

# 2009 HSC Agriculture Paper 1

## Sample Answers

This document contains 'sample answers', or, in the case of some questions, 'answer may include'. These are developed by the examination committee for two purposes. The committee does this:

- (a) as part of the development of the examination paper to ensure the questions will effectively assess students' knowledge and skills, and
- (b) in order to provide some advice to the Supervisor of Marking about the nature and scope of the responses expected of students.

The 'sample answers' or similar advice, are not intended to be exemplary or even complete responses. They have been reproduced in their original form as part of the examination committee's 'working document'. While the handwritten notes have been typed for legibility, no further editorial change or addition has occurred.

### Section I

#### Question 1 (a)

*Answers could include:*

- harvesting
- shearing
- milking
- grading
- slaughtering

#### Question 1 (b)

*Sample answer:*

A marketing/ advertising campaign can be conducted using a well-known sports person promoting the benefits of drinking flavoured milk products. This advertising campaign was shown on television and popular print media for a 15–25 year old demographic.

**Question 1 (c)*****Sample answer:***

At times where milk supply levels may be lower on farms (eg winter time), this can cause the prices to increase due to short supply. Large quantities from overseas or interstate can also flood local markets decreasing prices for consumers.

***Answers could include:***

Quality of products where higher quality levels may demand higher prices.

**Question 2 (a) (i)*****Sample answer:***

Application rate of N fertiliser at 50kg/ha

**Question 2 (a) (ii)*****Sample answer:***

All plants need nitrogen for growth; up to a point, the more nitrogen applied the greater the dry matter yield. Grasses generally obtain nitrogen from the soil and added nitrogen fertiliser; while legumes are able to fix atmospheric nitrogen. Hence, legumes are less reliant on nitrogen fertilisers and don't respond as well as grasses to nitrogen fertiliser application.

**Question 2 (b)*****Sample answer:***

When more fertiliser is applied to soil than can be used by plant, excess fertiliser components (e.g. nitrogen and phosphorous) may move into the landscape affecting the environment. In particular, when N and P are transported to surface water bodies such as lakes, rivers and creeks, these elements provide a food source for Blue green algae leading to eutrophication of the water body, which may result in decreased oxygen, and loss of wildlife.

**Question 3 (a)*****Sample answer:***

Control application rate 0 litres/ha

**Question 3 (b)*****Sample answer:***

To demonstrate the grain yield of chickpeas without the application of fungicide used compared to yield achievable with various application rates of fungicides.

**Question 3 (c)*****Sample answer:***

Difference between 0.5 and 1.0 L/ha  
\$35-\$20  
=\$15 for 0.5 L  
\$15x2=\$30/L chlorothalnil

**Question 3 (d)*****Sample answer:***

Some varieties of chickpeas have a natural resistance to *Ascochyta* fungus and hence a farmer may choose to plant a resistant variety rather than apply a fungicide.

A farmer may also consider a particular fungicide over another type due to a reduced withholding period and lesser effect on the environment and non-target species. The farmer is able to source this information from a chemical label and material safety data sheet (MSDS).

***Answers could include:***

- Withholding period of chemicals
- Varieties used
- Price of chickpeas
- Information on MSDS
- Effect on non-target species
- Effect on environment
- Skills and technology of farmer
- Climatic conditions prevalent
- Selling into organic market
- Specification of contacts for export/domestic sale

## Section II

### Question 4 (a) (i)

*Sample answer:*

Wheat: April to September inclusive

### Question 4 (a) (ii)

*Sample answer:*

Germination of millet in October through March will allow for greater than 80% germination. Millet will grow better when sown and germinate in Oct/ Nov as the crop will have a longer period of time with higher temperatures, greater photosynthesis and higher growth therefore maximising crop production potential.

### Question 4 (b)

*Sample answer:*

New varieties of wheat can be generated by using traditional cross breeding methods. Plants are crossed by transferring the pollen of one parent to the other variety. Seed is harvested from this plant, grown out and backcrossed to one of the parents to fix the trait. This can be used to improve protein quality in wheat. However, this trait can be associated with a decrease in yield or production.

