Agricultural Science marking guide and response

External assessment 2021

Combination response (115 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.

Allowing for FT error — 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 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	C
2	B
3	C
4	D
5	A
6	D
7	A
8	B
9	B
10	C
11	B
12	B
13	C
14	B
15	A
16	B
17	C
18	D
19	A
20	D

Paper 1: Short response

Q	Sample response	The response:
21	1. Gross energy 2. Digestible energy 3. Metabolisable energy 4. Net energy 5. Maintenance energy 6. Production energy	· correctly identifies 6 energy types **[1 mark]**
22	Diversification is one risk management strategy the producer could use. This could involve adding another egg production system, such as barn-laid or free-range eggs, to the production mix to access higher financial returns for the end product. Additionally, to prevent financial loss, the producer could attempt to secure a new market by arranging a new marketing agreement with another retailer.	· identifies a risk management strategy that could help prevent financial loss **[1 mark]** · explains the strategy **[1 mark]** · identifies a second risk management strategy that could help prevent financial loss **[1 mark]** · explains the second strategy **[1 mark]**

Q	Sample response	The response:
23a)	Paddock rotation involves moving livestock through a series of paddocks. This allows grazed paddocks to regrow before they are grazed again.	· describes paddock rotation **[1 mark]** · gives a reason for this practice **[1 mark]**
23b)	The grazing strategy most likely to increase animal production is cell grazing because the utilisation percentage is the highest.	· concludes that cell grazing is the most effective **[1 mark]** · justifies by identifying that cell grazing has the highest utilisation **[1 mark]**
24a)	A significant animal disease that affects production is pestivirus.	· identifies a significant animal disease **[1 mark]**

Q	Sample response	The response:	M
24b)	The health effects of a disease such as pestivirus are ill thrift and chronic diarrhoea. Two economic effects of pestivirus are foetus/animal death and reduced weight gains.	· states 2 health effects of the identified disease · states 2 economic effects of the identified disease	2
		· states 2 health effects of the identified disease **OR** · states 2 economic effects of the identified disease **OR** · states 1 health effect of the identified disease · states 1 economic effect of the identified disease	1
		· does not satisfy any of the descriptors above.	0

Q	Sample response	The response:
24c)	Rabbit haemorrhagic disease virus (RHDV) can be used to control rabbits by the strategic release of the virus into the wild near burrows. RHDV causes high mortality in both domestic and wild adult animals. Before it can be released, it must be tested to see that it is host-specific (i.e. not detrimental to other organisms in the ecosystem) and suitable for the environment it is being released into.	· identifies a biological method of pest control **[1 mark]** · explains how the biological method controls the animal pest **[1 mark]** · explains conditions that should be met for the biological method **[1 mark]**

Q	Sample response	The response:
25a)	Protein is used for growth.	· states a function of protein **[1 mark]**
25b)	As a sheep's weight increases, its requirement for protein in its diet decreases.	· identifies inverse relationship **[1 mark]**
25c)	The weight gain for this group of sheep would stop, and they could even start to lose weight as the pasture they are eating does not meet their crude protein (CP) requirements. They have a CP requirement of 10–12% and, at the late flowering and dry grass and stalk stages, grass-based pastures have a CP content of below 10%.	· concludes that weight gain would stop **[1 mark]** · identifies that - the CP requirement is 10–12% **[1 mark]** - pasture provided has CP below 10% **[1 mark]**

Q	Sample response	The response:
26a)	Income from peanut splits = 0.25 × $900 = $225 X = $225 Total peanuts income = $3000 + $500 + $225 = $3725 Y = $3725 Total lucerne variable costs = $29 + $35 + $44 + $8 + $630 + $193 + $32 = $971 Z = $971	· for peanuts - provides $225 for X (peanut splits income) **[1 mark]** - provides $3725 for Y (total income) **[1 mark]** · for lucerne - provides $971 for Z (total variable costs) **[1 mark]**
26b)	Lucerne has a higher gross margin. It is therefore the better crop. Peanuts gross margin = $3725 − $1146 = $2579 Lucerne gross margin = $3620 − $971 = $2649	· provides a consequentially correct gross margin - for peanuts **[1 mark]** - for lucerne **[1 mark]** · selects an appropriate crop **[1 mark]** · identifies that the chosen crop has a higher gross margin **[1 mark]**

