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books used

External assessment 2023

Question and response book

# Agricultural Science

## Paper 2

### Time allowed

- Perusal time — 10 minutes
- Working time — 90 minutes

### General instructions

- Answer all questions in this question and response book.
- Write using black or blue pen.
- QCAA-approved calculator permitted.
- Planning paper will not be marked.

### Section 1 (39 marks)

- 10 short response questions

### Section 2 (18 marks)

- 1 extended response question



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## Section 1

### Instructions

- If you need more space for a response, use the additional pages at the back of this book.
    - On the additional pages, write the question number you are responding to.
    - Cancel any incorrect response by ruling a single diagonal line through your work.
    - Write the page number of your alternative/additional response, i.e. See page ...
    - If you do not do this, your original response will be marked.
  - This section has 10 questions and is worth 39 marks.
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### QUESTION 1 (2 marks)

Explain a risk avoidance strategy for a lamb producer to minimise the effect of drought on farm income.

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## QUESTION 2 (5 marks)

An agricultural class entered two animals into a carcass competition at a local agricultural show. The tables show the carcass characteristics for both animals, a price grid and price penalties/premiums for the domestic market.

Animal	A	B
Carcass weight (HSCW) (kg)	270	310
Sex	Female	Male
Condition score	A	A
Bruising	Nil	Nil
MSA premium	No	Yes

HSCW (kg)	Price (c/kg)
300–359	655
280–299	650
260–279	645
240–259	640

Category	Price penalty/premium
Sex (female)	5c/kg less than price grid
Bruising	10c/kg less than price grid
Condition score	A   Zero change
	B   5c/kg less than price grid
	C   30c/kg less than price grid
	D   50c/kg less than price grid
	E   80c/kg less than price grid
MSA premium	25c/kg more than price grid

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Determine which animal is worth more on the domestic market. Show working to justify your decision.

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**QUESTION 3 (3 marks)**

Explain one positive and one negative consequence of genetic modification for a plant of your choice.

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**QUESTION 4 (4 marks)**

The table contains agronomic information for three different varieties of an agricultural crop.

Variety	Rust (disease)		Yellow leaf spot (disease)	Crown rot (disease)	Acid soils
	Stem	Leaf			
A	MS	MR	MR	MR	T
B	R	MR	MR	MR	I
C	R	MR	MR	R	T

<b>Key</b>	
<i>Disease resistance</i>	<i>Acid soil tolerance</i>
S     Susceptible	T     Tolerant
MS    Moderately susceptible	I     Intolerant
R     Resistant	
MR    Moderately resistant	

Draw a conclusion about which crop variety should be used in high rainfall areas. Justify your conclusion with three pieces of evidence.

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**QUESTION 5 (4 marks)**

Identify four differences between protein metabolism in ruminant and monogastric animals.

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**QUESTION 6 (3 marks)**

a) Identify an asexual plant propagation method. *[1 mark]*

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b) Describe the method identified in Question 6a), using an agricultural example. *[2 marks]*

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**QUESTION 7 (5 marks)**

An agricultural business owns and operates a portfolio of properties, feedlots and farms in Queensland and the Northern Territory. Each property is part of the business’s supply chain for breeding, growing and finishing cattle and growing grains and fodder crops to support cattle production.

Directors of this business are accountable for contributing to the success of the organisation. The business is listed on the Australian Securities Exchange.

Determine the ownership structure of the business. Justify your conclusion by identifying two characteristics of this ownership structure and use evidence to support your response.

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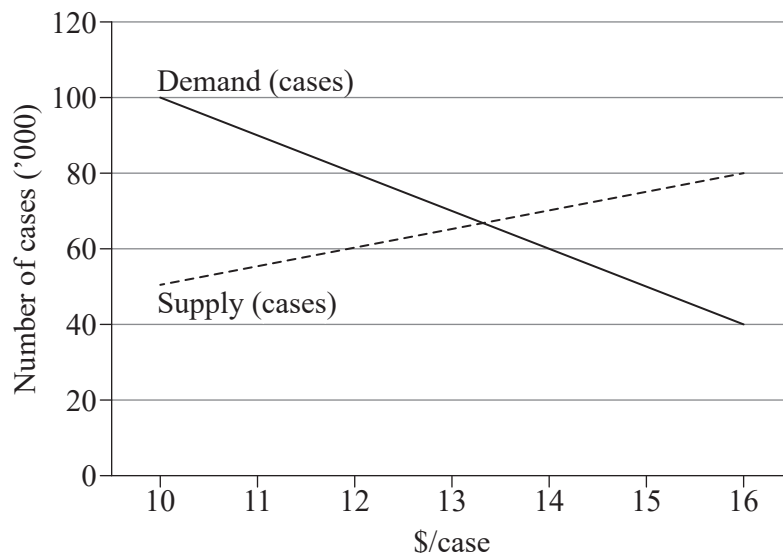
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### QUESTION 8 (3 marks)

The graph shows supply and demand for apricots at the start of the apricot season in southern Queensland.