### Question 4 (c)

*Sample answer:*

Animal Nutrition

Introduced pastures can provide a highly nutritious, digestible green feed for livestock. Species such as ryegrass and clover also allow for a balance between high energy and protein requirements.

Input Requirements

These introduced species often have a greater requirement for inputs such as fertiliser and water. This effects where some pasture species can be grown successfully. Lucerne has a high demand for water to grow productively.

**Question 5 (a) (i)*****Sample answer:***

As live weight of ewe increases from 35kg to 55kg, the percentage of lambing increases from 80-95%. After that point the heavier the ewe is at lambing, the lower the lambing percentage.

**Question 5 (a) (ii)*****Sample answer:***

A farmer can supply supplementary feed to 35kg ewes in the later part of pregnancy to increase the lambing percentage of his flock. This is to increase the birth weight of lambs from these ewes and to allow these ewes to improve milk production and hence, lamb survival.

(Answer could also include managing ewes at the top end of weight range).

**Question 5 (b)*****Sample answer:***

Pen X has more steers in the pen and the steers could be more stressed due to the overcrowding. This overcrowding could lead to some steers being bullied at the feed trough and hence eat less and their growth rate is reduced.

Pen Y has shade included that allows steers to feed and go back into the shade in hot weather to digest their feed. This allows them to convert their feed to growth rather than expending energy keeping cool, hence higher growth rate in Pen B.

**Question 5 (c)*****Sample answer:***

Hormones are chemicals that are carried in the bloodstream and cause specific actions on certain cells and tissues in an animal's body. There are a number of hormones that effect animal reproduction, including testosterone, oestrogen, progesterone, oxytocin and prolactin. Without the normal operation of these hormones, reproduction of the species would not be possible. Testosterone, for example, is essential for sperm production in males and causes the development of the male sex glands, the testes and other secondary sexual characteristics. Male animals also behave more aggressively than females due to the presence of testosterone, also impacted on by greater muscle development and larger size.

Oestrogen and progesterone levels vary during a female's oestrus cycle causing ovulation (release of egg) to allow for later fertilisation by the male sperm. The balances of these hormones also cause build-ups in the uterine lining. High levels of oestrogen at ovulation also causes behavioural effects in females that include a willingness to 'stand' for the male at mating and also cause females to mount or be mounted by other females in the herd. Female hormones also allow for development of greater fat muscle than males and females tend to be smaller than males of the same breed.

## Section III

### Question 6 (a)

*Sample answer:*

The family farm was the traditional form of farm ownership, which has operated for over 200 years. This has now changed dramatically where this form of farm ownership on smallholdings is proving uneconomical. This has led to the emergence of corporate farms and co-operatives. These larger commercial entities have better economies of scale through labour and capital sharing. As collectives, they can have improved buying power for farm inputs and can also improve their return on production through bulking, warehousing and forward selling options.

### Question 6 (b)

*Answers could include:*

Strategies that have issues associated with each could include:

- Insurance
- Diversification
- Forward selling/contracts/futures
- Hedging
- Off farm income
- Savings

Inputs and costs:

- Seed, fertiliser
- Fuel
- Insurance
- Labour
- Rental/ rates
- Interest rates

Income can be affected by:

- Weather
- Land use patterns
- Market demands
- Statutory constraints
- Levies/ protectionism
- Politics

**Question 7 (a)*****Sample answer:***

In Australia, the clearing of deep-rooted vegetation, the cultivation of soil and the production of shallow-rooted pastures and crops have led to greater percolation of water through the soil. In turn, this has led to the rising of water tables in some locations, causing salt-enriched water to move into the rooting zone of plants. Because there are fewer deep-rooting plant species remaining, there is less opportunity for subsoil water to be pumped out via transpiration and therefore less opportunity for the saline water table depth to fall.