Q	Sample response	The response:
27a)	Nitrogen is an essential part of chlorophyll and the process of photosynthesis (growth). Available forms of nitrogen for plant growth need to be present to ensure optimal plant growth.	· describes the function of nitrogen in plant growth **[1 mark]** · describes that a lack of available nitrogen will limit plant growth **[1 mark]**
27b)	The confidence interval error bars for each fertiliser treatment overlap, which means that there was no statistical difference between fertiliser types and celery yield.	· identifies that there was no statistical difference between the fertilisers **[1 mark]**
27c)	Refined organic fertiliser (ROF) should be used. There was a statistical difference between the yield for Tomato crop 1 using ROF and the yields for other Tomato crop 1 tomatoes using other fertilisers and the control treatment. There was a statistical difference between the yield for Tomato crop 2 using ROF and the yields for other Tomato crop 2 tomatoes using other fertilisers and the control treatment. Organic matter improves the soil's structure and increases its water holding capacity. It also promotes biological transformations, such as N-mineralisation. The higher level of organic matter added by the ROF fertiliser would mean a greater supply of available nitrogen in the root zone for the second rotation of tomatoes.	· selects refined organic fertiliser (ROF) **[1 mark]** · identifies a statistical difference for Tomato crop 1 **[1 mark]** · identifies a statistical difference for Tomato crop 2 **[1 mark]** · identifies a reason for differences in yield due to fertiliser treatment **[1 mark]**

Q	Sample response	The response:
28	The goals of a two-year chemical treatment program should initially be to kill ticks attached to the cattle and to prevent re-infestation by preventing ticks from producing eggs in the paddock. In order for milk production to continue, the chemical must have an acceptable withholding period. A follow-up application at an appropriate interval after the initial application will be necessary to prevent re-infestation. Consideration should be given to using a different type of chemical for the follow-up application to prevent tick resistance to the chemicals used for the initial application. Further applications will be required over the two-year period to control tick numbers.	· states that a goal for initial chemical application is to kill ticks **[1 mark]** · states that a second goal for initial chemical application is to prevent re-infestation by preventing egg production **[1 mark]** · justifies the chemical with reference to milk production **[1 mark]** · states that a follow-up application will be required using a different chemical at an appropriate interval after the initial application **[1 mark]** · states that it will prevent tick resistance to chemicals **[1 mark]** · identifies need for further applications across two-year period **[1 mark]**

Paper 2: Short response

Q	Sample response	The response:
1a)	Following the start of the Korea–Australia Free Trade Agreement (KAFTA) in 2015, the amount of fruit and vegetables exported to South Korea increased. For example, in 2014, only 245 tonnes of oranges were exported to South Korea; however, in 2015 after a full year of KAFTA, 1015 tonnes of oranges were exported.	· draws an appropriate conclusion **[1 mark]** · identifies a relationship that could be used to justify a conclusion **[1 mark]**
1b)	KAFTA caused an increase in cherry exports between 2014 and 2015. The Korea–New Zealand Free Trade Agreement (KNZFTA) would have allowed New Zealand growers to sell their cherries in Korea. This would have increased supply and therefore reduced demand for Australian cherries. The lower than expected yield of Tasmanian cherries would have reduced the local supply of cherries and therefore reduced the amount of cherries available for the export market.	· explains the impact of - KAFTA **[1 mark]** - KNZFTA **[1 mark]** - lower yields of Tasmanian cherries **[1 mark]**
2	A cooperative is a type of agricultural enterprise. An example of a cooperative in Australia is the NSW Sugar Milling Co-operative. One feature of this cooperative is that it brings together many smaller farms to buy their required farm inputs (e.g. fertiliser) in bulk, therefore decreasing the price. A second feature of this cooperative is that the volume of saleable products increases, meaning the cooperative can access new markets that need to supply greater volumes of product.	· identifies a type of agricultural enterprise **[1 mark]** · gives an example of the identified enterprise **[1 mark]** · explains - a feature of the identified enterprise **[1 mark]** - a second feature of the identified enterprise **[1 mark]**