Describe what effect a severe hailstorm in the major growing area for apricots would have on demand for the rest of this season. Show your reasoning.

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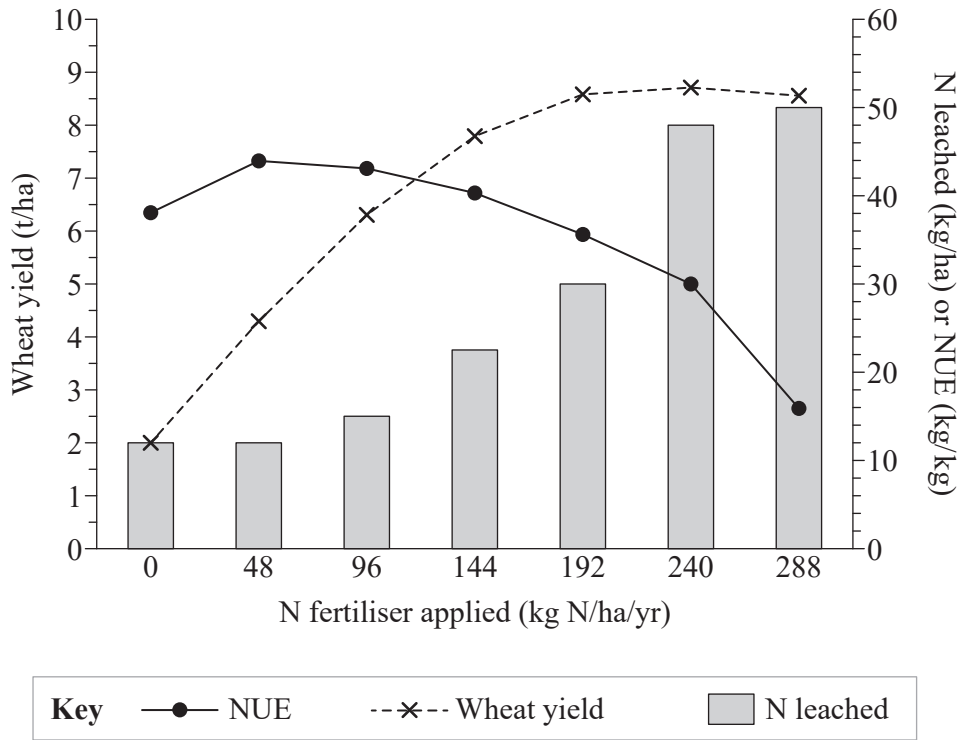
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**QUESTION 9 (6 marks)**

The graph shows the impact of nitrogen (N) fertiliser application on wheat yield, N losses due to leaching and estimated grain nitrogen use efficiency (NUE).



a) Identify the mass of N applied to achieve the highest wheat yield per hectare. [1 mark]

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b) Describe the trend between the level of N fertiliser applied and NUE. [2 marks]

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c) Draw a conclusion about the optimal level of N fertiliser for wheat production.  
Justify your conclusion using two pieces of evidence from the graph.

*[3 marks]*

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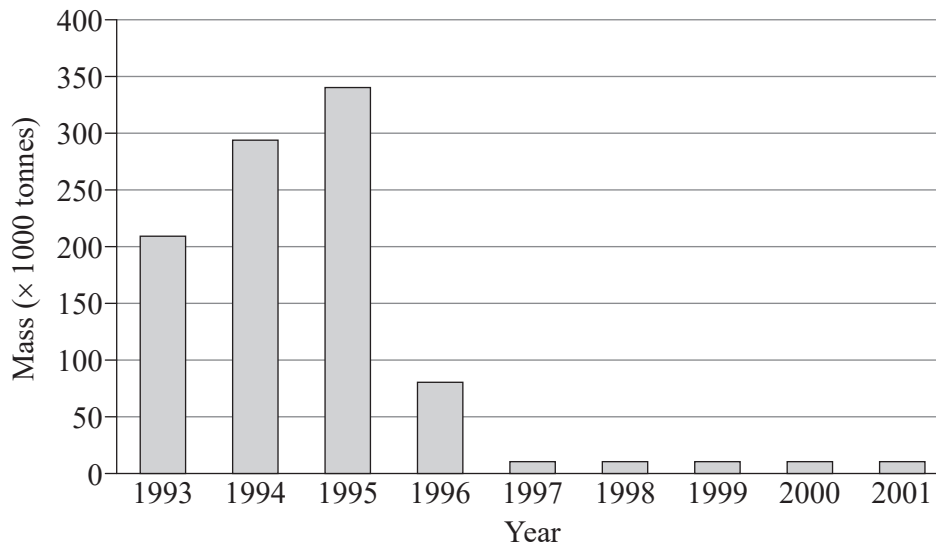
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### QUESTION 10 (4 marks)

Mad cow disease (BSE) is an exotic disease to Australia. It is spread by cattle eating animal products containing the disease and originated through cattle being supplemented with protein from meat and bonemeal. In 1996, BSE was identified as potentially passing from animals to humans in Great Britain.

