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1998 Higher School Certificate Examination Report

Agriculture

The total number of candidates presenting for Agriculture in 1998 was 1798, of whom 1485 presented for 2/3 Unit (Common) and 313 for 3 Unit.

2/3 Unit (Common)

Section I

Question 1

(a) No marks were awarded for naming a farm product. Most candidates were able to name a farm product, for example, wool, wheat, live cattle, prime lambs etc.

(i) The majority of candidates were able to identify two specific steps in the marketing chain of the product, for example slaughtering and boning out, or crushing grapes and fermentation of grape juice. This question was generally well answered; some students however, described the step rather than naming it.

Only one mark was awarded if candidates repeated a step in the chain, saying, for example, 'removing the skin and removing the intestines.'

The poorer candidates failed to link the end product with the steps in the marketing chain.

(ii) Most candidates correctly emphasised how the step affects the product at an end point of the chain, saying, for example, 'rough handling in transport could result in bruising' or 'refrigeration reduces spoilage and keeps the product fresh.'

(iii) To achieve maximum marks students had to relate feedback to 'farmer decision-making' saying, for example, 'feedback helps them make their product meet product specifications and achieve top prices. For example, kill sheets showing fat, carcass weight, and eye muscle area can be used to select sires, formulate feed rations and determine when to sell.' Many students failed to achieve maximum marks by responding with vague answers that, in many cases, were simply a rewrite of the question.

Some responses assumed a knowledge of what was meant by 'feedback'. Such responses achieved maximum marks when specific decisions were outlined, saying, for example, 'buy genetically superior rams to lower the fat content of prime lambs produced.'

(b) (i) Most students recognised an excess of supply (over demand) therefore the problem could be: excess supply, demand too low, low prices, reduced farm income or some of the product not sold.

(ii) Most students were able to outline two different strategies, saying, for example, on farm storage 'to reduce the supply onto the market and hold the product in the hope (or prediction) that prices will improve through increase in demand or reduction of supply' or 'add value to make the product more saleable - could create a niche market through value-adding. This may increase demand for the product or make the low product price more profitable.'

Poorer responses either showed no understanding of the problem or did not adequately outline a strategy, saying, for example, 'produce less.'

(iii) Full marks were awarded to students who were able to name a specific government or agribusiness agency such as Elders, Woolworth's, NSW Agriculture, ALMC and relate what they 'might' do to help overcome the problem in Figure 2, provided that it is within the organisation's current or historical charter or role. Some students named a specific agency/organisation but offered an unrealistic role or action, saying, for example NSW Agriculture (Department) could ban imports of the product. These responses received lower marks. Candidates who merely stated a generic organisation such as the government or stock and station agents without stating the action that might be taken to overcome the problem, failed to attract a mark.

Question 2

(a) The standard of answers for the graph question varied greatly. Full marks were awarded to candidates who used an appropriate scale, included properly labelled axes for farm numbers, average farm size and years (as the independent variable), a key that showed a clear difference in the trends for farm numbers and average farm size and an accurate plot of the data onto a bar graph. A full range of errors was evident in the answers, viz.:

- line graph rather than bar graph
- not starting axes at zero
- scales out of proportion
- graphing farm numbers against farm size
- poor labelling or no key.

It should be noted that all candidates should be able to present a graph that can be easily interpreted and read at a glance.

(b) The majority of candidates correctly identified the trends as being: 'declining number of farms', and 'increasing farm size'. Lower scoring candidates identified one trend only, or stated this trend as being decrease in farm ownership. These candidates also tried to explain these trends rather than simply describing them.

(c) The better candidates described the impact of technology on decreasing numbers of farms and increasing farm-size, using specific examples, for example:

'Bigger tractors/headers means more land can be efficiently farmed, with a smaller labour force.'

OR

'Use of computers for record-keeping, resulting in more efficient/better management of larger areas by fewer people.'

Poorer scoring candidates merely restated the trends stated in (b) and added that technology was important.

(d) Most candidates could identify factors (or causes) of the trends in the data, for example: increasing scale of production, increasing production costs, decreasing product prices, better off-farm opportunities, increasing farming corporations, land degradation.

Lower scoring candidates listed one word answers which did not show understanding of what might have contributed to these trends, stating for example, demand, costs, economics.

(e) Maximum marks were awarded to those who clearly identified social implications of these trends (as opposed to financial or technical effects) for people or groups outside the farm ie, in small country towns or provincial cities. The best answers showed a 'flow–on effect', for example: 'declining farm numbers have led to the demise of small rural towns whose traditional role was as service centres to farmers.'

Lower scoring candidates identified only one social implication linked to declining farm numbers or simply listed changes to the rural social environment without identifying any linkage.

Question 3

(a) The majority of candidates could calculate the mean yield for the sulfur treatment as 6.0 g/pot. Candidates were not expected to indicate units of measurement in their responses.

(b) Most candidates were able to recognise the contents of the control pot in the experiment as being soil from the paddock only. The higher scoring responses were also able to state that the 'control' pots had no added sulfur or potassium.

(c) Most candidates correctly identified sulfur as the nutrient most limiting to growth.

(d) The higher scoring candidates correctly identified a 'combination of potassium and sulfur' as the additional treatment.

(e) The majority of responses gave a generalised list of further experimental work that could be undertaken: saying, for example, increasing replication and/or randomisation, experimenting with fertiliser rates, soil types, climate, economic considerations and time factors.

The higher scoring candidates identified the need to conduct trials in the field (outside the glasshouse) before making field recommendations about fertiliser rates. They were also able to describe the biometric procedures in more detail, saying, for example, 'calculate SD, SE and coefficient of variance as the mean on its own gives a limited picture of differences.' Candidates needed to mention field trials along with a discussion of another two factors to gain full marks.

Section II

Question 4

90% of candidates attempted this question.

(a) (i) The majority were able to calculate the feed conversion ratio as 14.5.

(ii) Most candidates were able to specify Group B as being most likely to be monogastric on the basis of a lower average food conversion ratio.

(iii) The better scoring candidates were able to state that Group A had a high FCR due to energy losses in the ruminant digestive process including: loss of methane, CO2 and heat from microbial fermentation, degradation of high quality protein into microbial protein and the generally low quality feed consumed by ruminants.

