Agriculture

## Overview

Resource materials for the HSC on demand Agriculture video, analysing a research paper. Included in this resource are comprehensive questions that guide students through the breakdown of the structure and content of a scientific research paper. These questions can be used in conjunction with the video resource or using another research paper of choice. A selection of questions covering further aspects of experimental design and data analysis are also provided. Additionally, this resource includes example examination questions and a glossary of terms.

A copy of the original and annotated research papers can be downloaded from <http://agri-techeducation.com/hsc/>

## Content and activities

Answer the following questions in the space provided.

**Background information**

1. Define the term sheep predation?

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1. Outline is sheep predation a problem for the Australian sheep sector? Consider both economic and welfare concerns.

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1. Name and describe the technology that will be focused on in the research paper. Include a brief description or diagram of how the technology works using simple terms.

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**Analysing a research paper**

1. List the key parts of a research article.

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1. Recall the name of the research article and what journal it was published in.

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1. Identify the authors of the research paper and the agencies they are affiliated with.

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1. Outline the purpose of an abstract in a research paper. This question refers to the structure of a research paper.

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1. Summarise the information from the abstract of the research study being analysed. Include information such as:
   1. What is the importance of the research?
   2. How was the research conducted?
   3. What were the key results obtained?
   4. What was determined by the research at the conclusion?

The use of dot points or sub-headings for a summary is preferred.

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1. Outline the purpose of an introduction in a research paper.

This question refers to the structure of a research paper.

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1. For the research paper being analysed, describe some of the key pieces of information included in the introduction. This may include the species of plant or animal studied and why the research is needed.

**Describe**: present characteristics and features.

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1. Define the aim or objective of this research.

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1. Define the hypothesis given by the researchers. What did they expect the outcome to be based on, prior research or other evidence collected?

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1. Outline the purpose of the method section in a research paper.

This question refers to the structure of a research paper.

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1. Describe in detail, the method used to conduct this research. Include specifics such as:
   1. Amount of test samples or organisms used
   2. Number of treatment groups
   3. Materials required.

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1. Explain the difference between a control and a treatment group. Identify the control and treatment groups within the research study.

**Explain**: provide why and/or how.

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1. Define randomisation and replication. Examine the method presented in the research paper to determine how randomisation and replication (two of the basic principles of good experimental design) were incorporated.

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1. Use the information collated from the comparisons in the previous question, to distinguish the:
   1. independent variable
   2. dependent variable
   3. standardised conditions.

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1. Outline the purpose of the results section in a research paper.

This question refers to the structure of a research paper.

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1. Identify the key findings by summarising the results that were recorded from the research, include units of measurement where possible.

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1. Describe what results are presented within the results section and how the author has chosen to present the results, either graphically or in table format. Consider the most effective way of presenting the data and give reasons to justify your answer. Evaluate the authors choice of presentation.

**Evaluate**: make and overall judgement of the process or idea based on identified criteria.

This question has three parts to answer. Consider using sub-headings to break it down and clearly present your work.

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1. Outline the purpose of a discussion in a research paper.

This question refers to the structure of a research paper.

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1. Clarify the key points determined by the research paper in the discussion section.

Dot points would be beneficial in presenting this information.

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1. Explain why the hypothesis of the research was or was not supported by the data collected.

Begin with clearly identifying if the hypothesis was or was not supported.

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1. Describe the impact the authors expect this research to have on their respective fields for agriculture into the future. Include possible further studies to be conducted or different technologies to be explored that could be linked to this research.

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1. Explain why there is a need for research in the development of agricultural technologies.

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## Examination practice questions

### **2-mark questions**

Answer the following 2-mark questions in the space provided.

1. Recall the name of a research study and outline the purpose for undertaking the research.

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1. Summarise the conclusion and a recommendation made by the author/s from the research study.

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1. Outline the type of data collected by the researchers and how it was collected.

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### 6-mark questions

Answer the following 6-mark questions in the space provided.

1. Explain how the method used in the research study has contributed to the reliability of the conclusion. Use specific examples from the study to support your answer.

**Explain:** identify the underlying relationship between the given subjects and relate the why and how of the way one affects the other.

| **Tip:** when describing the methodology of the research study, include examples from the paper on design elements such as replication, randomisation, and standardisation. Link these to the reliability of results collected. |
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1. Discuss the validity of the conclusion from the research study based on its design. Use specific examples from the study to support your answer.

**Discuss:** identify issues or ideas and provide points that support or oppose them.

| **Tip:** identify important elements of experimental design that assist in achieving accurate results. Use specific examples from the research paper to make links between accurate results and valid conclusions. |
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1. Summarise the conclusion or findings of the research study analysed in class and explain how this information assists Australian agricultural production or environmental sustainability.

| **Tip:** this question has two parts that need to be addressed.   * 1. Begin with creating a detailed summary of the conclusions found from the research study. This could be done using dot points if they are comprehensive.   2. This question then asks for an explanation of how these findings assist Australian agricultural production, or environmental sustainability. Clearly link the findings from the dot points to uses or benefits in industry using examples. |
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### **12-mark question**

1. Analyse a research study of the development and/or implementation of ONE agricultural biotechnology/technology/management strategy related to climate variability.

