Agricultural Science marking guide and response

External assessment 2022

Combination response (104 marks)

Assessment objectives

This assessment instrument is used to determine student achievement in the following objectives:

1. describe and explain animal and plant production, agricultural enterprises, enterprise management, and evaluation of an agricultural enterprise
2. apply understanding of animal and plant production, agricultural enterprises, enterprise management, and evaluation of an agricultural enterprise
3. analyse evidence about animal and plant production, agricultural enterprises, enterprise management, and evaluation of an agricultural enterprise to identify trends, patterns, relationships, limitations or uncertainty
4. interpret evidence about animal and plant production, agricultural enterprises, enterprise management, and evaluation of an agricultural enterprise to draw conclusions based on analysis.

Note: Objectives 5, 6 and 7 are not assessed in this instrument.

Purpose

This document consists of a marking guide and a sample response.

The marking guide:

- provides a tool for calibrating external assessment markers to ensure reliability of results
- indicates the correlation, for each question, between mark allocation and qualities at each level of the mark range
- informs schools and students about how marks are matched to qualities in student responses.

The sample response:

- demonstrates the qualities of a high-level response
- has been annotated using the marking guide.

Mark allocation

Where a response does not meet any of the descriptors for a question or a criterion, a mark of ‘0’ will be recorded.

Where no response to a question has been made, a mark of ‘N’ will be recorded.

Allow FT mark/s — refers to ‘follow through’, where an error in the prior section of working is used later in the response, a mark (or marks) for the rest of the response can still be awarded so long as it still demonstrates the correct conceptual understanding or skill in the rest of the response.

Marking guide

Paper 1: Multiple choice

Question	Response
1	D
2	D
3	A
4	D
5	B
6	C
7	D
8	A
9	B
10	B
11	D
12	C
13	A
14	B
15	C
16	D
17	C
18	A
19	B
20	B

Paper 1: Short response

Q	Sample response	The response:
21	Rotating wheat with medic is the most sustainable crop rotation option. Evidence to support this conclusion is that rotating wheat with medic resulted in the highest wheat yield, at 3510 kg/ha. In addition, the continuous use of wheat as a monoculture produced a much lower yield — approximately 1000 kg difference —which would partly be due to nutrient depletion from the same crop being grown continuously. Lastly, the rotation of wheat after a crop of lupins produced a similar but slightly lower wheat yield. Having lupins (another legume like medic) in the crop rotation will improve soil fertility for the subsequent wheat crop, but the resulting wheat yield is lower.	• draws a plausible conclusion **[1 mark]** • justifies the conclusion using evidence from the graph **[1 mark]** • explains one benefit of the system **[1 mark]** • explains a second benefit of the system **[1 mark]**

<table>
<tr><th>Q</th><th>Sample response</th><th>The response:</th></tr>
<tr><td>22a)</td><td>Quality of feed in feedlots is higher than green fodder, because it is a formulated feed with the optimum level of each nutrient, e.g. energy and protein, to optimise growth.
Quality of green fodder will vary depending on the growing conditions and the species of fodder planted. The quality of feedlot rations remains constant.</td><td>• identifies feedlot rations have higher quality than green fodder [1 mark]
• identifies that quality of green fodder is more variable than feedlot rations [1 mark]</td></tr>
<tr><td>22b)</td><td>
<table>
<tr><th>First-cross sheep</th><th>60-day gain (kg)</th><th>Final live weight (kg)</th><th>Carcass weight (dressing at 45%)</th><th>Maximum carcass weight (20 kg)</th></tr>
<tr><td>Feedlot</td><td>18</td><td>50</td><td>22.5</td><td>Over</td></tr>
<tr><td>Green fodder</td><td>10.8</td><td>42.8</td><td>19.26</td><td>Under</td></tr>
</table>

