

Agricultural Science marking guide and response

Sample external assessment 2020

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.

Introduction

The Queensland Curriculum and Assessment Authority (QCAA) has developed mock external assessments for each General senior syllabus subject to support the introduction of external assessment in Queensland.

An external assessment marking guide (EAMG) has been created specifically for each mock external assessment.

The mock external assessments and their marking guides were:

- developed in close consultation with subject matter experts drawn from schools, subject associations and universities
- aligned to the external assessment conditions and specifications in General senior syllabuses
- developed under secure conditions.

Purpose

This document consists of an EAMG and an annotated response.

The EAMG:

- 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 annotated response:

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

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.

External assessment marking guide

Multiple-choice

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

Paper 1: Short response (40 marks)

Question		Sample response	The response			
21	a	The increase is due to consumer concerns about the welfare of chickens used in caged-egg systems, e.g. stress due to lack of space. Free-range systems provide greater area for chickens to demonstrate normal behaviour.	<ul style="list-style-type: none"> identifies consumer concerns about a specific animal welfare issue [1 mark] identifies how free-range systems address animal welfare concerns [1 mark] 			
	b	Caged-egg producers could convert to a certified free-range system. This would enable the producer to label their product as 'free-range' to address consumer demand.	<ul style="list-style-type: none"> identifies a strategy [1 mark] describes how the strategy addresses consumer demand [1 mark] 			
22	a	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="text-align: left;">Gross margin \$/ha</td> <td style="text-align: center;">192.78</td> <td style="text-align: center;">207.44</td> </tr> </table>	Gross margin \$/ha	192.78	207.44	<ul style="list-style-type: none"> provides 192.78 for sorghum [1 mark] provides 207.44 for sunflowers [1 mark]
	Gross margin \$/ha	192.78	207.44			
b	The producer should grow dryland sunflowers because the gross margin for sunflowers is higher than gross margin for sorghum.	<ul style="list-style-type: none"> identifies that the producer should grow dryland sunflowers [1 mark] identifies that gross margin is higher for sunflowers than sorghum [1 mark] 				
23		<p>1. Plant deep-rooted trees in the upper catchment area to lower the water table and prevent salinity coming to the surface. Reducing surface salinity would increase plant production.</p> <p>2. Allow regrowth of trees in the upper catchment area to lower the water table and prevent salinity coming to the surface. Reducing surface salinity would increase plant production.</p>	<ul style="list-style-type: none"> identifies two strategies [2 marks] OR identifies one strategy [1 mark] explains how each identified strategy would increase production [2 marks] OR explains how one identified strategy would increase production [1 mark] 			

Question	Sample response	The response	
24	1. use of food 2. types of food 3. digestibility of food	<ul style="list-style-type: none"> identifies three components [3 marks] OR identifies two components [2 marks] OR identifies one component [1 mark] 	
25	a	A chemical substance that is toxic to plants, used to control unwanted vegetation (e.g. weeds).	<ul style="list-style-type: none"> correctly defines herbicide [1 mark]
	b	A chemical used to kill nematodes (roundworms).	<ul style="list-style-type: none"> correctly defines nematicide [1 mark]
	c	A horticultural technique where tissues of plants are joined to continue their growth together.	<ul style="list-style-type: none"> correctly defines grafting [1 mark]
26	Tissue culture is a technique used to rapidly multiply the numbers of a new plant variety. In tissue culture, the new plants are exact replicates (clones) of the parent plant.	<ul style="list-style-type: none"> explains purpose of tissue culture [1 mark] explains genetic relationship between parent and offspring in tissue culture [1 mark] 	
27	Group A: $\frac{1825}{253} = 7.2$ Group C: $\frac{1953}{295} = 6.6$ Group B: $\frac{1840}{302} = 6.1$ Group D: $\frac{2095}{340} = 6.2$ In terms of production, group B is superior because it has the lowest FCR.	<ul style="list-style-type: none"> correctly determines FCRs for all four groups [1 mark] identifies superior group using FCR [1 mark] 	
28	a	through the rumen wall	<ul style="list-style-type: none"> identifies rumen wall [1 mark]
	b	through the small intestines	<ul style="list-style-type: none"> identifies small intestines [1 mark]