The graph shows beef exports from Great Britain from 1993 to 2001.



- a) Determine how introducing BSE to Australia could affect a cattle production system. [2 marks]

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- b) Identify two strategies Australia currently uses that reduce the risk or effect of BSE being introduced. [2 marks]

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## Section 2

### Instructions

- This section has one question and is worth 18 marks.
  - Respond in 300–350 words.
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### QUESTION 11 (18 marks)

An 8000-hectare cropping/grazing property in Central Queensland runs 400 breeding cows on improved pastures (mostly buffel grass) and includes a feedlot to finish the steer offspring. It also grows irrigated crops, including cotton in summer, and wheat, barley and chickpeas as crop rotations in winter.

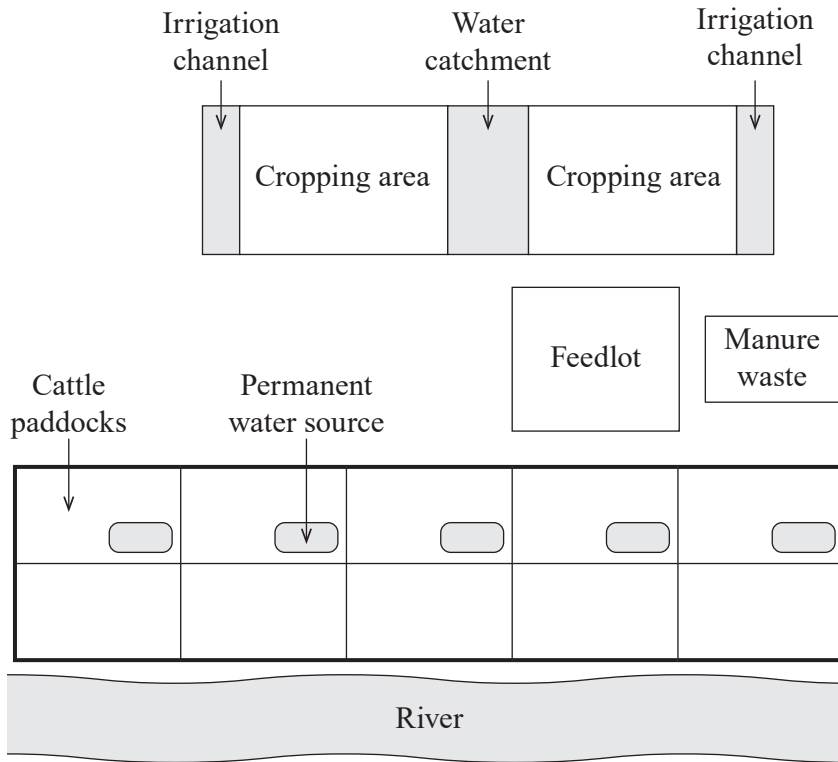
The cotton used is a variety genetically modified to make it resistant to a common herbicide and contains a gene that codes for the production of Bt toxin. The toxin causes the caterpillar pest *Helicoverpa sp* to die when it consumes the cotton leaves.

Water for irrigation comes from the Nogoia River, which runs through the property. Water is supplied to the Nogoia River from the Fairbairn Dam as per the irrigation licence for the enterprise. Water is then recycled through a catchment system and reused on property using water storage. Irrigation timing is based on visual appraisal of the crop.

The cattle are Santa Gertrudis, made up of  $\frac{5}{8}$  *Bos Taurus* and  $\frac{3}{8}$  *Bos Indicus*. The steers produced are finished on the property, with the feedlot located uphill from the river. Waste is removed from the feedlot and stockpiled nearby, and this sometimes flows into the river during heavy storms.

The cattle are grazed using a rotational grazing system with smaller paddocks. Half of the paddocks have a permanent water supply through troughs linked to a pump in the river. The paddocks that are located near the river use it as a water source for the cattle.

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Use three environmental management criteria to assess sustainable practices in the production system. For each criterion, identify three strengths or weaknesses.

Draw a justified conclusion about the environmental sustainability of the production system. Explain two management practices that would improve aspects of this enterprise's environmental sustainability.