Q	Sample response	The response:
3	Beneficial organisms enhance plant production. Pollinators are essential for the transfer of pollen from male to female flowers and plants. Farmers rely on pollinators to help their crop achieve optimal yield. Nematodes can be beneficial in destroying and controlling larvae of crop-damaging species, leading to higher plant yields.	· explains the role of beneficial organisms **[1 mark]** · explains an example **[1 mark]** · explains a second example **[1 mark]**
4	As the concentration of magnesium applied to the foliage increases, the number of fruits harvested also increases. The optimum application rate is 100 ppm. According to the table, an application of 150 ppm of magnesium results in the highest biological yield. At a foliar application of 100 ppm, the biggest response to magnesium, in terms of the weight of fruit in relation to the number of fruits, occurs. At 50 ppm, an increase in magnesium concentration does not always result in a statistically different number of fruits.	· draws an appropriate conclusion **[1 mark]** · identifies - a trend **[1 mark]** - a second trend **[1 mark]** - a third trend **[1 mark]**

Q	Sample response	The response:
5	Different markets have different carcass requirements in terms of the live weight of the animal and fat coverage across the carcass. There are opportunities for animals of different ages to meet the market specifications because of the percentages that the relevant tissues (i.e. fat and muscle) represent in terms of the overall carcass weight, as seen in the graphs. For example, animals going to the domestic market are likely to be younger, as the specifications are looking for animals that have grown quickly in terms of muscle growth but have less fat as a percentage of the carcass. As the percentage of fat increases on a weight basis, the animals are better finished and are more suited to the top end of the domestic market or some overseas markets. That is, the animal continues to grow but fat represents a greater percentage of the carcass. Other export markets require more finishing or greater fat coverage where fat forms a greater percentage of the carcass. This generally favours older animals, as seen in the graphs.	· draws an appropriate conclusion **[1 mark]** · describes - a piece of evidence **[1 mark]** - a second piece of evidence **[1 mark]** - a third piece of evidence **[1 mark]**

Q	Sample response	The response:
6a)	Specialty eggs have a much higher unit price per egg in the market compared to other egg production systems. Both barn-laid (20 944 × 1000, 9.45%) and specialty (3465 × 1000, 3.51%) egg production systems produced smaller quantities of eggs, and both represent a smaller percentage of the market value. However, the ratio of number of eggs to a single % of the total market value is lower for specialty eggs compared to all other systems. Therefore, the most expensive eggs are specialty eggs.	· determines the egg production system with the highest unit price **[1 mark]** · provides - a piece of evidence **[1 mark]** - a second piece of evidence **[1 mark]**
6b)	Free-range and specialty eggs' market shares have increased by approximately 14% and 15% respectively. Barn-laid eggs' market share has increased by 3%. There has been a decline of close to 7% in cage egg sales. Free-range eggs have significantly increased their market share due to consumer trends that have demanded better conditions for hens. Although sales of cage eggs have decreased a little, they have held their place in the market because they are a cheaper product.	· identifies a trend **[1 mark]** · explains the first trend **[1 mark]** · identifies a second trend **[1 mark]** · explains the second trend **[1 mark]**

Q	Sample response	The response:
7	Decision: The best variety of forage sorghum to plant is Sorghum A. This is the best option because: · it tolerates a cold start — planting in late winter · it is close to the best variety for beef grazing · it can be grazed or hayed and is also suitable for bale silage · the expected rainfall between late August and summer will ensure it will continue to grow and provide a feed source while waiting for summer rains. The producer can expect to have more summer rain, and should have natural grass cover to continue the growth of their cattle.	· chooses an appropriate variety of sorghum **[1 mark]** · identifies - a reason **[1 mark]** - a second reason **[1 mark]** - a third reason **[1 mark]** - a fourth reason **[1 mark]**
8	A cultural practice is an agricultural practice that is used to enhance crop or livestock health, and prevent weed, pest or disease problems without the use of chemical substances. Examples are using high-quality seeds and choosing plant species native to the local environment.	· explains cultural practice **[1 mark]** · identifies - an example **[1 mark]** - a second example **[1 mark]**

