded to responses that included:

* a possible challenge to the food or fibre supply chain that could result from a reduction in a carbon footprint
* a statement that demonstrated that the student understands the meaning of ‘carbon footprint reduction’ (e.g. in relation to greenhouse gas emission reduction, or similar)
* further specific detail about the challenge that demonstrated an understanding of the relationship between any dimension/pillar of sustainability or a generalised definition of sustainability and a reduced carbon footprint in the food or fibre supply chain.

Most responses identified a challenge to sustainability as a result of a shift toward a carbon footprint reduction, with many responses also able to demonstrate an understanding of the concept of carbon footprint reduction, often linking it to greenhouse gas emissions. However, lower-scoring responses provided non-specific and simplistic challenges about the cost of producing less carbon using new technologies that replace traditional combustion-engine machinery. Marks were awarded to responses that detailed a link between sustainability dimensions and carbon footprint reduction.

Higher-scoring responses showed a clear understanding of the concept of, and relationships between, carbon footprint (net greenhouse gas emissions), climate change (long-term changes in weather patterns), environmental sustainability, and the current direction of many food and fibre supply chains to reduce their carbon footprint.

An example of a mid-scoring response was:

This is going to be challenging for production to move to. This is due to most machinery used being diesel operated which will be phased out. This will cause producers to spend a lot of money on new technology, possibly causing some businesses to shut down.

Examples of high-scoring responses included:

* Carbon footprint refers to the emissions produced by an individual or a company. It is a challenge for sustainability as economically it often means production methods need to be changed to be better at supporting the environment by reducing emissions. This means high start-up costs and time consumption occurs in the effort to reduce emissions.
* Carbon reduction in the food or fibre supply chain poses a challenge during transport. Here large trucks often burn fossil fuel, increasing CO2 emissions and moving in the opposite direction of carbon footprint reduction. Currently there are no alternative options in transport as electric trucks are not on the market. Therefore to reduce CO2 in the supply chain, specifically during transport, innovations must be created to overcome their challenge.

Question 9d.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | Average |
| % | 32 | 32 | 28 | 8 | 1.2 |

Full marks were awarded to responses that included:

* a possible opportunity for the food or fibre supply chain due to a reduced carbon footprint
* a statement that demonstrated that the student understands the meaning of ‘carbon footprint reduction’ (e.g. in relation to greenhouse gas emission reduction, or similar)
* further specific detail that demonstrated an understanding of the relationship between any dimension/pillar of sustainability or a generalised definition of sustainability and a reduced carbon footprint in the food or fibre supply chain.

Responses to Question 9d. and Question 9c. were very similar. Overall feedback provided for Question 9c. above therefore applies to this question part as well.

Examples of mid-scoring responses included:

* Carbon footprint reduction will see the reduction in greenhouse gases produced on farm, which is believed that the ag sector will help with. This will increase environmental sustainability as measures such as carbon credits / carbon sequestration will be used. This will also increase biodiversity on farms and promote healthy natural ecosystems.
* Reducing carbon footprint provides increased environmental sustainability as less impact is left on the environment and it also provides increased economic opportunity as people will be more inclined to invest in products that aim to reduce carbon footprint in their supply chain.

Examples of high-scoring responses included:

* Through reducing carbon in the supply chain, CO2 emissions will reduced. This may result in positive environmental implications such as increased air quality. Additionally, the reduction of CO2 emissions may provide producers access to the carbon credits scheme where farmers are paid based on CO2 stored. This, therefore acts as an opportunity for sustainability in the food and fibre supply chain.
* Carbon footprint reduction may allow quality assurance in products such as clothes made from wool. By reducing carbon and greenhouse gas emissions, more people may want to buy the product (social sustainability) because they protect the environment. This may enhance the economic sustainability of the business as well through increased revenue.

Question 10a.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark | 0 | 1 | Average |
| % | 12 | 88 | 0.9 |

Full marks were awarded to responses that included, but were not limited to, any of the following evidence taken from the stimulus that supported increased avocado consumption:

* high-impact, evidence-based marketing campaigns
* emphasis on the health benefits of avocados
* highlighting versatility in dishes such as salads and smoothies
* promoting locally grown avocados to boost domestic demand
* increased export of avocados to meet global demand
* showcasing Australian avocados as top-quality produce
* increased domestic demand for Australian avocados.