Lower scoring responses merely stated that the animals in Group A were ruminant because of their high FCR.

(iv) The better scoring candidates were able to describe a practice used by producers to aid ruminant digestion, such as feeding by-pass protein that is not broken down in the rumen, lime to neutralise acidity, feeding roughage to stimulate rumination, a change of diet by controlling the grain/roughage ration. Low scoring responses involved merely naming a practice.

(b) (i) The majority of candidates stated that the market price was low at A and C and highest at B. The higher scoring candidates were able to state that market price rose as the optimum fat depth was reached, then fell as it was exceeded.

(ii) The majority of candidates were able to state that the price drop occurred because of consumer preference, while the higher scoring candidates related this to health consciousness in the community.

(iii) Higher scoring candidates were able to state a factor such as cash flow problems or drought forecast or overstocking or targeting markets that have different fat cover requirements.

(iv) No mark was awarded for naming an animal production system.

(c) (i) Poor responses involved naming one characteristic such as percentage of butterfat, marbling, carcass weight or diameter of wool in microns. The complete answer needed candidates to explain how a change in this characteristic affected price received.

(ii) Many candidates suggested that breeding the ‘best’ animals improved quality. The better answers explained how progeny testing, culling or selection accounted for ABV’s improved quality.

(iii) The majority of candidates named a management practice such as AI, accurate heat detection, synchronisation of oestrous, then described how it affected reproductive efficiency. The better responses described the management practice in more detail.

(iv) The majority of candidates were able to name a pest, detail its action and relate this to a drop in productivity, stating, for example, ‘cattle ticks suck blood from the animal leaving it anaemic, the associated stress lowers productive efficiency.’

Question 5

90% of candidates attempted this question.

(a) (i) The majority of candidates successfully identified 25˚ C as the optimum temperature for the table.

(ii) Most candidates were able to state in very general terms why seedlings take longer to germinate at lower temperatures. Higher scoring responses stated that optimum temperature and moisture conditions cause the release of hormones and enzymes in the seed and this promotes germination.

(iii) Many candidates showed a limited understanding of how a specific management technique reduces the effect of low temperatures. The best responses stated a management technique such as germinating seeds in a glass/hot house with a controlled temperature or using the greenhouse effect followed by planting out. Lower scoring responses simply stated or named a management technique, stating, for example, 'mulching, planting in warmer months.'

(b) (i) This part of the question was well answered. The majority of candidates obtained maximum marks by stating environmental factors such as precipitation, soil type, sunlight and topography that affect plant growth and development.

(ii) Many candidates showed a limited understanding of the impact of the named environmental factor on each of the three stages of the final plant product, as illustrated in the diagram.

The majority simply listed some effects of the environmental factor, but were unsuccessful in linking them to the plant life cycle stages or the final plant product. More detailed responses clearly identified the stages of the plant life cycle and showed how the environmental factor affected each stage and, hence, the final plant product. For example, sunlight is essential for plant growth. It provides warmth (energy) to trigger the germination stage. It is necessary for the plant to photosynthesise and manufacture sugars, starches and cellulose for tissues in the vegetative stage. These products of photosynthesis are pumped into flowers and fruits in the reproductive stage.

(c) (i) 1. The majority of candidates obtained marks for stating that nitrogen increases plant growth but did not demonstrate the actual benefits of nitrogen to pasture, for example, increasing photosynthesis and thereby protein level or yield. A few incorrect responses confused the use of artificial nitrogenous fertilisers with a direct benefit to rhizobia bacteria.

2. Poor candidates did not clearly establish a link between the application of artificial nitrogenous fertiliser and the benefit to grazing animals. The better candidates clearly established these relationships by stating 'pasture protein level should increase in response, thereby benefiting the growth and development of the animal'.

(ii) The possible negative effects of the nutrients in fertilisers in the context of this question were understood by most candidates. Lower scoring responses simply listed an effect, stating for example, algal blooms, whereas the higher scoring responses clearly described how waterways and the wider ecosystem are affected, stating, for

example, 'excessive nutrients in run-off lead to: eutrophication, blue green algae and toxicity in fauna.'

(iii) The majority of candidates could state or name a strategy a farmer could use to help prevent the nutrients in fertilisers from being transferred to the wider ecosystem, for example, contour banks. Higher scoring responses described the role of the named strategy and how it prevents transfer of nutrients, stating for example, 'contour banks reduce water speed and increase infiltration, preventing the nutrients from reaching the waterways.'

(iv) The role of micro-organisms in providing nitrogen for pasture was poorly understood by the majority of candidates who simply stated 'microbes are involved in mineralisation'. Higher scoring candidates showed a good understanding of the role of microbes in the nitrogen cycle, stating, for example, 'Rhizobia in the nitrogen cycle' – referring to ammonification, mineralisation and how they assist pastures.

(v) The majority of candidates obtained marks for naming two valid management techniques for reducing pasture losses due to trampling by animals, for example, cell grazing, paddock rotation, strip grazing. The better candidates also described how each of these techniques reduces losses due to trampling, for example, cell grazing, rapid turn around, rapid recovery for pastures, minimising of trampling.

Question 6

89 % of candidates attempted this question.

(a) (i) 1. The higher scoring responses linked time of grazing to oat yield by stating: Oat yield is greatest when no late grazing occur; early grazing yields more than late grazing.

Poorer responses listed yields only.

2. The better responses again linked time of grazing to sheep live weight gain by stating, for example: 'Sheep live weight gain is greatest when oats are grazed late in the vegetative stage. Early grazing leads to a lower sheep live weight gain.' Poorer responses listed gains in kg/month only.

(ii) Highest scoring candidates mentioned four distinct points on which to base a financial analysis including: the price the farmer expected to receive for the oats and sheep and the costs involved in producing the oats and the sheep. Poorer scoring candidates mentioned only one factor, usually the selling price.

(iii) The better candidates named a gross margin analysis which allowed a comparison of the enterprises on a $/ha basis. Poorer candidates simply stated a gross margin or a partial budget analysis.