Question	Sample response	The response	
29	<p>The producer should use product B.</p> <p>The start of the wet season is when dung beetles are most active and product A will kill dung beetle larvae in the dung while there is no likelihood of chemical activity in the dung with product B. Product B offers longer term use due to the low likelihood of resistance in flies to the chemical compared to product C.</p>	<ul style="list-style-type: none"> identifies product B [1 mark] provides a reason based on action of products in manure [1 mark] provides a reason based on likelihood of resistance [1 mark] 	
30	a	<p>In an established export market for Australia like Asia, beef production can meet the increased food requirement of a growing population. In particular, beef production could meet the increased demand for animal protein in Asia and Sub-Saharan Africa. However, increased beef production carries risks with respect to water security.</p>	<ul style="list-style-type: none"> identifies opportunities or risks due to: <ul style="list-style-type: none"> population distribution [1 mark] food quality [1 mark] food security [1 mark]
	b	<p>There is a sustainable demand for beef production. There will be significant population growth in Asia and Sub-Saharan Africa. There will also be significant increases in demand for animal protein in Asia and Sub-Saharan Africa. However, animal products require more water per unit of protein than most plant products.</p>	<ul style="list-style-type: none"> draws a valid conclusion [1 mark] gives reason based on <ul style="list-style-type: none"> population distribution [1 mark] food quality [1 mark] food security [1 mark]
31	a	<p>Price per kilogram:</p> <ul style="list-style-type: none"> Animal A: $5.90 - 30 - 10 - 20 \rightarrow \\$5.30/\text{kg}$ Animal B: $5.90 + 10 \rightarrow \\$6.00/\text{kg}$ Animal C: $5.90 - 5 - 5 + 10 - 5 \rightarrow \\$5.85/\text{kg}$ <p>Income from each animal:</p> <ul style="list-style-type: none"> Animal A: $\\$5.30/\text{kg} \times 250 \text{ kg} = \\1325 Animal B: $\\$6.00/\text{kg} \times 220 \text{ kg} = \\1320 Animal C: $\\$5.85/\text{kg} \times 220 \text{ kg} = \\1287 <p>Animal returning the highest income: Animal A</p>	<ul style="list-style-type: none"> correctly determines the price/kg for all three animals [1 mark] determines the income from all three animals [1 mark] identifies highest income animal [1 mark]

Question	Sample response	The response
b	<p>Characteristics of Animal A that would reduce its income are</p> <ul style="list-style-type: none"> • age • low p8 fat level • butt shape. <p>Animal B conforms closely to market requirements and therefore will receive the designated grid price.</p> <p>Characteristics of Animal C that reduce income are</p> <ul style="list-style-type: none"> • age • heifer (in a steer competition). 	<ul style="list-style-type: none"> • identifies that age, low p8 fat level and butt shape affect price for Animal A [1 mark] • identifies that Animal B has no characteristics that affect its price [1 mark] • identifies that age and sex affect price for Animal C [1 mark]

Paper 2: Short response (35 marks)

Question	Sample response	The response
1	<p>Feed B should be used.</p> <p>Feed B has the lowest protein content, which makes it most suitable because older animals require less protein.</p> <p>Feed B has the highest calcium content. This is important because egg-laying chickens will need high calcium to help with shell formation.</p>	<ul style="list-style-type: none"> identifies Feed B as most suitable [1 mark] explains two differences between Feed B and the other feeds that make it most suitable [2 marks] <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> explains one difference between Feed B and the other feeds that make it more suitable [1 mark]
2	<p>The metabolisable energy (ME) value of 10.5 MJ satisfies the requirements for categories 2, 3 and 4 but not 1.</p> <p>The protein value of 11.7% satisfies the nutritional requirements for categories 2 and 3 but not 1 and 4.</p> <p>The pellet could be fed to categories 2 and 3.</p>	<ul style="list-style-type: none"> identifies that pellet meets <ul style="list-style-type: none"> ME requirements for categories 2, 3 and 4 [1 mark] protein requirements for categories 2 and 3 [1 mark] identifies categories 2 and 3 as suitable [1 mark]

Question	Sample response	The response	
3	<p>Land clearing causes erosion because when vegetative cover is removed, the soil is exposed and can be eroded by wind and water.</p> <p>Land clearing also increases dryland salinity because reducing vegetative cover causes the water table to rise and bring salinity to the surface.</p>	<ul style="list-style-type: none"> identifies two effects of land clearing [2 marks] <p>OR</p> <ul style="list-style-type: none"> identifies one effect of land clearing [1 mark] <ul style="list-style-type: none"> explains, for each of two identified effects, how it is caused by land clearing [2 marks] <p>OR</p> <ul style="list-style-type: none"> explains for one identified effect, how it is caused by land clearing [1 mark] 	
4	<p>A government decision that has had an impact on Australian agriculture is the introduction of biosecurity laws. This strengthens on-farm biosecurity and improves the control of disease outbreaks.</p>	<ul style="list-style-type: none"> identifies a valid decision or policy [1 mark] describes an impact of the decision/policy [1 mark] 	
5	a	conservation tillage	<ul style="list-style-type: none"> identifies a valid soil management technique [1 mark]