The only option for this producer to meet the specifications is use green fodder crops, which produce a carcass weight less than 20 kg (19.26 kg). The lot fed lambs will go over the required maximum carcass weight.</td><td>• calculates 60-day gain for both feedlot and green fodder [1 mark]
• calculates final live weight for both feedlot and green fodder [1 mark]
• identifies the correct dressing percentage for first-cross lambs, i.e., 45% [1 mark]
• calculates the carcass weight for both feedlot and green fodder [1 mark]
• determines the optimal feeding system [1 mark]</td></tr>
</table>

Q	Sample response	The response:
23	The tissue is treated with plant hormones to initiate new root and shoot growth. It is used for the rapid increase of new plant varieties.	• explains the process of tissue culture **[1 mark]** • explains its use in agricultural production **[1 mark]**

Q	Sample response	The response:
24a)	Steer B matures earlier than steer A. This is indicated because the graph for steer B plateaus at a lower muscle tissue weight than for steer A.	• determines steer B **[1 mark]** • identifies a reason from the graph **[1 mark]**
24b)	An implication of an early maturing breed is that it would be able to meet market requirements in terms of fat coverage for the domestic market sooner than a late maturing breed. This would allow a greater turnover of animals but yield a smaller carcass. An implication of an early maturing breed is that they could have problems meeting the required range for depth of fat essential for export markets. A common solution is to use a crossbred animal to take advantage of the desirable carcass traits for both early and late maturing animals.	• identifies an implication of using an early maturing breed for accessibility to different markets **[1 mark]** • identifies a second implication of using an early maturing breed for accessibility to different markets **[1 mark]** • proposes a solution for greater accessibility to domestic and export markets **[1 mark]**

Q	Sample response	The response:
25	Online auctions occur in the beef cattle industry. A feature of an online auction in the beef cattle industry is that products are sold by description only. A second feature of an online auction in the beef cattle industry is that the buyer is responsible for the collection of their purchase.	• identifies a relevant industry **[1 mark]** • identifies one feature of the online auction process for that industry **[1 mark]** • identifies a second feature of the online auction process for that industry **[1 mark]**

Q	Sample response	The response:
26	Socially sustainable opportunities exist for expansion into Asian countries when considering increased income and stronger demands for protein sources in the form of nutritious quality food that Australia can supply. First, the graph indicates that the higher the average annual income of the person, the more meat consumed. Greater income for producers could be gained from targeting countries with higher incomes. Second, Australia's red meat industry, particularly that of the Northern area, is well-poised to take advantage of this, as Australia is a neighbour to a number of these countries. The exception is India where, despite increasing GDP, meat consumption remains low. Third, Australia could benefit from exporting other protein sources (i.e. plant protein sources) to India to supply it with a sustainable food source. Lastly, demand for Australian meat and plant protein will continue to remain strong due to the demand for food by countries with high populations continuing to grow.	• identifies an appropriate conclusion **[1 mark]** • justifies the conclusion using evidence from the graph **[1 mark]** • uses one argument based on the criterion of standard of living to support the conclusion **[1 mark]** • uses a second argument based on the criterion of standard of living to support the conclusion **[1 mark]** • uses a third argument based on the criterion of standard of living to support the conclusion **[1 mark]** • uses a fourth argument based on the criterion of standard of living to support the conclusion **[1 mark]**

Q	Sample response	The response:
27a)	Overall, the erosion rates on the grass-covered block is much higher than on the block covered by trees and shrubs. When grass species are the covering vegetation, there is a significant difference in erosion rate between slopes less than 25 degrees and those greater than 25 degrees. In contrast, the erosion rate under trees and shrubs does not vary significantly between slopes.	• identifies a difference between land covered with trees and shrubs and land covered in grass **[1 mark]** • identifies a second difference between land covered with trees and shrubs and land covered in grass **[1 mark]**
27b)	Trees and shrubs would be better suited for section A of the property due to the > 40 degree slope. A reason is to prevent erosion and allow shrubs and associated understory vegetation to support animal production. Grass would be better suited for section B of the property. A reason is to maximise animal production in a sustainable fashion, as there are similar rates of erosion at slopes < 25 degrees.	• decides trees and shrubs are best suited for section A **[1 mark]** • identifies a reason for the decision for section A **[1 mark]** • decides grass vegetation is best suited for section B **[1 mark]** • identifies a reason for the decision for section B **[1 mark]**