Responses to this question were not awarded marks if they outlined their own marketing plans for Australian avocados in addition to what was provided in the stimulus, or provided examples of strategies that could be used to further improve the Australian avocado industry’s marketing campaign instead of identifying evidence from the stimulus.

Question 10b.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | Average |
| % | 18 | 21 | 44 | 16 | 1.6 |

Full marks were awarded to responses that included:

* an identification of a marketing tool for the Australian avocado industry
* a statement about how the marketing tool would increase demand for the product
* further specific detail that demonstrated an understanding of how the marketing tool could be implemented for avocados, or how the selected marketing tool acts to support the industry.

Marketing tools should refer to specific resources or platforms used to promote/support Australia’s avocado industry. (e.g. social media, TV advertisements).

Examples of mid-scoring responses included:

* Social media can be used to access different age demographics and spread Australian avocados reputation domestically and internationally as social media is a universal tool. Establishing trends involving the avocados could increase sales as well.
* The Australian avocado industry’s marketing plans could be further moved to social media networks. This will broaden the range they get of consumers as most people have phones and social apps.
* Could implement TV Ads which talk about food provenance of avocados and their health benefits. Would help customers understand where products are made and how.

Examples of high-scoring responses included:

* Social media – Through online promotions or a Facebook page dedicated to the innovation strategy, more people may hear about it. As the use of social media is increasing rapidly, marketing the product across Australia may entice more people to try new recipes which could help increase demand and profits. This may help support growing industries of avocado production.
* Advertisements can be placed on television to reach a wider audience, therefore increasing the number of people who are aware of the health benefits, likely increasing sales through increased demand.

Question 10c.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | 5 | 6 | Average |
| % | 21 | 15 | 21 | 14 | 17 | 8 | 4 | 2.3 |

Full marks were usually awarded to responses that included two of:

* an identification of how quality assurance programs support Australia’s food and fibre industries
* a generalised statement linking quality assurance programs to a dimension/pillar of sustainability, or to a more generalised definition of sustainability
* further specific detail that demonstrated an understanding of how sustainability is supported in Australian food and fibre industries, including but not limited to a component of a quality assurance program, an example of an Australian program and/or how they operate in Australia.

While varied methods for how quality assurance programs support the sustainability of Australian food and fibre industries were awarded marks, higher-scoring responses included detail that demonstrated an understanding of what quality assurance programs are in an Australian context, or gave a specific example of a current quality assurance program in Australia. Responses that referenced a connection between a dimension of sustainability (economic, social or environmental) and quality assurance programs were awarded marks, but only those that demonstrated an understanding of the relationship between Australian quality assurance programs in food and/or fibre industries, and specific benefits to sustainability, were awarded full marks.

Examples of mid-scoring responses included:

* Quality assurance programs that are related to the environment such as certified organic encourage producers to adopt environmentally sustainable practices so they are able to market their products under these programs.
* Quality assurance programs support sustainability by ensuring that all products meet a set of quality standards. This ensures that products such as vegetables will be safe for consumers to eat, improving social sustainability as overall health of individuals is improved.
* Support economic sustainability as the food and fibre industries are paid more for reputable premium products that are of quality because of the quality assurance programs.

Examples of high-scoring responses included:

* Quality assurance programs can reassure consumers that their food is safe for consumption. For example, food sold at the supermarket has to be of a certain standard to be sold and cannot be contaminated. This fulfills the social dimension of sustainability as consumers are kept happy, safe and satisfied.
* Quality assurance programs such as Sustainawool integrity scheme aims to give customers confidence in what they are buying. By supporting the claim that they focus on animal welfare such as the 5 freedoms and shearing conditions it may enhance product awareness and social sustainability through positive bonds with customers.
* Quality assurance promotes and increases economic sustainability. This is due to these industry-agreed standards ensuring consumers that products are reliable and safe to use. This therefore promotes the consumers to buy more of the products, so demand is increased and therefore so are profits.