Question	Sample response	The response
	<p>b</p> <p>An advantage of conservation tillage is that a reduced number of tillage operations will help sustain soil structure.</p> <p>A disadvantage is that greater chemical control of weeds is required.</p>	<ul style="list-style-type: none"> • identifies one advantage of the technique [1 mark] • identifies one disadvantage of the technique [1 mark]
6	<p>a</p> $\frac{116.2-18.3}{28} = 3.5$ <p>Average growth rate for control treatment = 3.5 cm/day</p> $\frac{71.3-20.2}{28} = 1.8$ <p>Average growth rate for eight-plant treatment = 1.8 cm/day</p>	<ul style="list-style-type: none"> • provides 3.5 for control [1 mark] • provides 1.8 for eight-plant treatment [1 mark]
	<p>b</p> <p>At day 7, the higher the planting density the taller the plants.</p> <p>At day 35, the lower the planting density the taller the plants.</p>	<ul style="list-style-type: none"> • identifies that, after 7 days, planting density increases plant growth [1 mark] • identifies that, after 35 days, planting density decreases plant growth [1 mark]

Question	Sample response	The response
	<p>c</p> <p>Initially, plants grown at higher than the recommended density will grow quicker than those at the recommended rate as they will be competing for available light.</p> <p>As they grow, competition for other resources such as water and nutrients will limit their growth, meaning they will be smaller than plants grown at the recommended density.</p>	<ul style="list-style-type: none"> explains plant growth at early emergence phase [1 mark] explains plant growth during vegetative phase [1 mark]
7	<p>a</p> <p>Bull purchased: A</p>	<ul style="list-style-type: none"> provides A [1 mark]
	<p>b</p> <p>The rump fat EBV for Bull A is negative. The 400-day weight EBV for Bull A is higher than the other bulls. The eye muscle area EBV and retail beef yield EBV are highest for Bull A.</p>	<ul style="list-style-type: none"> identifies three valid reasons to justify decision [3 marks] OR identifies two valid reasons to justify decision [2 marks] OR identifies three valid reasons to justify decision [1 mark]
8	<p>a</p> $\frac{5\,200\,000 - 2\,000\,000}{6} = 530\,000$ <p>Average annual increase in barley = 530 000 tonnes/year</p>	<ul style="list-style-type: none"> determines the average annual increase [1 mark]
	<p>b</p> <p>2 000 000 tonnes + 530 000 tonnes/year × 11 years</p> <p>Expected barley exported in 2018 = 7 800 000 tonnes</p>	<ul style="list-style-type: none"> correctly extrapolates data [1 mark] correctly predicts the amount of barley exported [1 mark]

Question	Sample response	The response
9	1. nutrition 2. genetics 3. animal health	<ul style="list-style-type: none"> identifies three factors [3 marks] <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> identifies two factors [2 marks] <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> identifies one factor [1 mark]
10	Selected pest: tick Impact: Ticks reduce liveweight gain or body condition	<ul style="list-style-type: none"> identifies a production animal pest [1 mark] describes an effect of the identified pest on production [1 mark]
11	Animal welfare issue: Mulesing The removal of skin requires cutting of the skin and is usually done with no pain relief, causing pain and discomfort to the animal.	<ul style="list-style-type: none"> identifies a valid animal welfare issue [1 mark] explains why this is a welfare issue [1 mark]

Paper 2: Extended response — Question 12 (20 marks)

Question	The response					
12a	Positive practice 1	Mark	Positive practice 2	Mark	Positive practice 3	Mark
	<ul style="list-style-type: none"> identifies a positive practice explains two reasons for the practice 	3	<ul style="list-style-type: none"> identifies a positive practice explains two reasons for the practice 	3	<ul style="list-style-type: none"> identifies a positive practice explains two reasons for the practice 	3
	<ul style="list-style-type: none"> identifies a positive practice explains one reason for the practice 	2	<ul style="list-style-type: none"> identifies a positive practice explains one reason for the practice 	2	<ul style="list-style-type: none"> identifies a positive practice explains one reason for the practice 	2
	<ul style="list-style-type: none"> identifies a positive practice 	1	<ul style="list-style-type: none"> identifies a positive practice 	1	<ul style="list-style-type: none"> identifies a positive practice 	1

Sample response

Practice: improving pastures including the use of selected legumes (butterfly pea, stylo, wynn cassia) throughout all properties
 The addition of legumes will improve soil nitrogen and soil quality. It will also provide year-long coverage, which will reduce erosion.