Paper 2: Short response

Q	Sample response	The response:
1	Two strategies that farmers could implement to reduce the incidence of WSD include: • destruction, disposal and decontamination of infected prawn farms to eradicate the disease and reduce the possible spread of the disease • restricting the movement of prawns, lobsters and crabs, including those used as bait, to reduce the spread of the disease.	• identifies a strategy **[1 mark]** • explains the strategy **[1 mark]** • identifies a second strategy **[1 mark]** • explains the second strategy **[1 mark]**

Q	Sample response	The response:
2a)	Cattle treated with HGPs grow at a faster rate, meaning they can be sold earlier. Cattle treated with HGPs are leaner and this might meet the required market specifications.	• explains a reason why producers use HGPs **[1 mark]** • explains a second reason why producers use HGPs **[1 mark]**
2b)	Meat quality is reduced when hormones are used. For example, meat tenderness achieved a score of 50 in contrast to a score of 60 for cattle not treated with HPG.	• draws a conclusion **[1 mark]** • justifies the conclusion using evidence from the graph **[1 mark]**

Q	Sample response	The response:
3a)	The yield data collected for moderately saline soils is more uncertain than that collected for strongly saline soils, as demonstrated by larger SE error bars across varieties for moderately saline soils. This may be due to a greater variation in salinity levels in soils regarded as moderately saline.	• identifies a difference in level of uncertainty between moderately and strongly saline soils **[1 mark]** • explains a reason for the difference **[1 mark]**
3b)	No, variety 4 is the best. The results indicate that variety 1 has only the second-best yield in strongly saline soils.	• identifies the best option **[1 mark]** • provides a reason **[1 mark]**

Q	Sample response	The response:
4a)	Treatments B, C and D all extend the shelf life of radishes in contrast to the control. Treatments B and D are the most effective treatments. Both treatments extend the shelf life of radishes by approximately an extra day compared to treatment C. Treatment C is the least effective treatment.	• identifies a difference between the treatments used **[1 mark]** • identifies a second difference between the treatments used **[1 mark]** • identifies a third difference between the treatments used **[1 mark]**
4b)	A negative effect of using preservatives is that it may reduce the saleability of the product. There is a mistrust by some consumers about the benefits of using preservatives as they are generally considered to be a negative additive and therefore will decrease consumer satisfaction.	• identifies a negative effect of using preservatives on radish crops **[1 mark]** • explains the potential effect on consumer satisfaction **[1 mark]**

Q	Sample response	The response:
5a)	In egg production systems that use cages, hens are unable to practice some natural behaviours, like nesting and dust-bathing.	• identifies an ethical issue relevant to egg production **[1 mark]**
5b)	In egg production systems that use cages, an example of a measurable welfare issue would be cage size.	• identifies a welfare issue relevant to egg production **[1 mark]**
5c)	Ethical issues are about the process, e.g. using a caged system of production, while welfare issues are related to how the process is carried out, e.g. how big the cages are.	• explains the difference between ethical and welfare issues **[1 mark]**

Q	Sample response	The response:
6	One way that natural resources are influenced by land clearing is through an increase in the productivity of grazing land. Land clearing would result in more grass for grazing animals, but less trees for native wildlife, i.e. decreased biodiversity. A second way that natural resources are influenced by land clearing is through increasing the amount of land available for cultivation, which would result in a higher risk of erosion and soil loss in contrast to uncleared land.	• identifies an influence **[1 mark]** • explains the effect of the influence on a natural resource **[1 mark]** • identifies a second influence **[1 mark]** • explains the effect of the second influence on a natural resource **[1 mark]**