(b) (i) Most candidates were able to state that the greatest genetic gain is achieved when the percentage of bulls selected for breeding is less than 10%. Few candidates were able to outline an implication for farmers of such a relationship. The better candidates stated: 'Farmers who wished to see rapid improvements in production characteristics in their herds would have to cull bulls heavily and use only superior sires.'

(ii) Maximum marks were awarded to candidates who listed and explained two changes in management, stating, for example:

'Beef:

1. Improved level of nutrition to maximise marbling for the Japanese trade.
2. Drenching at strategic times to ensure parasite levels are not minimising the animal's potential growth rate.'

Average marks were awarded to those who listed and explained one change or simply listed three or more changes. Low marks were awarded to students who merely listed two changes.

(c) (i) The majority of candidates were able to list three different reasons for mulching the garden, including:

– weed control,

– water conservation,

– improved soil structure,

– improved fertility.

(ii) The more capable candidates explained that legumes decompose at a faster rate because they have a lower C:N ratio (and less lignin) which makes them more susceptible to microbial breakdown. Poorer scoring responses merely mentioned that legumes have higher nitrogen levels, but did not link this to breakdown by microbial fertility.

(iii) Most candidates were able to state that decomposition causes an improved soil nutrient status and greater microbial activity. Average students simply listed two effects.

(iv) The majority of candidates were able to state that as a result of mulching, earthworm numbers would increase due to favourable environmental conditions and a constant food supply. Poorer responses merely mentioned that there would be an increase in earthworm numbers without stating any reasons.

(v) Most candidates were able to list and describe a physical property, for example, improved drainage, due to worm tunnels, and a chemical property, for example, greater level of soil nutrients due to worm casts. The average candidate simply listed a physical and a chemical property. The poorer candidate listed only one property – either physical or chemical.

Question 7

90% of candidates attempted this question.

(a) (i) Higher marks were awarded to those who gave clear and appropriate headings to their table, including date, mean number of predators and mean number of insects. Poor scoring candidates simply transferred the data from the diary to the table without any calculation of mean.

(ii) Many candidates were unable to describe a reason for the trends.

The better candidates stated, for example: 'Insect numbers grew in the week 2 February – 9 February, while predators remained stable. Over the following week predator numbers grew rapidly and caused a significant decline in the number of insects.'

(iii) The better candidates stated, for example: 'This information could identify possible natural biological control agents for insect pests. Further testing would be required before the predator was released widely.'

(b) (i) Most candidates identified the benefits of a crop rotation strategy.

Descriptions of benefits included nitrogen fixation and disease breaks. The better candidates included detailed examples and descriptions of a crop rotation, such as oats and lucerne.

Poorer responses confused paddock fallowing with crop rotation.

(ii) 1. The majority of responses clearly listed three soil quality characteristics, such as: soil fertility, water holding capacity, soil pH, soil structure and texture. Lower scoring responses simply offered three aspects of the same characteristic, for example, clay, sand, silt.

2. Most candidates responded with an adverse management practice and a consequence of this practice, stating, for example: 'Over-ploughing causes soil structural decline and therefore reduces soil quality.' Poorer responses offered a description of a soil improvement strategy only.

(iii) 1. Full marks were awarded to responses which stated, for example, 'When soil quality is high, the need for chemical input is low. This leads to less residue from chemicals in the food'.

Low scoring responses stated simply: 'Residue on food is not good, or good soil quality reduces the need for chemical input,' but did not explain why this is sustainable.

2. High scoring responses stated: 'Good soil quality reduces the need for chemical input leading to less run off into waterways or impacting adversely on the ecosystem.'

(iv) Maximum marks were awarded to responses describing four parts of an IPM program, including, for example, physical, biological, chemical and management strategies. Fewer marks were awarded for fewer components to the IPM or to candidates elaborating on one management strategy only.

(v) Higher scoring candidates described consequences of good management. For example, the following is a typical answer:

'In a wheat production system resistance to disease such as rust can be achieved by the selection of wheat varieties suited to the region.'

Others described the early detection of a problem and timing of application of chemicals as roles of skilled management. The highest scoring responses included three aspects of IPM management.

Section III

Question 8: Plant Production

10% of candidates attempted this question to which there was a wide range of responses, including some excellent responses but many very poor answers. A significant number of candidates offered no responses at all to many questions.

(a) (i) This question was generally well answered; vague answers such as 'stimulate growth' were, however, not acceptable.

(ii) The better responses to this question clearly linked the effect of the specific plant hormone to improvements in production from an identified industry or crop.

(b) (i) Most candidates identified vegetative yield as being leaves, stems etc and reproductive yield as being from seeds, fruits etc. The better responses indicated the relative timing of the stages, how yield was measured in each, and the effect of density.

(ii) 1. Most candidates correctly identified reproductive yield as being the most important for an economic product.

2. Most candidates received full marks for this question. The best responses incorporated the concept of optimum plant density which gave the highest yield and how yield declines due to excessive competition for limiting factors, for example, light. Some candidates confused total yield ie yield from a system, with the effect of density on individual plants.

(c) (i) This question was very straightforward and was generally well answered.

(ii) Again, this was generally well answered, although many candidates confused the more rapid multiplication of plants ie increase in numbers from tissue culture, with increasing growth rates.

(d) Many candidates showed a poor knowledge of photosynthesis. Good responses gave a detailed account of the process and /or an accurate expression of the general formula for photosynthesis. Marks were also awarded for recognising the role of chlorophyll (and chloroplasts) as well as the light and dark phases of the process.

Techniques used by farmers to manipulate photosynthesis were generally well known. Techniques commonly described in many responses included using C4 plants, manipulating light intensity and photo period, the use of glasshouses and hothouses to manipulate temperature and regulate (and increase) CO2 levels, irrigation and plant density. The better candidates described areas such as canopy management in horticulture and viticulture, and pruning as well as nutrition and pest control to promote plant health and maximise leaf area.

Question 9: Animal Production

32% of candidates attempted this question.

(a) (i) This was generally answered well, with most students correctly naming either protozoa, bacteria or fungi. A few candidates actually named two specific organisms, for example, Streptococcus bovis and Ruminococcus albus. Poor responses simply named enzymes or gastric juice.