***Answers could include:***

- Increased irrigation
- Restorative land use practices to reduce salinity

**Question 7 (b)*****Answers could include:***

- Environmental awareness
- Financial status of the farmer
- Government policy/ regulations
- Condition of the land
- Availability of resources (e.g. water)
- Succession planning/ family enterprise

**Question 8 (a)*****Sample answer:***

Through the reaction between chlorophyll and light, simple sugars such as glucose are made in the leaves/ stems of green plants. This energy is used to allow cells to grow and divide (mitosis) in the growing parts of plants (apex, growing buds) during the process of respiration.

**Question 8 (b)*****Sample answer/Answers could include:***

- Timing savings
- Use of diverse plants
- Row spacing variations
- Managing weed diversities
- Herbicide selection
- Timing of herbicide applications
- Sowing rate variations
- Companion planting

**Question 9 (a)*****Sample answer:***

Animals require water, vitamins, minerals, carbohydrates, proteins and fats/lipids. Carbohydrates (sugars and starches) are essential for the provision of energy. Proteins are important for growth of tissue and a number of enzymes/hormones etc. Steers require high levels of energy and protein when young and growing fast, in addition to other requirements mentioned. Energy and protein levels are then changed when steers are being finished for the market, with lower protein levels in feeds being substituted by higher proportions of energy.

**Question 9 (b)*****Answers could include:***

- Animal welfare organizations eg (PETA) on producers/consumers/markets
- Mulesing debates by the general public and/or by farmer groups
- Industry based codes of practice/materials/advertisements
- Government legislation materials in place for industries
- CSIRO new techniques/technologies that encourage newer markets
- RSPCA guidelines/campaigns that may affect productivity/markets
- Mass media campaigns/advertisements



# 2009 HSC Agriculture Paper 2

## Sample Answers

This document contains 'sample answers', or, in the case of some questions, 'answer may include'. These are developed by the examination committee for two purposes. The committee does this:

- (a) as part of the development of the examination paper to ensure the questions will effectively assess students' knowledge and skills, and
- (b) in order to provide some advice to the Supervisor of Marking about the nature and scope of the responses expected of students.

The 'sample answers' or similar advice, are not intended to be exemplary or even complete responses. They have been reproduced in their original form as part of the examination committee's 'working document'. While the handwritten notes have been typed for legibility, no further editorial change or addition has occurred.

### Question 1 (a)

#### *Sample answer:*

A study was conducted to determine the impact of building an orange juice factory in a small country town.

A survey was developed containing 100 questions that were given to 3 focus groups:

- farmers
- local business
- community groups

The recipients of the survey were determined randomly from an agribusiness data base. The results were collated, recorded and analysed.

**Question 1 (b)**

*Answers could include:*

Advisory Service		
NSW Department of Primary Industries	<ul style="list-style-type: none"> <li>– low cost (free)</li> <li>– independent advice (public good)</li> <li>– backed by a specialist research base</li> </ul>	<ul style="list-style-type: none"> <li>– may be difficult to access</li> <li>– unable to choose certain people</li> <li>– limitation of individual property visits at critical times</li> </ul>
Private Agriculture Consultant	<ul style="list-style-type: none"> <li>– ability to choose</li> <li>– available under contract (can visit on demand)</li> <li>– may have very specific and/or local knowledge</li> </ul>	<ul style="list-style-type: none"> <li>– fees to be paid by farmer</li> <li>– may not have direct access to broad research</li> <li>– may have affiliations with certain commercial bodies</li> </ul>

**Question 1 (c)**

*Sample answer/Answers could include:*

- Import duties on commodities
- Market requirements for quality/continuity of supply/quotas
- Biosecurity and quarantine requirements
- Competing products in the target market
- Protectionist policies (subsidies)
- Seasonality of the target international markets
- Language, religious and other cultural requirements

Criteria for evaluation may include:

- Profitability of the business
- Ease of market compliance
- Cost associated with market compliance
- Currencies/exchange rates
- Capital or knowledge that may be required to meet requirements
- Political impacts or stability in various international markets

**Question 2 (a)*****Sample answer:***

A study was undertaken on a new type of progesterone sponge to be used in sheep AI programs.