Q	Sample response	The response:
7a)	In China, African Swine fever (ASF) had a significant impact on protein availability due to the large, estimated animal losses. With the loss of 40 million pigs, there was a significant impact on the amount of pork that was available to Chinese people on the mainland and in Hong Kong. It can be seen that the incidence of ASF in China would have a significant effect on protein availability for human consumption due to the preference for eating pork. Pork consumption per person is greater in China than the world average as seen in the first graph. Considering that Hong Kong Chinese people consume over 60 kg of pork per person per year, there will be a significant shortfall of available protein. This will result in a greater reliance on protein consumption coming from other animal sources as seen in the second graph. This can be supported by comparing pork consumption in China to other protein sources. The meat consumption per capita went from 40.5 kg in 2015 to 23.2 kg in 2020.	• concludes an impact ASF will have on protein availability **[1 mark]** • justifies the conclusion using evidence from the stimulus **[1 mark]** • concludes a second impact ASF will have on protein availability **[1 mark]** • justifies the conclusion using evidence from the stimulus **[1 mark]**
7b)	Like China there would be an expected 10% reduction in pig numbers. There would be further losses in pig numbers and production due to the need to destroy all pigs which are susceptible on an infected property to prevent further spread of the disease. Further costs to the producer from having to decontaminate their property to eliminate the virus on infected equipment.	• identifies an impact **[1 mark]** • identifies a second impact **[1 mark]** • identifies a third impact **[1 mark]**

Q	Sample response	The response:
8	Using an increased amount of fertiliser will increase the mean yield of corn up to 120 g of fertiliser per pot. Using between 120 g and 140 g of fertiliser per pot results in no difference in average yield — 1800 g. Using more than 140 g of fertiliser per pot results in reduced yields.	• identifies an increase in yield up to 120 g of fertiliser per pot **[1 mark]** • identifies a stagnation of yield between 120 g and 140 g of fertiliser per pot **[1 mark]** • identifies a decrease in yield with more than 140 g of fertiliser per pot **[1 mark]**

Paper 2: Extended response — Question 9

Sample response	The response:	M
Anticipated risk: Drought Prevention: Gather information from the Bureau of Meteorology (BOM) for long-term weather predictions. This would allow planning of timelines, stock management, water reserves and budgeting. Preparedness: Increase the level of feed stored. The storage of extra feed, such as cotton seed meal, in times when prices are favourable allows for controlled feed budgeting and economic value. Some pastures can be turned into conserved feed in the form of hay to take advantage of favourable growing conditions. Response: Consider the stock numbers. Monitor and control the feed levels in paddocks. Monitoring feed levels will help determine when supplements such as urea should be given to minimise losses in animal production. Recovery: Allow paddocks on the property an opportunity to recover and manage restocking rates. Giving paddocks adequate time to recover will allow paddocks to revegetate, i.e. increase pasture productivity, and minimise risk of erosion. **Anticipated risk: Economic hazard** (e.g. a downturn in cattle prices) Prevention: Diversify the existing enterprise. Diversification into another subsystem, such as adding in a tourism component, or diversifying existing enterprise, such as organic accreditation, will help prevent the impact of falling cattle prices. Preparedness: Lock in cattle prices with long-term contracts. Locking prices into contracts in advance will help secure market prices and lessen potential volatility in the marketplace and help ensure a steady income stream.	**Identification of strategies for drought**	
	• identifies a strategy for all four components of the PPRR model	4
	• identifies a strategy for three components of the PPRR model	3
	• identifies a strategy for two components of the PPRR model	2
	• identifies a strategy for one component of the PPRR model	1
	• does not satisfy any of the descriptors above.	0
	Justification of strategies for drought	
	• justifies each strategy for all four components of the PPRR model	4
	• justifies each strategy for three components of the PPRR model	3
	• justifies each strategy for two components of the PPRR model	2
	• justifies a strategy for one component of the PPRR model	1
	• does not satisfy any of the descriptors above.	0
	Identification of anticipated risk	
	• identifies an anticipated risk **[1 mark]**	