(ii) Most students were able to name the protein and carbohydrate pathways and some also mentioned vitamin synthesis. Responses receiving maximum marks were those able to provide some biochemical detail and a succinct description of the role of the rumen microbes in the various digestion processes of ruminant feedstuffs.

(b) (i) This question was generally well answered. Those who could name a technique and describe that technique and/or how it manipulated growth and development gained maximum marks, saying, for example: 'Use of growth hormones, (for example Ralgro) injected behind the ear will increase growth rates if included in an adequate grazing or feeding regime. The hormone is released over a two month period.'

Some responses failed to describe adequately a technique that can be used to manipulate growth and development.

(ii) This part was answered reasonably well. Many students identified a form of feedback from markets or explained feedback in general and related this to a specific management strategy.

(iii) Many students gained high marks as they named and explained a method of manipulating genetic material, for example, embryo transplants, artificial insemination and crossbreeding, as well as relating the technique to improved product quality and/or quantity. A response that could maximise marks stated 'selecting semen from a superior bull and using this to fertilize eggs flushed from a superovulated genetically superior cow would lead to improved product quality or quantity. The embryos are transplanted into surrogate mothers, thus increasing the number of genetically superior offspring.'

Many responses, however, were very general and failed to describe clearly the key aspects of the method selected for genetic material manipulation.

(c) Most candidates could identify a disease/pest affecting a specific animal production system and state two control measures.

Higher scoring candidates clearly identified two control measures and described at least two advantages and two disadvantages for each control measure, quoting, for example, the sheep/wool system and the pest blowfly 'Lucilia cuprina'; controls such as mulesing and jetting were common answers.

Poor scoring candidates did not indicate a clear difference between control measures and advantages and disadvantages, stating, for example, if dipping/jetting were used, both advantages and disadvantages were almost the same. Control techniques were sometimes poorly understood. Explanation of costs for particular treatments was poorly outlined. A description of cost effectiveness was considered a better answer than simply stating high or low cost of the control measure.

Question 10: Land Management

58% of candidates attempted this question.

(a) (i) The majority of students were able to describe methods whereby groups such as Land Care can publicise land degradation issues in general by using, for example, media, (TV, radio, newspapers,) meetings, field days. Many students failed to name methods of identifying such issues. Those who did describe methods of identification included

the use of field trips, mapping, water quality testing, use of Soil Conservation groups, NSW Department of Agriculture, CSIRO. High scoring candidates included a specific example such as gully erosion – the Saltram creek, or more general examples such as water pollution, river bank erosion, salinity.

(ii) This question was generally well answered. Poorer scoring candidates simply listed strategies rather than describing them, while some students failed to name the soil problem. High scoring candidates were able to name at least two strategies to reduce the effect of the soil problem and then gave a concise description of how the strategy reduces the effect, eg salinity – tree planting or planting of deep rooted perennials (for example, lucerne) to lower the water table.

(iii) On the whole this question was poorly answered. Many candidates showed a lack of understanding of 'social attitudes'. Few were able to give an explanation of the social attitudes of both the farmer and the wider community. Many students failed to link social attitudes with 'implementation' of the action plan. The best candidates explained attitudes of farmers such as tradition and finance, and attitudes of the whole community such as community spirit and political pressure. These candidates were also able to link the attitudes of the farmers and the community as being critical for the success of such plans.

(iv) This question was well answered. The majority of candidates were able to list three characteristics for assessing land for capability classification. The poorer responses recognised only soil characteristics, for example pH, texture, fertility, as needed for classification, while higher scoring responses included topography (slope), vegetation, hydrology and other environmental factors.

(v) This question was poorly answered. Many candidates gave generalised answers that failed to show an understanding of land capability assessment as it relates to a TCM plan. Higher scoring candidates showed this understanding as well as providing a link back to the TCM plan, saying, for example: 'If class VI land is used for cropping the run-off, resulting erosion would cause widespread damage of the waterways in the catchment.'

(b) There was a wide range of responses to this question, with some excellent answers being presented. No marks were awarded for stating the degradation problem, while a number of candidates spent too much time in trying to define the problem. The better responses clearly identified three farming practices which led to the soil degradation problem and explained how these practices were damaging to the soil, saying, for example: 'Over-cultivation breaks down soil structure, encouraging erosion.'

The better responses then dealt with the second part of the question by identifying at least three beneficial procedures for dealing with the problem previously nominated; they explained in only general terms how they improved the soil, and further linked these factors to the chemical, biological and physical processes in the soil, saying, for example, 'the use of minimal tillage helps to retain the organic matter, encouraging microbial activity and improving the development of the soil structure.' Candidates were not required to explain how all three processes (physical, biological and chemical) where affected.

The lower scoring responses identified only one or two farming practices in either part of the question and did not explain how the soil was affected. These responses made no attempt to link the procedure to the physical, biological and chemical processes in the soil.

Section IV

Question 11

160 candidates (8.6%) attempted this question.

(a) The majority of candidates were able to identify at least three interference factors in a plant production system and describe them briefly to gain full marks.

Poorer candidates could only list the factors, and give examples that came under broader headings, for example, instead of environmental factors, they listed sunlight, rainfall, flooding etc as separate interferences, rather than those such as allopathy, pests, and weeds and high density.

The majority of students were able to give a number of significant components of interference, the higher scoring candidates offering most examples. These candidates were able to give at least three of these. Highest scoring candidates successfully described in detail four forms of interference: competition, alternate host, allopathy and environmental modifications.

(b) This section was not handled as well, with the poorer students providing no more than a range of strategies and management techniques. The more able students linked these to the broader areas of interference and then fully explained how the strategy modified the factor. For example 'Plant Density – use of correct planting rates or by thinning out to allow plants to get adequate resources and not be in competition.' Final discrimination of top candidates was achieved when they further expanded these factors to explain how they then positively affected the production.

Poorer responses reflected understanding of the types of interference factors but did little to explain the actual effect of the interference on plant production systems or how the remedial strategy countered this effect.

Most candidates could name a number of strategies. The lower scoring candidates limited their responses to one or two factors, such as weeds, which limited the number of strategies offered to spraying, biological control etc. Higher scoring candidates related several factors and clearly related strategies to plant production.