Q	Sample response	The response:
9a)	Wind erosion — loss of topsoil from the paddocks.	· identifies a management issue **[1 mark]**
9b)	This could have occurred because cultivated paddocks were left bare, with no stubble to hold the soil together. Overgrazing would have the same effect, i.e. leaving no plant matter to hold the soil together.	· explains - a process **[1 mark]** - a second process **[1 mark]**
9c)	Instead of leaving cultivated paddocks bare, the crop stubble could be left to mulch down into the soil after harvesting. A solution to overgrazing would be to destock before overgrazing occurs.	· proposes - a solution **[1 mark]** - a second solution **[1 mark]**

Paper 2: Extended response — Question 10

Sample response	The response:	M
Considering beef production: **Physical resource management** 1. Fencing (strength): Fencing off creeks helps to prevent soil erosion and maintain soil fertility and high water quality. 7. Whole-farm planning, e.g. wildlife corridors (strength): This increases on-farm biodiversity, provides shelter for stock and sequesters more carbon in the ground. 8. Land care, e.g. cell grazing (strength): Increasing the amount of time the pastures are spelled between grazing events will increase pasture productivity and carrying capacity of stock. **Biological resource management** 1. Genetic selection of animals (strength): This improves animal growth and helps retain heterosis in future generations under the same environmental conditions. 2. Vegetation management (strength): This includes having excellent vegetation management practices for conservation and biodiversity, including small paddocks for cell grazing to maintain pasture productivity and creeks that have been fenced off to reduce erosion. 3. Biosecurity control (strength): This includes purchasing stock from known producers, obtaining health declarations for any incoming stock, and keeping new animals in the quarantine paddock for a minimum of 10 days before introduction to new pastures, flocks and herds. **Waste management** 1. Solid waste (weakness): Removal of solid waste from the feedlot should happen on a regular	**Identification of criteria**	
	· identifies 3 criteria	3
	· identifies 2 criteria	2
	· identifies 1 criterion	1
	· does not satisfy any of the descriptors above.	0
	Analysis of physical resource management	
	· provides justified analysis of 3 strengths and/or weaknesses	3
	· provides justified analysis of 2 strengths and/or weaknesses	2
	· provides justified analysis of 1 strength and/or weakness	1
	· does not satisfy any of the descriptors above.	0
	Analysis of biological resource management	
	· provides justified analysis of 3 strengths and/or weaknesses	3
	· provides justified analysis of 2 strengths and/or weaknesses	2
	· provides justified analysis of 1 strength and/or weakness	1
	· does not satisfy any of the descriptors above.	0
	Analysis of waste management	

Sample response	The response:	M
basis. This would assist in decreasing the number of flies on the property and assist in reducing flystrike. 2. Water run-off (weakness): Management of the water run-off from the feedlot should be improved to avoid further contamination of other areas on the farm, e.g. controlling water run-off to avoid reducing the quality of water in the creek. 3. Vegetation management (strength): This will improve nutrient cycling carbon sequestration due to greater retention of vegetation on the property. **Conclusion** Currently, the company is operating in a sustainable manner. It has solid biological and physical resource management that demonstrates sound sustainable practice in fencing, land care, cell grazing and wildlife corridors. There is room to improve the company's waste management practices, as its solid and run-off feedlot waste currently does not use sustainable practices.	· provides justified analysis of 3 strengths and/or weaknesses	3
	· provides justified analysis of 2 strengths and/or weaknesses	2
	· provides justified analysis of 1 strength and/or weakness	1
	· does not satisfy any of the descriptors above.	0
	Conclusion	
	· provides a justified conclusion	3
	· provides a reasonable conclusion	2
	· provides a conclusion	1
	· does not satisfy any of the descriptors above.	0