

2022 VCE Agricultural and Horticultural Studies external assessment report

General comments

The 2022 VCE Agricultural and Horticultural Studies examination assessed content according to the *VCE Agricultural and Horticultural Studies Study Design 2020–2025*.

Students demonstrated a good understanding of why soil compaction occurred and had reasonable knowledge of autonomous technology. They were also able to state their preferred egg production in Australia and describe advantages and disadvantages of each method. Most students were able to identify fungal rust.

Areas for improvement include:

- features of natural and managed systems: a wider range of features taught, not just two and then reverse.
- referencing wildlife, not agriculture, with regard to drought and sustainability
- more in-depth knowledge of issues relating to water quality, the integrated approach principles, and biological resistance and why it is important to food and fibre industries
- use of the correct terminology for specific degradations
- all pests, weeds and diseases in the study design need to be studied.

Students need to develop more detailed answers to questions, particularly questions that are worth four or more marks. Students need to consider the command words in each question and respond accordingly. This includes questions that have two elements, such as 'identify and describe'. Analysis and evaluation questions were not well answered. Students need to follow the question thread for multiple-part questions.

In preparing students for the examination, teachers must refer to the current study design and the examination specifications for Agricultural and Horticultural Studies. Students need to be able to apply their understanding to a range of land management techniques and plant and animal businesses throughout Victoria.

This report should be read in conjunction with the 2022 VCE Agricultural and Horticultural Studies written examination.

Specific information

Note: Student responses reproduced in this report have not been corrected for grammar, spelling or factual 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 more or less than 100 per cent.

Question 1a.

Mark	0	1	Average
%	22	78	0.8

The required answer was fungal rust. Rust, cereal rust, leaf rust and wheat rust were also accepted.

This question was generally well answered.

Question 1b.

Mark	0	1	2	3	4	Average
%	50	17	19	5	9	1.1

The question referred to the same disease identified in Question 1a. If fungal rust wasn't referred to then no marks could be awarded.

Examples of strategies to prevent fungal rust included:

- resistant varieties – grow genetically rust-resistant varieties of wheat
- seed treatment / certified seed – buy certified seeds or treat seeds with fungicides
- cultural methods – planting location or timing or crop rotation change the conditions to make them less favourable for the fungus, or sow plants farther apart for air flow (wider row spacing)
- improve the health of the plant – optimise growing conditions.

Examples of strategies to control fungal rust included:

- physical strategies, such as removal of all cereal and host plants after harvest
- chemical strategies, such as regular application of foliar fungicides
- cultural practices, such as heavy grazing or the use of herbicides during autumn to remove self-sown wheat/cereals will reduce the amount of rust in following crops
- biological controls, such as using bacterial endophytes (microbes) to help with control.

Students needed to know the difference between prevention and control. Not many students were able to describe the strategies well. As fungal rust is a fungus, students needed to write fungicide or a name of a fungicide, not just chemical spraying.

The stimulus says it is a wheat crop – so quarantining new plants was incorrect. The fungal spores need a live host, so washing boots and machinery was also incorrect.

Question 1c.

Mark	0	1	2	3	Average
%	26	45	26	3	1.05

High-scoring responses referenced that wheat is an important food source and that there would be a decrease in growth/yield/quality.

Many students incorrectly wrote about the impact on profit for farmers, not about the wheat industry.

Question 2

Mark	0	1	2	3	4	Average
%	6	15	29	32	18	2.4

Examples of answers were as follows.

Issue	Relevant act	One potential positive impact on sustainability of an agricultural and/or horticultural businesses
Unsafe working conditions including bullying	<i>Occupational Health and Safety Act 2004</i>	<ul style="list-style-type: none"> Happier employees Safer work environment/less stress
Disposal of unused chemicals, old paint, fuels, and oil (dangerous litter) from a farm	<i>Catchment and Land Protection Act 1994</i>	<ul style="list-style-type: none"> Increased safety, less hazards/chance of accidents such as fires, explosions and poisoning Better for the environment (due to no contamination)
Selling fodder or grain that contains the seeds or any part of a noxious weed	<i>Environment Protection Authority Act 1970</i>	<ul style="list-style-type: none"> Containing/less spread of weed Decreased costs with controlling and managing weeds
Controlling weeds and pests on a neighbouring farm or by the roadside without permission	<i>Environment Protection Authority Act 1970</i>	<ul style="list-style-type: none"> Decreased costs with controlling and managing weeds Support neighbours with organic status if not using chemicals

Most students could answer some of the question based on either the issue or the Act. The first three issues were generally well answered. The last issue in the table was poorly understood.