The researcher collected data related to ewes in the experiment each being tagged with a specific number to assist with ensuring each ewes details were correlated with lamb data. Data collected included lambing date, number of lambs born, lamb weights, weaning weights and weaning and lambing percentages. This data allows for various measures of reproductive effectiveness to be analysed according to particular industry requirements or conventions that may be used to assess the effectiveness of that type of progesterone sponge.

**Question 2 (b)*****Sample answer/Answers could include:***

A vaccine (that may be live/attenuated or dead) is administered to an animal. This vaccine that mimics a disease-causing agent, stimulates the animals immune system to produce antibodies for that specific disease. This then provides a level of immunity against that disease should the animal acquire the actual disease agent in the future, therefore disease symptoms will not eventuate. This immunity may be short term in many cases and require annual boosters to raise the long term level of the immunity.

**Question 2 (c)*****Answers could include:***

- Breedplan/Lambplan/Woolplan
- Embryo transfer
- Genestar technology
- Use of synthetic reproductive hormones

Criteria for evaluation may include:

- Profitability/costs
- Fertility levels
- Weaning percentages
- Levels of experience/technological equipment/knowledge required
- Animal welfare issues and any associated market implications

**Question 3 (a)*****Sample answer:***

A study was conducted to compare irrigated and non-irrigated orange production. The data obtained included the yields of trees, the amount of water entering the soil in each system and the water lost through drainage under each system. The results were entered onto a computer spreadsheet, analysed statistically and then presented as tabulated data with associated column graphs comparing yield, water addition and drainage loss under both treatments. These graphs included standard error bars to indicate the error associated with the means that were plotted.

**Question 3 (b)*****Sample answer/Answers could include:***

Tulips originated in cold climates and therefore propagation of tulips in horticulture requires a cold treatment (refrigerate bulbs) to be provided to overcome dormancy. Grapevines regenerate from buds after pruning, therefore plant form and function is able to be manipulated through strategic pruning to control fruit set and positioning on the trellis.

**Question 3 (c)*****Sample answer/Answers could include:***

Traditionally, large table tomatoes were sold and marketed simply as ‘Tomatoes’. Consumer demands have led to a change and expansion in the types of tomatoes that are produced and marketed. Examples of these include field grown tomatoes, truss tomatoes and hydroponically produced tomatoes. All of these products now occupy the large table tomato market. Therefore, by adapting to market change growers can capture greater market share through diversity and ensure profits are maintained or increased. This, however, requires some changes to existing production techniques to be made, for example installing hydroponic systems rather than growing in soil media or the installation of trusses to support growing tomato plants and ensuring that parts of the stem are included when tomatoes are packed for sale.

***Answers could include:***

- Organic farming markets
- Extended varieties of wine grapes for different wine styles

**Question 4 (a)*****Sample answer:***

A researcher conducted a study of the merit of developing and implementing a controlled traffic technology for potato production. The study analysed the cost of guidance equipment for machinery and compared the soil condition and potato yields of the fields where the technology had been used for 5 years and where it had not been used. Findings of the study included the expenses of implementing the controlled traffic technology and differences in soil condition and potato yield. The final findings related the profitability of implementing this technology and included that it was more profitable for a particular soil type that was studied and also that further trials were recommended in other soil conditions.

**Question 4 (b)*****Sample answer:***

Two marketing techniques that can be used for an agricultural innovation are:

- 1: *Field day exhibit*: The advantage of this method is that it may allow for a practical demonstration of the innovation. It also may allow direct interaction between provider and the client. However it needs to be remembered that it may not attract the entire potential market for the innovation unless it is carefully targeted.
- 2: *Print media*: This may allow for a variety of materials to be produced (eg, brochures/advertorials/editorials or product reviews) and has the potential to reach a diverse range of potential clients. However, this may not allow for demonstrations and would require careful planning to ensure all potential clients are targeted through one form or another.