Practice: increasing fencing to increase paddock rotations
 This will increase rest periods for pasture recovery and reduce compaction through trampling, therefore improving soil quality.

Practice: maintaining a healthy dung beetle population
 Dung beetles improve soil quality through nutrient cycling and provide a biological control to manage pests such as buffalo fly.

Question	Sample response	The response
12b	<p>Action: fencing off the water courses This will reduce the erosion caused by cattle on water edges and improve water quality.</p> <p>Action: utilising IPM This will maintain appropriate species balance in improved pastures and maintain the nutritional capacity of pasture for grazing livestock.</p>	<ul style="list-style-type: none"> identifies a water/soil management action [1 mark] identifies a weed management action [1 mark] <p>OR</p> <ul style="list-style-type: none"> identifies two reasons to support the water/soil management action [2 marks] identifies one reason to support the water/soil management action [1 mark] <p>OR</p> <ul style="list-style-type: none"> identifies two reasons to support the weed management action [2 marks] identifies one reason to support the weed management action [1 mark]
12c	<p>Three future risks are the loss of tropical genetics in cross-breeding practices, drought and market changes.</p>	<ul style="list-style-type: none"> identifies three future risks to sustainability [3 marks] <p>OR</p> <ul style="list-style-type: none"> identifies two future risks to sustainability [2 marks] <p>OR</p> <ul style="list-style-type: none"> identifies one future risk to sustainability [1 mark]

Question	Sample response	The response
12d	The loss of tropical genetics in cross-breeding practices is a risk because using non-tropical breeds reduces tropical traits, leaving offspring more susceptible to disease or climatic factors. Also, these breeds may not compete as well in growth rate as tropically-adapted breeds.	<ul style="list-style-type: none"> • provides two reasons outlining the future sustainability risk [2 marks] <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> • provides one reason outlining the future sustainability risk [1 mark]

Paper 2: Extended response — Question 13 (20 marks)

Question	The response							
13a	Prevention	Mark	Preparedness	Mark	Response	Mark	Recovery	Mark
	• provides three recommendations for improvement	3	• provides three recommendations for improvement	3	• provides three recommendations for improvement	3	• provides three recommendations for improvement	3
	• provides two recommendations for improvement	2	• provides two recommendations for improvement	2	• provides two recommendations for improvement	2	• provides two recommendations for improvement	2
	• provides one recommendation for improvement	1	• provides one recommendation for improvement	1	• provides one recommendation for improvement	1	• provides one recommendation for improvement	1

Sample response

Recommendations for prevention are on-farm feed budgeting, store feed on the farm and increase water storage and the number of water points on property. Recommendations for preparedness are sell animals before it is too dry, maintain high levels of animal nutrition and identifying further markets, e.g. live exports. Recommendations for response are selling animals before the crisis point, maintain the body weight of remaining animals through supplementary feeding and rotate paddocks to ensure minimum ground cover is maintained. Recommendations for recovery are continue supplementary feeding, monitor ground cover and feed on offer and control any erosion developed from the dry period.

Question	The response							
13b	Prevention	Mark	Preparedness	Mark	Response	Mark	Recovery	Mark
	• explains how two recommendations reduce the impact of drought	2	• explains how two recommendations reduce the impact of drought	2	• explains how two recommendations reduce the impact of drought	2	• explains how two recommendations reduce the impact of drought	2
	• explains how one recommendation reduces the impact of drought	1	• explains how one recommendation reduces the impact of drought	1	• explains how one recommendation reduces the impact of drought	1	• explains how one recommendation reduces the impact of drought	1

Sample response

For prevention, on-farm feed budgeting will improve nutrition for animals to maintain body weight and condition during a drought. Storage of feed on the farm will reduce feeding costs when drought fodder becomes more expensive.

For preparedness, selling animals before it is too dry will maintain adequate feed supply for most valuable stock remaining. Maintaining high levels of animal nutrition will ensure animals meet market requirements.

For response, sale of animals before crisis point will ensure ethical treatment of animals and limit the possibility of animals becoming too poor to travel or needing to be euthanised onsite. Maintenance of body weight of remaining animals through supplementary feeding will allow regular production (such as mating/calving) to continue.

For recovery, continuing supplementary feeding will allow paddocks to rejuvenate. Monitoring ground cover will ensure the appropriate stocking rate is set to avoid overgrazing.