Question 3a.

Mark	0	1	2	Average
%	12	32	56	5

Possible answers included:

- ethical production
- better animal welfare
- socially acceptable
- where the eggs are coming from / provenance.

Question 3b.

Mark	0	1	2	Average
%	6	30	64	1.6

For parts a. and b., most students directly quoted information from the stimulus material. Some students inferred other advantages from their learning. Marks were awarded in both instances if the response was accurate and reasonable.

Possible answers included:

- better economic outcomes for farmers
- climate control
- lighting
- more efficient feed conversion
- more efficient feeding and egg collection – less labour intensive
- fewer issues with social hierarchy within the flock
- optimising the conditions for the birds
- less disease
- no predation
- lower cost of eggs for consumers
- more chickens per hectare; more eggs mean feeding the world.

Question 3c.

Mark	0	1	2	Average
%	30	34	37	1.1

Possible answers include:

- push from producers to include government legislation to provide industry standards (guidance for producers to not overcrowd/overstock)
- influence from consumers to have more accurate labelling of free-range eggs / a mandatory national standard for free-range eggs.

Question 3d.

Mark	0	1	2	3	4	5	Average
%	2	7	15	29	19	28	3.5

Most students repeated their answers from parts a. and b. The question asked students to evaluate, so they needed to make a judgment using the information supplied and their own knowledge about the different points regarding egg production, rather than reusing their answers for parts a. and b. Most students obtained at least one mark for naming the preferred method.

Question 4a.

Mark	0	1	2	Average
%	20	16	64	1.5

Examples of answers were:

- accessibility/convenience – more places for people to see and buy flowers
- different varieties – more varieties of flowers available
- seasonal – flower varieties are available all year round, not just when in season in Australia
- higher demand – reduces cost of flowers for consumer
- reduced costs of imported flowers, making them more affordable to consumers.

This question was generally well answered, with students using the stimulus material as a guide.

Question 4b.

Mark	0	1	2	3	4	Average
%	12	14	43	23	8	2.0

High-scoring responses referenced the following.

- Provenance
 - increased transparency – Australian consumers want to know where their products are sourced
 - less travel for product – reduced carbon footprint
- Country of origin labelling may also help to keep the local Australian cut-flower industry viable.

Students were required to analyse how ‘country of origin’ labels may affect the promotion of Australian cut flowers. Two points of analysis were expected; for full marks, students needed to link the discussion to the promotion of Australian cut flowers.

Question 5a.

Mark	0	1	2	3	Average
%	8	33	34	24	8

Most students were able to provide answers about the economic and social dimensions of sustainability. The environmental dimension was poorly done, with many students mentioning wildlife rather than agriculture.

Possible answers included the following.

- **Environmental:** for example, reduced water for crops and animals, bare soil / decreased plant matter leads to increased chance of degradation (erosion), infrastructure (cracks in channels), better irrigation and water storage needs
- **Economic:** for example, reduced income, less money spent in local community, labour shortages, increased irrigation costs (higher water value), lower stocking rates, decreased yields, government support packages
- **Social:** for example, decline in mental health due to stress of surrounding community and not being able to provide adequate care for the farm/animals/crops, reduced population leading to shops closing and less community events such as sports.

Question 5b.

Mark	0	1	2	3	4	Average
%	24	35	27	9	6	1.4

High-scoring responses evaluated:

- reducing water consumption
- survive with less rain over time
- greater yields during drought conditions
- less on farm operations, e.g., irrigation
- increase arable land use
- reducing the chance of land degradation such as erosion to an increase of vegetative cover
- crops can better compete with weeds/pests/disease, as climate change can improve conditions
- more accessible to buyers/consumers.

Question 6a.