**Question 4 (c)*****Answers could include:***

- Certain government standards/regulations/registrations/compliance
- Environmental regulations
- Consumer labeling
- Animal welfare requirements and legislation
- Warranty compliance
- Industry codes of ethics/codes of practice

(all will depend upon the type of alternative system, enterprise or technology)

Criteria for evaluation may include:

- Profitability/costs associated in meeting requirements
- Levels of experience/technological equipment/knowledge required
- Feasibility/possibility/reality of being able to introduce the new system
- Necessity, ie, compulsory to meet requirements

**Question 5 (a)*****Sample answer:***

A study examined whether a new variety of wheat with greater drought hardiness performed better in a semi-arid area than other wheat varieties. Replicated plots of new variety and three other wheat varieties were grown in a semi-arid area and yield of all plots recorded. Average grain yield data was calculated for each variety and these averages were statistically compared to determine significant differences between varieties. The statistical technique that was used in this analysis was a one-way analysis of variance (ANOVA) to compare the means and variances involved with each treatment.

**Question 5 (b)*****Sample answer/Answers could include:***

Water in the soil that contains soluble plant nutrients move into the plant across the root cell wall via diffusion. Root hairs are the most active points of nutrient uptake. Water absorbed by the root creates a water deficit near the root, so more water moves to the root carrying nutrients with it. Differences in concentration of nutrient ions, inside and outside the root cause nutrients to move into the root from the soil solution. This movement via diffusion continues across plant membranes to move nutrients into and around the plant.

**Question 5 (c)*****Answers could include:***

- Cultivation Vs zero tillage
- Increased fallow length
- Sub drainage systems
- Sowing date/plant density adjustments
- Irrigation technologies
- Soil additives
- Match fertiliser needs to potential yields
- Canopy architecture

Criteria for evaluation may include:

- Profitability/costs associated in introducing techniques
- Levels of experiences/technological equipment/knowledge required
- Feasibility/possibility/reality of being able to introduce the new technique
- Water use efficiency budgets as measured by probes/neutron probes

**Question 6 (a)*****Sample answer:***

A study considered the water use efficiency of drip irrigation of broadacre cotton production. Equipment used in this study included the drip tapes, buried just beneath the soil surface to deliver water to the plant root, and capacitance probes, used to monitor soil water content in the plant root zone. When the capacitance probes measured a critical low water content in the plant root zone, the drip tape lines would be turned on to allow further irrigation. These lines would be shut off when the capacitance probes measured a critical upper water content in the plant root zone.

**Question 6 (b)*****Sample answer:***

*Over-allocation of irrigation water:* Poor planning in water budgeting by government agencies led to over-allocations of water to irrigators. This led to irrigators investing heavily in capital equipment and infrastructure and also increased the number of irrigated farms in catchments. When water became more limiting, and was re-valued, irrigators found themselves with reduced water allocations leading to lower profitability.

*Allocation of water to environmental flows:* Political/environmental awareness in recent times has resulted in reduced water allocations for irrigation purposes with the balance being directed to environmental flows. While this has led to environmental restoration in some areas it has also led to a decline in the profitability of many irrigated farming systems, where other alternatives are not implemented.

***Answers could include:***

- State Vs federal water management and policy
- Urban Vs agricultural Vs mining water demands
- Groundwater issues

**Question 6 (c)*****Answers could include:***

- Networking meteorological stations
- Aerial photography and satellite imagery
- River flow data
- Nutrient analysis
- Tree planting
- Soil mapping
- Whole farm/catchment plans
- Soil landscaping
- Land use capability
- Water quality assessments

Criteria for evaluation may include:

- Profitability/costs associated in introducing strategies
- Access to funding
- Cooperation levels across catchments
- Levels of experience/technological equipment/knowledge required
- Levels of improvement in water quality
- Levels of participation in the program