Question 12

7% of candidates attempted this question.

(a) Higher scoring candidates were those whose responses included three or more thorough explanations of factors such as age, sex, breed, production level, and target market that managers consider when trying to meet the nutritional requirements of animals. Full marks were awarded to those who related the factors back to nutritional need, saying, for example 'Production level – level of nutrition varies depending on the stage of production in dairy cows. Lactating cows require a high level of proteins, roughages and supplements to ensure optimum production with high SNFs and butterfat percentage as well as maximising volume.'

Average responses did not relate the factors to the nutritional requirement, saying, for example: 'Production level – Lactating cows need a well formulated ration to maintain good quality and quantity of milk.'

Poor responses were able only to list those key factors without giving any explanation or described only a very limited range of factors.

A minimum of three considerations, each describing in detail the link back to the nutritional requirement of the animal, was required to score full marks in this section.

(b) Most candidates were able to give examples of strategies available to producers for evaluating the effectiveness of nutritional management.

The higher scoring candidates were able to describe well at least three strategies, for example growth rates, FCR, visual assessment, feedback sheets and lambing percentage used by producers, and linked these to the nutritional requirement of animals. Lower scoring responses merely listed strategies. Some candidates confused key factors with strategies of evaluation.

Question 13

52% of candidates attempted this question.

In general candidates scored well here by showing a sound knowledge of farm management, post-harvest handling and recognising the importance of a market-driven production system.

(a) Using guidelines such as market specifications or requirement, the majority of candidates recognised the fact that agricultural products were produced. The better candidates were able to state accurate product specifications for a specific product and described how they were produced especially to meet these requirements.

(b) Most candidates were able to describe both some on-farm and off-farm strategies used in the production process. The better responses continued to describe how this strategy contributed to the production of a quality product and assessed how effective the process was. The less successful candidates in this section often failed to describe any form of assessment that related to the strategies applied.

Question 14

33% of candidates attempted this question.

(a) Most candidates attempting this question were able to identify some negative effects of intensive cultivation, the improper use of fertilisers and chemicals, and continuous monoculture. The better candidates described at least two detrimental effects of each practice. High scoring candidates linked these effects to a reduction in crop production, saying, for example: ‘Intensive cultivation can lead to a breakdown in soil structure and the formation of plans for ploughing. This reduces porosity which, in turn, restricts water infiltration, gaseous exchange, root growth and nutrient uptake and results in reduced crop growth and yield.’

(b) Candidates were able to list modern practices that were suitable alternatives. Well presented answers included a description of such practices and how they benefit plant production, for example: ‘Intensive cultivation can be replaced by the practice of minimum or zero tillage in cropping enterprises. This can be achieved through the use of herbicides and direct drilling techniques such as sod seeding – the seeds are directly sown into existing crop residue, maintaining soil structure and reducing the risk of erosion.’

Many candidates mistakenly identified environmental damage that was not specifically linked to a reduction in crop production such as contamination of waterways affecting natural balances.

3 Unit (Additional)

Section I

Question 1

(a) Higher scoring candidates were able to clearly outline an area of modern agricultural research. They identified the findings of the research and their effect on farm management and practices. They showed a clear understanding of profitability resulting from such scientific research.

Genetic engineering and its implementation in both plant and animal production systems was a popular choice for an area of research. Candidates who selected the beef and dairy industries as examples found it difficult to identify current commercial applications of gender engineering used by farmers.

Lower scoring candidates expressed only a superficial knowledge of a current research project and failed to link findings to changes in farm practices. They showed a poor understanding of profitability, often confusing productivity and profitability.

(b) Those candidates who obtained higher scores here were able to explain and expand on a number of issues relevant to the research.

Issues such as ethics, moral questions, environmental impacts, cost, truth in reporting and practical application of the research were popular choices.

Low scoring responses only listed such issues without discussing them further.

Section II

Question 2: Animal Breeding and Reproduction

(a) 133 candidates attempted this question.

(i) The majority of candidates were able to name and describe the role of four hormones. The higher scoring candidates stated two or more roles of each, in regulating other hormones, regulating reproductive physiology or reproductive behaviour of animals. Lower scoring candidates gave a less detailed description of the role of each hormone.

(ii) The more capable candidates were able to explain how the regulatory role of one reproductive hormone affects the level of another reproductive hormone, giving a logical sequence of events and explaining the subsequent effect upon the reproductive behaviour of the animal. Most candidates chose to answer this question with reference to the hormonal regulation of the oestrus cycle, although there were other acceptable responses. Those who gave a less detailed explanation of the regulatory mechanism scored fewer marks.

(iii) Higher scoring candidates stated a management technique that can be used to influence the normal/natural functions of reproductive hormones, for example; flushing ewes, boar effect, use of PRIDs to synchronise oestrus or day-length control for laying hens, and then gave a more extended description of the technique. These candidates then also explained the logical sequence of how the technique changes the

level of a named reproductive hormone, linking this to any effect upon reproductive behaviour, as well as explaining the resultant implication for reproductive efficiency.

There was a tendency to confuse the use of management techniques to manipulate hormones with the use of hormones as a management technique in itself. Some candidates chose to answer this question in relation only to the hormonal regulation of lactation or milk let-down, with no reference to any implications for reproductive efficiency. Such candidates received fewer marks.

(b) 68 candidates attempted this question.

(i) The majority of candidates were able to provide a brief explanation of why an understanding of heritability is important to animal breeders. The better scoring candidates described the need to know the degree to which characteristics will be passed on to offspring, resulting in overall herd improvement. Good responses described in detail at least two examples of inherited characteristics and their relative heritability.

(ii) Most candidates identified management practices that involve the collection of data, including using easily recognised tagging of individuals, accurate weighing, measuring and recording of data. The better scoring responses identified actual measurements required for breed plan/lamb plan such as 200/400/600 day weights, scrotal size, eye muscle area.

(iii) Here candidates were able to make generalisations about herd improvement as a result of increased genetic potential. Few candidates adequately assessed the potential benefits resulting directly from collected data. The better scoring candidates were able to relate EBVs or ABVs to rapid genetic gain resulting in improved production.