Mark	0	1	2	3	Average
%	15	38	34	13	1.5

High-scoring responses referenced all of the following in their explanation:

- spread of disease/pests/weeds
- traceability and movement across Australia/regions
- a positive impact on sheep production.

Question 6b.

Mark	0	1	2	Average
%	30	40	30	1.0

This question wasn't well answered as many students referred to electronic identification as a GPS tracker.

Possible answers:

- making individual animal data collection and tracking easier
- easier and quicker identification if stray or lost stock enter flock
- making individual animal data collection more accurate
- improves efficiency in flock management (e.g., drenching, weighing, mothering)
- traceability of disease origin
- better decision making for farmers
- allowing buyers to trace animals and purchase animals from trusted sellers/producers
- less manual handling of livestock.

Question 7a.

Mark	0	1	Average
%	34	66	0.7

This question was generally well answered, with students using the stimulus material as a guide.

Possible answers included:

- more accurate levelling for efficient irrigation
- more accurate than farmers' sight
- to catch irrigation runoff for recycling
- precision irrigation
- the ground is level/flat.

Question 7b.

Mark	0	1	2	3	4	Average
%	21	22	37	11	10	1.7

Examples of reasons were:

- it minimises waterlogging – fast irrigation with quick run off (more control of irrigation speed)
- it reduces irrigation time and effort to manage a crop (labour)
- it allows uniform plant growth (even watering throughout the paddock)
- stop topsoil blowing away
- water saving
- cost saving due to more efficient farming
- better possible yield
- improve environmental sustainability
- water use efficiency/reduces water runoff
- improve crop establishment
- increase land use.

Students should have been familiar with the term 'waterlogging' from page 19 of the study design, and should not have used 'pooling' or 'flooding' instead.

Question 8a.

Mark	0	1	2	Average
%	3	19	78	1.8

Most students quoted information from the stimulus material.

Responses could include:

- compaction due to livestock
- heavy machinery working the soil over 20 years
- limited fences to separate livestock
- heavy clay soils don't drain well, so using machinery or introducing livestock when paddocks are wet
- limited nutrients that are tying up the soil increasing chance of compaction.

Question 8b.

Mark	0	1	2	Average
%	27	27	45	1.2

Part 8b. required students to know how to prevent and control compaction.

The answers below can refer to both prevention and control but the description must be in the correct response.

- Introduce controlled traffic systems/laneways in the paddocks, so traffic only travels on one area of the paddock, not all over.
- Build more fences around the property, so the lambs can be separated around the farm, rather than mob together in one paddock and use laneways.
- Map the soil types on the land, and grow crops intermittently on the heavy clay soils to reduce compaction.
- Introduce reduced tillage techniques, like direct drilling, to help reduce the amount of compaction from the heavy machinery.

Question 8c.

Mark	0	1	2	Average
%	38	28	34	1.0

Part 8c. also required students to know how to prevent and control compaction.

Examples of answers were:

- deep rip on heavy clay soils
- add gypsum on heavy clay soils.

Question 9a.

Mark	0	1	2	Average
%	12	63	25	1.2

Students needed to describe the challenge that FutureFeed was attempting to address. Most students could identify reducing methane emissions from the stimulus material, but were unable to describe it well or link methane as one of the greenhouse gases.

Question 9b.

Mark	0	1	2	3	4	5	Average
%	16	17	24	22	15	4	2.2

To obtain full marks for this question students needed to consider the pros and cons of feeding seaweed to sheep and cattle and make a judgement about its effectiveness.

Responses could have included the following points:

- reduces methane emissions by two thirds
- can increase production output of the animal long term while also reducing methane
- increasing feed conversion, hence could lead to the need for less livestock to feed
- opportunity to promote sustainable farming practice in production
- socially acceptable as it is reducing methane (GHG) and not contributing to climate change
- long time to be commercially viable
- accessibility of seaweed to farms
- capacity to grow and deliver amount of product
- farmers to change behaviour / amount of time
- evidence to support this change and use it to change farmers' practices
- effect on life expectancy of livestock
- cost of growing and delivering seaweed
- do cows like to eat seaweed? Will need to be fed in a TMR for palatability
- is seaweed nutritious enough for cattle and sheep? e.g., dairy cattle for milk production – does it change the taste/flavour and nutritional value and of the milk and flavour of meat?