**Analyse:** identify parts and the connection between them; draw out and relate effects.

| **Note:** depending on the elective topic you have studied in class, you will only address the appropriate biotechnology, or technology, or management strategy, not all of them. Please confirm with your classroom teacher if this is unclear.  **Tip:** this is a summary of the whole research study, similar to the questions completed with the video clip.   * 1. Identify the name of the paper and its objective.   2. Provide a summary of the methodology, results, and conclusion.   3. What was the function of the research, for example, what need was it addressing or trying to improve in industry or environmental sustainability? What impact has or could it have on the future production.   Longer answer questions do not always have to be written in essay format, it may be clearer to break it down into sub-headings or use tables to present ideas and information. |
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## Glossary

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| Term | Definition |
| Aim | Short description of the objective or purpose, it says what can be learned from the experiment. |
| Analyse (HSC verb) | Identify parts and the connection between them; draw out and the relate effects. |
| Clarify (HSC verb) | Make a statement of situation clearer or more understandable. |
| Compare (HSC verb) | Show how things are alike or different |
| Conclusion | A short paragraph that discusses the overall results of an experimental design and states if the hypothesis at the beginning of the experiment was correct or not. |
| Control treatment | The treatment group in an experiment that is not subjected to the varied treatments or represents the current practice in industry. The control is a baseline which allows for comparison. |
| Controlled variable | An experimental element that is kept constant (or changed in constant ways) across all treatment groups. |
| Define (HSC verb) | Give the meaning of a word or phrase and identify important characteristics. |
| Dependant variable | The variable that is being tested or measured and changes in response to the independent variable. |
| Describe (HSC verb) | Present characteristics and features |
| Discuss (HSC verb) | Identify issues or ideas and provide points that support or oppose them. |
| Discussion | An in-depth analysis that interprets and describes the significance of the results. It also gives an evaluation of the experimental design, including its limitations. |
| Distinguish (HSC verb) | Recognise or suggest something as being different from something else or to note differences between two or more things. |
| Examine (HSC verb) | Inspect the nature of something. |
| Experiment | A scientific procedure that results in the collection of data to make a discovery, test a hypothesis, or demonstrate a known fact. |
| Explain (HSC verb) | Identify the underlying relationship between the given subjects and relate the why and how of the way one affects the other. |
| Evaluate (HSC verb) | Make an overall judgement of the process or idea based on identified criteria. |
| Identify (HSC verb) | Recognise and name. |
| Independent variable | The variable that is changed on purpose in an experiment to see what effect it has on the variable you are trying to measure. |
| Hypothesis | A statement of the expected outcome to a scientific question. |
| Justify (HSC verb) | Support and make a case for an argument or theory. |
| Mean (x̅) | The average of the data collected. Calculated by adding together all the numbers collected and then dividing this total by the total number of individual results recorded. |
| Median | The middle value of a sorted list (ordered lowest to highest) of numbers or data collected. |
| Method | A sequence of steps, or processes of the investigation that recall what was carried out by the researcher. |
| Outlier | One or more values of data collected that are far removed in value from the others within the set. |
| Outline (HSC verb) | Present in general terms the main features of. |
| Population | The complete group of individuals of interest. Agricultural trials generally use a sample of a population as opposed to the whole group. |
| Qualitative data | Usually non-numerical data collected through methods of observation, for example colours or attitudes of focus groups. Usually includes units such as kilograms. |
| Quantitative data | Measures of values or counts and are expressed as numbers. For example, weights collected for animals. |
| Range | The difference between the largest and the smallest value recorded. |
| Randomisation | The chance of an experimental group receiving a treatment is exactly the same for all groups. The purpose of randomisation is to reduce bias. |
| Recall (HSC verb) | Present remembered ideas, facts, or experiences. |
| Replication | The practice of repeating the same treatment several times. Replication improves the validity of the experiment or trial. |
| Summarise (HSC verb) | Briefly explain the main points. |
| Sample | A group of individuals from a population selected for use in an experiment. |
| Standardisation | All treatments in the experiment are exposed to the same conditions (other than the independent variable). It helps ensure that one treatment group is not advantaged or disadvantaged by outside factors. |
| Title | A brief description of the experiment. |
| Treatment | The application of the independent variable to the experimental units or groups. |
| Validity | A concept used to evaluate the quality of research and measure of how correct the results of the experiment are. It indicates how well a method, technique, or tests measures something. |
| Variables | Any factor, trait or condition that can be changed, maintained, or measured. |