Question 3: Horticulture

18 candidates attempted this question.

(a) This question was generally poorly answered, with responses lacking specific examples and factual content.

(i) Most candidates were able to state three methods by which horticulturists can modify the environment. The more able candidates stated the environmental factor and outlined how it is modified. Some candidates mistakenly outlined techniques to 'modify' a specific plant rather than the environment.

(ii) The better responses included specific examples of horticultural crops. These responses explained how each environmental modification affects the plant. For example: 'Chrysanthemums are induced to flower, in time for the Mother's Day market, by modifying day-length with the use of artificial lighting.'

Many responses did not link the modifications to the environment and the resultant effect on plants and plant production.

Many candidates were able to identify the fact that an investment in environmental modification would have to increase returns in order to be justified. Few related modifications to environmental sustainability. No candidate was able to analyse critically either economic viability or environmental sustainability.

(b) (i) This question was poorly answered. Candidates did not discuss both the domestic and international markets, and generally showed only a rudimentary understanding of the concepts involved and, in many cases, concentrated on only one product.

(ii) Production techniques were often only listed and were not discussed.

(iii) This was the best answered of the three parts. Candidates were able to list a number of post-harvest handling processes and, in some cases, a variety of techniques for a specified product were clearly explained.

Question 4: Alternative Agricultural Systems

(a) 47 candidates attempted this question.

(i) Candidates discussing a range of strategies or plans gained full marks; providing a list of strategies was inadequate. The better candidates included a description for each strategy, while those gaining full marks were able to relate the strategy to either economic or environmental sustainability of the system. Good strategies and economic plans included marketing of the product, value adding, finding niche markets and a cost/benefit analysis. Environmental sustainability could involve something as simple as mulching. This assists weed control, reduces soil water evaporation and provides some soil nutrient improvement. Environmental sustainability occurs as there is then reduced reliance on chemicals that would otherwise interfere with nutrient cycles, soil health and productivity.

Many candidates chose Alpacas as their alternative system, discussing the monitoring of breeding, investigating export and niche markets and advertising at field days. Each of these strategies was then related to how it enables the farmer to ensure long-term sustainability.

(ii) Many candidates could identify the institutional and legal requirements of their chosen industry. Few stated specific legal requirements and could not evaluate their role in establishment of the alternative system. In the poorer answers candidates failed to identify specific economic and environmental strategies and simply explained how to produce the product. These students could not discuss the role of the institutional and/or legal requirements in the establishment of the industry.

(b) 38 candidates attempted this question, which was well answered.

(i) Most candidates could discuss at least one economic factor such as markets, and one environmental factor, such as the physical effect of free-range layer hens on soil or suitability of climate (heat and cold stress), and one management factor such as housing and protection of birds from predators.

The majority of students discussed one or two factors in each area. Many looked at the effect of climate on the free range hens. The better answers were those that expanded on the effects that the hens would have on the environment.

(ii) Most students were able to show how these same factors had been evaluated to determine the viability of a system they had studied.

Economic factors considered included low initial capital outlay (high fence being the main consideration).

Question 5: Technological Perspectives in Agriculture

(a) Ten (10) candidates answered this question.

(i) This part of the question was generally well answered. Some students, however, failed to include a range of computer applications in their answers. High scoring responses include good explanation with examples.

(ii) Generally, candidates were able to name several data inputs, but had difficulty in providing a clear description of them.

(iii) This part was not answered well. Most students were unable to explain how information from computer programs could aid decision-making. Many responses were vague and brief.

(b) Three (3) candidates attempted this question.

(i) Candidates were asked to describe how changes in technology have influenced management practices and product marketing. The responses given were very limited. Artificial insemination and embryo transfer were listed and described, but little mention was made of how management practices were influenced or product marketing affected.

(ii) This part was poorly answered, with little evaluation attempted. The responses were very generalised, for example, 'Doesn't need to keep a bull so saves a lot of money,' was a typical response.

It was felt that, in spite of the broad range of technological changes that are affecting agricultural enterprises, especially information technology, this question was poorly interpreted and answered.

Question 6: Pasture Production

(a) 80 candidates attempted this question.

The terms climate, soil fertility and farm enterprise were clearly understood individually but they were not well described as a whole by most candidates. Further, the majority of candidates provided only sketchy examples of grazing management systems. Higher scoring responses showed a clear link between these factors in the responses to parts (i) and (ii).

(i) Many candidates had difficulty in discussing the establishment and management of pastures in relation to soil fertility, climate and farm enterprise. The better candidates discussed pasture establishment in relation to all aspects of the question, such as determining fertiliser needs, discussing specific fertilisers and the effect of lime.

(ii) The majority of candidates were able to describe two alternative grazing systems but did not establish any link to optimal animal productivity. The better responses, however, successfully established links with productivity by providing examples.

(b) 82 candidates attempted this question.

(i) The majority were able to identify a range of strategies to overcome variability in quality and quantity of feed. In the majority of cases students could support such strategies by giving specific examples.

The strategies given fell into the categories of grazing management, fodder conservation, manipulation of the environment, species selection and stocking options.

Higher scoring candidates successfully described how these strategies are used to cope with varying quantity and quality of feed.

Poorer candidates simply listed strategies or restricted their description to only one category, for example, grazing management.

(ii) Candidates in the lower bracket generally reiterated the strategies mentioned in part (i), viz how to cope with varying quantity and quality of food. Many were able to identify the provision of year-round pasture-based feed (filling the feed gap) as a measure of success.

The higher scoring candidates were able to link productivity of the grazing animals (for example live weight gain) to the success or otherwise of the strategies.

Some students used sustainability or decreased input costs as a means of assessing the success in providing year-round pasture-based feed for grazing animals.

Question 7: Coping with Climate

(a) Only 5 candidates attempted this question.

(i) The better candidates identified the major agricultural production zones in Australia and related their distribution to rainfall. Poorer candidates simply stated that rainfall is necessary for plant growth.

(ii) In the better responses candidates identified and described at least two short term and longer term strategies both on the farm and over whole catchment areas. Strategies included analysing weather forecasts, managing stock-rates according to rain conditions, irrigation, bores, dams, fodder conservation, and zero chemical use before rain to preserve catchments.