Question 9c.

Mark	0	1	2	3	Average
%	47	18	20	14	1.0

For full marks students needed to explain the strategy and link it to sustainability. They had to ensure they only referred to the primary producer in the food supply chain.

Examples of strategies that required explanation were:

- managing degradation
- use of alternative energy sources
- value adding
- using heat-tolerant genetics (estimated breeding values or EBVs)
- introducing irrigation systems
- reusing manure from livestock and applying to crops.

Question 10a.

Mark	0	1	2	3	4	Average
%	48	18	17	8	9	1.2

Students were required to identify features of a natural and managed ecosystem. This was not well answered, with almost 50 per cent of students scoring zero marks because they answered with examples rather than features. A feature is a noticeable or important characteristic, it is not an example.

This is key knowledge in the study design (page 20) and is a key component that underpins agricultural and horticultural production. The concepts in this content should be the focus of this study; they cover a wide range of features, examples and comparison of natural and managed systems.

Many students identified two features for a natural ecosystem and the reverse for a managed ecosystem. They need to study a range of features, not just two and the reverse.

Possible answers include the following.

Natural ecosystem:

- can survive without intervention from human beings
- more species and genetic diversity (biodiversity)
- no artificial selection
- nutrients recycled naturally
- population controlled naturally (limiting factors such as food)
- natural checks and balances, for example not allowing pests to become unmanageable in a population
- uses natural energy sources
- closed system.

Managed ecosystem:

- relies on human intervention to function
- humans control the interactions
- managed weeds/pests/diseases
- artificial selection for advantageous genes
- has the ability to add inputs to increase production (energy, fertiliser, chemicals)
- uses some fossil fuels as energy sources
- open system.

Question 10b.

Mark	0	1	2	3	4	Average
%	65	15	11	5	4	0.7

Biodiversity is a key concept when studying natural and managed ecosystems.

Students showed little understanding of the relationship between biodiversity and sustainable agriculture and horticulture in Australia, with many students repeating the question with no explanation or giving a general answer.

Responses that scored highly were able to explain that:

- Biodiversity creates a genetic diversity in crops and livestock to help guard our food supply against disease and other threats.
- Sustainable agriculture and horticultural practices embrace biodiversity by minimising its impact on wild ecosystems and incorporating numerous plant and animal varieties into complex, on-farm ecosystems.
- There's a reduction in pesticide/herbicide use when practising sustainable agriculture and horticulture.
- Sustainable agriculture and horticultural practices provide habitat for beneficial insects.

Question 11a.

Mark	0	1	2	3	4	Average
%	40	20	28	4	8	1.2

Students needed to identify and describe two agricultural and/or horticultural practices that could contribute to a blue-green algal bloom. Students didn't seem to have enough understanding of water quality issues, with some incorrectly stating that use of chemicals causes blue-green algae. Several students could identify, but not describe the practices.

Possible answers included:

- overuse of fertiliser
- incorrect fertiliser applications (timing and rate)
- manure runoff into waterways
- stock having access to water, and defecating in water
- irrigating with blue green algae.

Question 11b.

Mark	0	1	2	Average
%	20	48	32	1.1

Most students were able to list at least one effect of blue-green algae.

Possible answers:

- capable of producing toxins (can be poisonous), that effect drinking and usability for people (e.g., farmers couldn't wash down machinery)
- reduce the potential of available water for irrigation
- reduce the potential of available water for animals
- when algae decompose, they may deplete oxygen in the water, causing fish to die
- need for water to be purchased.

Question 11c.

Mark	0	1	2	3	Average
%	58	16	14	12	0.8

The stimulus material and knowledge of agricultural and/or horticultural practices from Question 11a. should have helped with answering this question. Many answered 'put shade over dam' or received only one mark for identifying a method without an explanation.

Possible answers:

- pump effluent around property
- improve management around waterways (fencing off and having a riparian zone)
- continuous flow of water increases oxygen levels and decreases chance of nitrification
- apply chemical treatment
- more efficient use of nitrogenous application.