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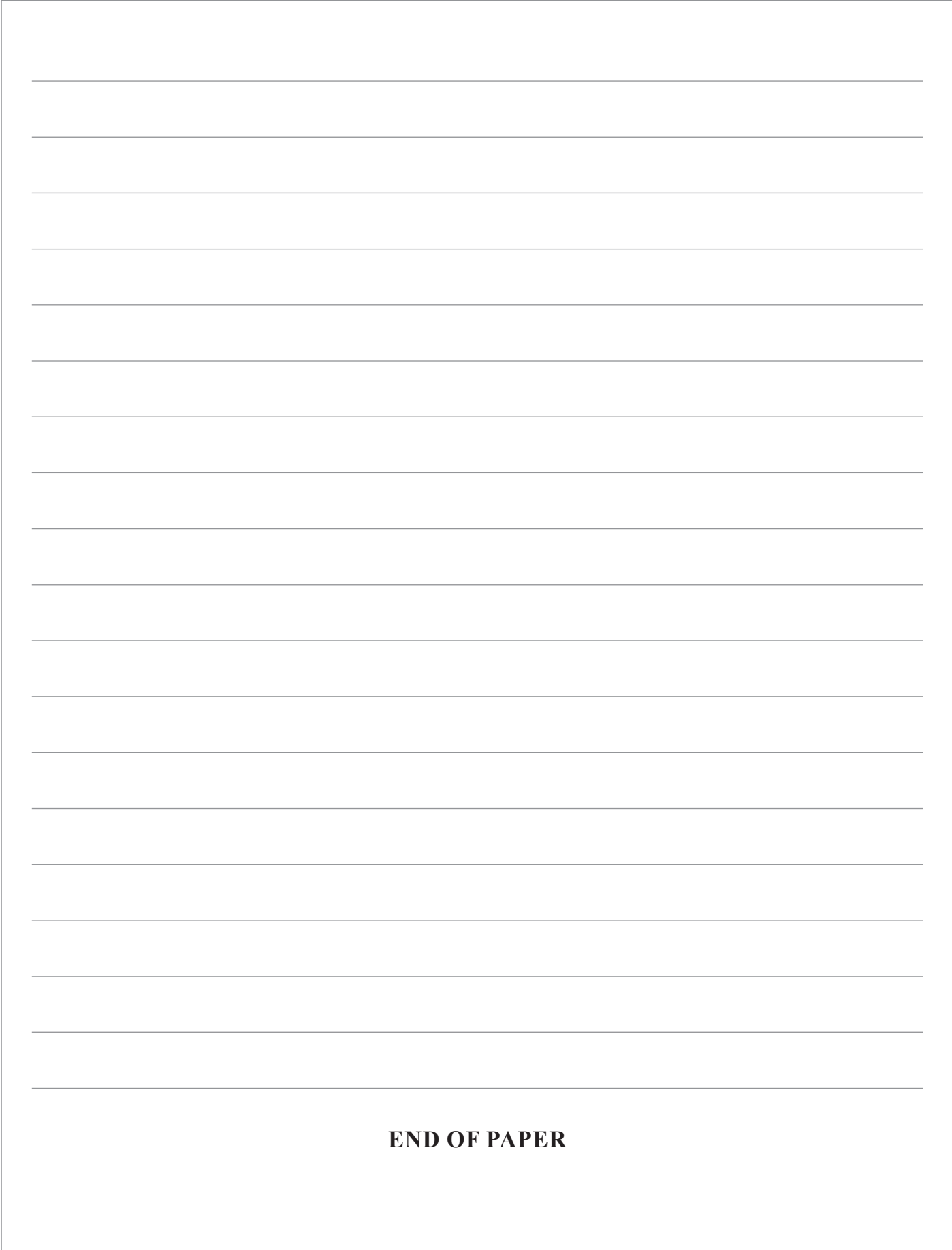


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**ADDITIONAL PAGE FOR STUDENT RESPONSES**

Write the question number you are responding to.

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## References

### Question 9

Adapted from Hawkesford, M 2014, 'Figure 2: Illustration of impact of N fertilizer application on winter wheat yield (solid line, diamonds), N-losses due to leaching (bar chart) and estimated grain NUE (dashed line, squares)' in Reducing the reliance on nitrogen fertilizer for wheat production, *Journal of Cereal Science*, vol. 59, issue 3, pp. 276–283, [www.sciencedirect.com/science/article/pii/S0733521013001859#bib27](http://www.sciencedirect.com/science/article/pii/S0733521013001859#bib27). Creative Commons Attribution 3.0 licence (CC BY 3.0)

### Question 10

Data from Figure 1: World exports of British beef and cattle, 1993–2001' in Moens, A 2006, 'Mad cow: A case study in Canadian-American relations', Fraser Institute Digital Publication, [www.researchgate.net/publication/237109689\\_Mad\\_Cow\\_A\\_Case\\_Study\\_in\\_Canadian-American\\_Relations](http://www.researchgate.net/publication/237109689_Mad_Cow_A_Case_Study_in_Canadian-American_Relations).



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