The two extremes of climate stated were drought and flood. Candidates could either explain strategies for coping with both of these extremes or strategies for either.

(b) 9 candidates answered this question.

(i) This section was well answered.

(ii) Candidates described a limited range of agricultural practices. The better candidates described a climatic factor and then related this to a specific practice, saying for example, ‘If cold weather is predicted don’t shear; if rainfall or periods of rainfall are imminent, re-schedule sowing.’

(iii) Most candidates could explain long-term strategies for both drought and flood.

Question 8: Agribusiness

(a) 5 candidates attempted this question.

(i) All understood well the concept intrinsic to the question, and discussed financial analysis of farm finances positively.

(ii) Most candidates could readily evaluate strengths and weaknesses of alternative selling systems and often presented their data and arguments clearly in a table indicating 'strength' and 'weakness', eg forward selling in terms of budgetary predictions (strength) as opposed to inability to supply the product (weakness).

(iii) Responses explained selling systems and the importance of time in selling well. Value-adding was discussed in only a cursory manner, the influence of selling systems on farm finances was well represented, however.

(b) 9 candidates attempted this question.

(i) All candidates were able to describe a selling system and a marketing strategy that focus on international markets. The best responses gave a detailed description of at least three selling systems, and two marketing strategies. Candidates showed little awareness, or understanding, however, of the range of marketing strategies currently being used.

(ii) Candidates failed to show that they fully understood the link between international market fluctuations and decision-making at a farm enterprise level.

Question 9: Whole-farm Planning

(a) 91 candidates attempted this question.

(i) Most candidates were able to list benefits of trees to a whole-farm plan, since they could be used as windbreaks, to lower the water table, for aesthetics, etc. The better scoring candidates listed many of the benefits of trees to such a farm plan.

(ii) The higher scoring candidates explained factors that related to the location of trees in a whole farm plan, including which species are planted where and for what reasons.

(iii) Those scoring well in this section discussed, with specific examples, how tree management and enterprise management must be carefully planned together to optimise farm productivity. Poorer responses did not discuss the planning of tree and enterprise management but merely continued their discussion of tree location from the previous section.

(b) 11 candidates attempted this question.

(i) Most students could state three ways in which financial planning and budgeting might influence the implementation of a whole farm plan; higher scoring candidates, however, were able to provide very specific examples. All candidates understood the various factors that affect the rate of implementation of a whole farm plan, with the higher scoring candidates listing up to eight factors.

(ii) Low scoring candidates merely listed the names of relevant off–farm agencies. High scores were gained by those explaining how the agencies encourage and aid farmers to adopt a whole farm plan.

3 Unit Research Project

This year the projects, again, covered a very wide variety of topics. While quantitative analysis remains the dominant project type, many qualitative/survey projects were submitted.

A General Comments

Second–hand data

The use of second-hand data is still a problem in a small number of projects. Many candidates used such data in a legitimate manner, while a few poorer candidates simply repeated results from a previous experiment. Often the use of second-hand data was not properly acknowledged.

Agricultural relevance of projects

A small number of candidates continue to submit projects which have a tenuous relationship to agriculture. A problem of distinct agricultural significance should be addressed by the project. A few contained no research question at all and appeared simply as a 'case study' similar to that conducted in the 2 Unit Preliminary Course.

Setting out and presentation

Too many students still included large quantities of raw data in the text, and failed to provide a concise, well tabulated summary of data. Many produced large numbers of computer-generated graphs which were unnecessary and irrelevant.

As most reports appear to be computer-generated, the use of a spell-check would be expected; however, spelling and grammatical errors remain a problem.

A significant number of projects were excessively long, far exceeding the 3000 – 5000 words expected for the report. Much of this information was irrelevant or superfluous and was given as part of the literature review.

Candidates should not present individual pages of the report in plastic sleeves.

Appropriate Language

The project should be written in the third person. Far too many candidates begin with 'I decided to do my project on …'.

Referencing

Most candidates provide an alphabetical reference list/bibliography at the end of the report. Many, however, fail to refer to any of the listed references in the body of the report.

Graphs and tables used from other sources were generally not correctly cited, if at all. Use of the Internet was quite good; referencing of this resource was, however, in many cases, poor.

Integration of the Components of the Project

Candidates scoring in the highest mark range not only completed all project parts thoroughly, but integrated these throughout the report, maintaining a strong and consistent ‘storyline’.

Acknowledgements

Too many candidates continue to acknowledge people and institutions by name, including their school and teacher. All assistance needs to be correctly acknowledged; this must not result, however, in the potential identification of the school.

B Comments On Specific Sections

Synopsis

Many candidates still do not appear to understand the purpose of the synopsis. Some are unable to separate it from the introduction, often simply repeating the same information. Commonly the synopsis excludes the outcome of the project and does not provide a summary of the report as a whole.

Literature Review

The best of these reviews were concise and to the point. They were directly related to the research problem and discussed recent and relevant experimental work. Previous experimental research was also correctly cited in these higher scoring projects.

Many literature reviews tended to resemble a report on all aspects of the project. More than ten pages of information on ‘the nitrogen cycle’ or ‘poultry nutrition’ is neither necessary nor relevant.

Some candidates presented a series of ‘book reviews’ and provided only a paragraph which summarised each reference, rather than an integrated piece covering the research question.

Methods

Most candidates presenting a scientific investigation showed a sound knowledge of scientific method and design.

The major faults encountered involved inadequate replication, too many variables under study and a failure to explain the choice of experimental design. These included inappropriate and irrelevant questions, poor sampling techniques resulting in bias, and designs that precluded adequate analysis. Often the information sought was of a very trivial nature.

While some qualitative research reports were of a high standard and displayed a clear understanding of research methodology appropriate to surveys/interviews, many were poorly designed.

Results and Analysis

Statistical analysis of results was well handled in the majority of projects. Candidates scoring in the lower ranges failed to carry out any statistical analysis or presented a very basic comparison of treatment means.

Often these candidates showed little understanding of what their results actually meant. Some still insist on ignoring unexpected results that contradict their own biometrical analysis.