Explanation:

- Pump effluent around property so it is not highly distributed in one area, allowing nutrients to be absorbed.
- Create plantations around effluent ponds to reduce the chance of runoff.
- Reduce intensive agriculture practices around susceptible waterways and systems.
- In smaller contained outbreaks, chemical treatment is an option, such as a copper sulfate solution.
- Nitrogenous fertilisers should be applied to systems in the correct rate and during specific growing periods.

Question 12a.

Mark	0	1	2	3	4	Average
%	24	21	34	12	9	1.6

This was generally well answered, but some answers lacked the depth of description for four marks.

Examples of answers were:

- Labour – the use of autonomous farming could completely change the labour market for that industry. The ability of technology to function without humans could lead to fewer workers needing to be employed for traditional roles in growing and harvesting produce. This could possibly affect farming communities, towns and sporting clubs as people move to seek work elsewhere.
- Technology doesn't have the ability to visually see an error or a sick animal/plant that a human would be able to detect; just looking at data doesn't tell you everything. A farmer's knowledge of what a sick animal or plant looks like cannot be reproduced by autonomous technology at this point in time. This is particularly true of the early, less obvious signs of disease/pests in animals and plants.

Question 12b.

Mark	0	1	2	3	4	Average
%	39	21	25	10	4	1.2

Many students were unable to present a considered discussion that identified issues and demonstrated arguments for concepts stated in this question.

Some students misread the question and discussed negative rather than positive/supportive economic sustainability or talked about other types of sustainability.

Responses could include points such as:

- be more productive, do more for less cost
- improve efficiencies, but there are issues with fewer people being employed, fewer jobs so not everyone benefiting, better yields, qualities, occupational health and safety standards, shelf life
- broadening the labour force and attracting them to the industry
- possibility to retrain for other jobs on the farm or within the sector
- creating lower input costs, for example, labour unit.

Question 12c.

Mark	0	1	2	3	Average
%	40	28	23	9	1.1

This question required students to incorporate their knowledge of integrated weed management (IWM) with autonomous technology. However, many were unable to list a principle of IWM.

Principles of IWM include using one or more of the following steps so that the reliance on any one weed control technique is reduced:

- identification
- monitor
- prevention
- control – mechanical, chemical, biological, cultural
- timing and frequency
- review and revisit above strategies.

Question 12d.

Mark	0	1	Average
%	62	38	0.4

This question was not answered well.

High-scoring responses were able to suggest that no single management technique provides 100 per cent weed seed control. A combination of techniques needs to be employed throughout the year.

Question 13a.

Mark	0	1	2	Average
%	64	33	3	0.4

Questions 13a. to 13c. showed that students had limited knowledge of biological resistance. Students need to familiarise themselves with the meaning of biological resistance in order to better understand its causes, impacts and strategies to combat it (page 17 of the study design).

Organism will either be sensitive or resistant to a selective pressure; if they are resistant, they will survive and pass that on to their offspring, resulting in the population becoming resistant over time

Question 13b.

Mark	0	1	2	Average
%	81	11	8	0.3

Many students talked about the benefits of biological resistance in their response.

Possible answers included:

- makes management/control of weeds, pests and diseases harder
- impacts on yield, quality and productivity
- food security
- food safety concerns
- environmental contamination
- production losses
- economic losses.

Question 13c.

Mark	0	1	2	Average
%	49	40	11	0.7

Most students were unable to discuss this question thoroughly to obtain two marks.

Possible points included:

- rabbits and viruses evolve
- rabbits become resistant to the viruses
- rabbits will survive and pass that resistance to their offspring, resulting in the population becoming resistant over time
- discussion around resistance occurring due to long-term exposure.

Question 13d.

Mark	0	1	2	3	Average
%	32	45	20	4	1.0

Students needed to explain why it was important to continue to research ways to reduce the wild rabbit population in Australia and to reference Australia's food and fibre industry for full marks.

Possible answers included:

- rabbits are adapting/evolving and become resistant to the viruses, need to develop/find new viruses to use
- changing genetics takes time
- the need to feed and grow productive land and crops
- expectation for efficient and new technology to control populations
- ethical methods of control.