Sample response	The response:	M
Response: Respond to market changes and/or monitor market trends for signs of improvement. Consider restocking when market prices are low. Consider selling older breeding stock when prices are high. Recovery: Evaluate available relevant sources of information. Use a wider market to find higher market prices. Lock in co-ops and set markets for future sales to consolidate income. Increase the breeding rates on the property to reduce the cost of restocking.	**Identification of strategies for anticipated risk**	
	• identifies a strategy for all four components of the PPRR model	4
	• identifies a strategy for three components of the PPRR model	3
	• identifies a strategy for two components of the PPRR model	2
	• identifies a strategy for one component of the PPRR model	1
	• does not satisfy any of the descriptors above.	0
	Justification of strategies for risk 2	
	• justifies each strategy for all four components of the PPRR model	4
	• justifies each strategy for three components of the PPRR model	3
	• justifies each strategy for two components of the PPRR model	2
	• justifies a strategy for one component of the PPRR model	1
	• does not satisfy any of the descriptors above.	0

Paper 2: Extended response — Question 10

Sample response	The response:	M
Anticipated risk: Cyclones Prevention: Plant windbreaks such as more trees on parts of the farm that are less impacted by winds and floods. This could mitigate damage that is inflicted from flooding and storm water run-off. Preparedness: Update the existing netting and increase the amount of netting and other forms of tree protection across the property. This strategy will help prevent crop losses and potentially avoid having to replace damaged trees. Response: Put flood water diversions and barriers in place. This would help to prevent floodwater from reaching vulnerable trees. Recovery: Have the resources available to replant and/or prune and repair trees after a weather event. Getting the trees to grow productively again as quickly as possible is important to the long-term economic survival of the business. **Anticipated risk: Financial risk** (e.g. from having only one income stream) Prevention: Introduce a second income stream, such as running cattle on the hills on the unused portion of the farm or growing hay on the river flats. A diversification of the enterprise would help to reduce volatility in domestic and or export market prices for Honey-Murcott mandarins. Preparedness: Lock in future prices with long-term contracts. Having a fixed price would help sustain the income generated by the enterprise. Response: Monitor market trends and ensure selling to the right market for the maximum price. Maximising prices will assist the overall profitability and long-term sustainability of the business.	**Identification of strategies for cyclones**	
	• identifies a strategy for all four components of the PPRR model	4
	• identifies a strategy for three components of the PPRR model	3
	• identifies a strategy for two components of the PPRR model	2
	• identifies a strategy for one component of the PPRR model	1
	• does not satisfy any of the descriptors above.	0
	Justification of strategies for cyclones	
	• justifies each strategy for all four components of the PPRR model	4
	• justifies each strategy for three components of the PPRR model	3
	• justifies each strategy for two components of the PPRR model	2
	• justifies a strategy for one component of the PPRR model	1
	• does not satisfy any of the descriptors above.	0
	Identification of anticipated risk	
	• identifies a second risk **[1 mark]**	

Sample response	The response:	M
Recovery: Look for value adding of the product, e.g. more long-term storage like juices/cordials. Value-adding can increase income through new markets the products are sold to as well as avoid wastage of the product. For example, juicing will use mandarins that wouldn't meet market requirements. Therefore, creating diversification of income to help sustain the business.	**Identification of strategies for anticipated risk**	
	• identifies a strategy for all four components of the PPRR model	4
	• identifies a strategy for three components of the PPRR model	3
	• identifies a strategy for two components of the PPRR model	2
	• identifies a strategy for one component of the PPRR model	1
	• does not satisfy any of the descriptors above.	0
	Justification of strategies for anticipated risk	
	• justifies each strategy for all four components of the PPRR model	4
	• justifies each strategy for three components of the PPRR model	3
	• justifies each strategy for two components of the PPRR model	2
	• justifies a strategy for one component of the PPRR model	1
	• does not satisfy any of the descriptors above.	0