Too often candidates did not show a clear understanding of their statistical analysis or presented manipulated data with no explanation of how or why it was derived. Analysis was compromised when inappropriate parameters were used in the design, for example, height of lettuce, leaves of a broccoli plant, rather than product mass.

Discussion and Conclusion

In general this area was well handled and a genuine attempt was made to explain data. The better candidates were quite astute in their conclusions, and often acknowledged the limitations of their own research. They successfully related their results to the findings described in the literature review.

Process Diary

While not 'contributing' to the marks allocated to the project, a comprehensive process diary accompanied the better projects.

A good diary contains evidence of the processes involved in the development of the project, ie the student's thoughts and actions in formulating a research question, designing and implementing research, data collection and analysis.

3 Unit Project Marking – General Comments

Marking is based around key criteria that have been constructed from the syllabus outcomes. Good projects comprise the following characteristics:

- a consistent story line
- component parts that are clearly linked
- component parts that achieve their purpose
- appropriate methodology
- accurate data analysis
- relevant literature review and referencing
- appropriate referencing.

Purpose of each section of the project

(i) Abstract

In 250-300 words students should be able to conceptualise the whole project – ie indicate what was investigated, how it was investigated, the conclusions reached and possible implications.

(ii) Introduction/Research Question

This section should link the investigation to some context or reason. At some point a clear statement of aim or research question should be clearly articulated. This provides the basis for the storyline and both the content and processes in the subsequent sections.

(iii) Literature Review

The clear purpose of the literature review is to find out what is already known about the research question (aim) being investigated and the appropriate methodology to use. It should be directly related to the research question.

(iv) Method

The method section should define the paradigm (quantitative or qualitative), justify the methodology in relation to the research question and provide a clear description of the procedures used so that a reader can be informed in sufficient detail to be able to repeat the investigation.

(v) Results

This section should use the accepted method of reporting the data collected, considering the paradigm being used. For example, a quantitative study would be expected to report data in tabular and graphical form, while qualitative data can be reported in a number of acceptable forms such as a diary descriptive report form.

(vi) Data Analysis

The material in this section will vary significantly, depending upon the research paradigm used, however, its purpose should be to re-sort, order and manipulate the data into a form which can facilitate some answer to the research question. The form of analysis should be justified, appropriate, valid and reliable.

(vii) Conclusion

The conclusion should draw a clear statement from the analysis in relation to the research question, evaluate its significance and critically reflect on the conclusion and methodology. In particular, students might reflect on improvements/problems associated with the methodology, the conclusion as related to the existing knowledge (of literature review) and any local ‘beliefs’ about the expected results. Comments on the ethics or responsibility of the researcher/research results and conclusions are also appropriate here.

(viii) Recommendations

This component should relate the conclusion to the wider agricultural context, while noting that recommendations based on a single trial always have limitations. Recommendations may also suggest further research and/or problem research methodologies that could be pursued to throw further light on the question being investigated.

Descriptors

The following points broadly describe the characteristics of projects common to each mark range.

A Mark Range: 16 – 20

- All sections included and all sections achieve their purpose to a high level.
- The project maintains a strong and consistent storyline throughout.
- The project shows a high degree of interaction and relationship between sections.
- Conclusions are reflective, evaluative and show insights beyond the obvious.
- The project displays a high level of communication.
- The research shows originality in terms of some of the following aspects:
  - the research question
  - methodology
  - linking the project to a local problem
  - insights in the conclusion.

B Mark Range: 11 – 15

- All sections included and most achieve their purpose.
- The project maintains a consistent storyline.
- The project shows some degree of interaction between sections.
- The project shows some originality.
- Conclusions clearly state the obvious and show some evaluation.
- The project communicates well.

C Mark Range: 6 – 10

- Most sections included and some sections achieve their purpose.
- The project is not always consistent throughout.
- Virtually no integration of the sectors occurs.
- Conclusions state the obvious only.
- The project displays reasonable communication.
- No originality.

D Mark Range: 0 – 5

- Significant omissions, most sections do not achieve their purpose.
- Little consistency throughout the project.
- No integration of sections.

- Often incorrect, poorly stated conclusions.
- Poor communication.
- No originality.

A selection of project titles submitted in 1998 are listed below.

- Factors affecting current trends in meat consumption
- Soil solarization for controlling weeds
- Allopathic effects of stubble
- Effect of water quality on herbicide effectiveness
- Do organically produced foods enjoy advantage in the marketplace?
- Crayfish farming in Australia – towards stability and consumer orientation
- Fertilizer effect on Wallaby Grass
- Response of pigs to porcine somatotrophin
- Early weaning vs traditional calf-rearing methods
- Comparison of natural mating and synchronised heat matings in dairy cattle
- Mineral rock effect on soils
- Pre-germination treatment of wattle seeds
- Investigating methods to increase germination rate of Sturt Desert Pea
- A comparison of 5 Canola varieties in the Central West of NSW
- Effect of Ram breed on lamb growth
- Composted mushrooms stalk effective as tree seedling growing medium
- Alternative feed effects on egg production
- Night-ploughing effect on weed germination
- Influence of gene SRZ on wheat resistance to rust
- Cost effectiveness of irrigation versus dry land cotton
- Comparison of ponding versus deep ripping on scald reclamation and water infiltration
- Storage temperature effect on egg shelf-life
- Comparison of grape yield with Smart-Dyson trellis versus conventional 2 wire vertical trellis
- Effect of press wheels on oat crop density
- Effect of treatment solutions on post-harvest flower longevity
- Short term effectiveness of chemical and organic methods of nematode control

- Effect of activated charcoal on trifluralina chemical capacity
- Smoke technology on the germination rates of Australian native plants
- Score structure traits to establish heritabilities and correlations in sheep
- The effect of Selenium supplement on the reproductive system of female beef cattle
- Water temperature effect on growth rates of rainbow trout
- Folia fertilizer effect on sorghum
- Castration method effect on beef calves
- Improving market prospects during drought for young merinos
- Biofumigation of take-all in inoculated pots
- Silver perch feed trial
- Influence of pen size, diet and shedding fibre diameter and micron count in sheep
- Atrazine trial
- Water retaining capacity of various potting mixes
- Oral drench versus pour-on drench for dairy cattle

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