VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2011 Agricultural and Horticultural Studies GA 3: Written examination

GENERAL COMMENTS

Students demonstrated a reasonable understanding of modifying climates, soil/growing media, water and topography for plant and animal production. Some explanations were given of the benefits of laser levelling, contouring, terracing or raised beds; however, the responses were limited in content.

Students were able to list the effects of their selected weed species on business production (for example, take up space in the pasture), but were not able to explain specifically how production would be affected. Students were able to list various techniques for the Integrated Weed Management of their weed. Few students could provide a well thought out plan to control the weed that included a time frame for management or application. Most students were able to describe the responsibilities of farmers in relation to regionally controlled weeds.

Students struggled with the concept of withholding periods in agricultural and horticultural production and their effect on quality assurance. They had a far better understanding of methods of monitoring pests or diseases. The outline of a biosecurity plan for the selected pest or disease was poorly understood as were examples of software programs that can be used to help predict or suggest management strategies.

The use of biotechnology in agricultural and horticultural production is not new but has been given a greater emphasis in the new study design. Student responses showed limited understanding of biotechnology. It is important that teachers cover various examples of biotechnology applications in class.

Students were required to describe two new and emerging technologies that they had studied throughout the year. Most students could list one example but struggled with the second. Teachers need to make certain that the course work covers this area, that the technology discussed is either new or emerging and that several are covered in detail. Information from research organisations in agriculture or horticulture will highlight many new innovations.

Students' understanding of the causes of soil acidification and how to test for it was quite good. The description of the scientific method used to determine the correct combination of chemical fertiliser or manure for the property was poorly done. Students should have had some understanding as the new study design states the need for students to not only know but to apply this concept by undertaking a scientific experiment on plants or animals in all units of study.

Climate change is a new addition to the study. Students were able to list the causes of climate change due to agricultural or horticultural practices; however, many students could not describe them effectively. Students generally listed potential changes to agricultural or horticultural practices to cope with climate change but were not able to expand on this by giving a detailed explanation.

Some aspects of agricultural and horticultural business management were not well understood by students. Inputs, processes and outputs were generally understood, but the responses were quite limited. A major part of the course is the undertaking of a small agricultural or horticultural business by the student. It is important that students study the equivalent commercial business in depth and focus on such aspects as business plans, quality assurance, development of budgets and cash flows along with potential risks (for example, climate change).

The main weakness shown by students was a general lack of detail in their responses. In many questions, students were able to list a relevant answer but did not explain the implications that these responses had on a range of agricultural or horticultural situations. When teaching the course, teachers need to develop strategies to challenge students to ask what the problem is; how it affects the plant, animal or land; how it affects agricultural or horticultural production; and explain what strategies need to be put in place to remedy the situation.

When preparing students for the examination, teachers must refer to the current *VCE Agricultural and Horticultural Studies Study Design* and the examination criteria. Students need to be able to apply their understanding to a range of land, plant and animal management techniques in agricultural and horticultural businesses throughout Victoria.

Some questions addressed more than one of the examination criteria. Marks were allocated to specific elements of the correct answer or according to descriptive criteria. Marks were not deducted if students provided incorrect answers.

This report should be read in conjunction with the 2011 VCE Agricultural and Horticultural Studies written examination.

SPECIFIC INFORMATION

For each question, an outline answer (or answers) is provided. In some cases the answer given is not the only answer that could have been awarded marks.

Question 1a.

Marks	0	1	2	3	4	5	6	7	Average
%	2	10	14	15	17	16	16	10	**4.0**

1ai.

One of:

- fogging
- misting
- close ventilation
- wet flooring.

1aii.

One of:

- fans, helicopters, etc.
- shade cloth, shelter, etc.
- overhead irrigation
- fires.

1aiii.

One of:

- add organic matter, compost, humus
- add water-holding crystals
- mix in other soil types – clays or loams.

1aiv.

One of:

- add lime (calcium carbonate)
- add dolomite (calcium magnesium carbonate).

1av.

One of:

- provide shade in the paddock, shade trees, shelter belts, sheds
- carefully time the shearing (not too bare but not too much heavy wool).

1avi.

One of:

- deep ripping
- add organic matter
- add gypsum if the clay component is high
- reduce traffic (stock or machinery).

1avii.

One of:

- recycle CO_2 emissions from other farm activities
- recycle CO_2 emissions from off farm businesses (for example, power stations)
- release CO_2 from cylinders of compressed gas.

This question was generally well answered; however, knowledge of methods to increase carbon dioxide in glasshouses or polyhouses was limited.

Question 1b.

Marks	0	1	Average
%	53	47	**0.5**

Benefits of using a non-soil growing media include (any one of):

- there is less chance of disease; no soil-borne diseases or weed seeds
- they are lighter; there is less mass for lifting or hanging pots, baskets, etc.
- they are clean and attractive
- they provide better control over:
    - water holding capacity
    - porosity
    - nutrient application
    - pH.

The common responses included reduced weeds and diseases in pots.

Question 1c.

Marks	0	1	2	Average
%	27	57	17	**0.9**

- laser levelling: better control over water management; allows for precision irrigation, collection and recycling of irrigated water; reduces water entering and raising the water table
- contouring: reduced runoff; retains moisture in the soil; reduced likelihood of soil erosion; safer use of tractors and other vehicles
- terracing: converts land that is too steep for cropping to land that can be cropped; increases the area available for crops; retains moisture; prevents the erosion of top soil
- raised beds: improved drainage; less water-logging; reduced impact of compaction if vehicles always use hollows between beds

One mark was awarded for listing one or two benefits. Two marks were awarded for an explanation considering most of the benefits (or for listing three or four good benefits). Students were generally able to list benefits, but few were able to explain them.

Question 2a.

Marks	0	1	2	Average
%	16	59	26	**1.1**

This question asked students to describe two effects of the chosen weed (from the prescribed list of weeds) on business production.

Blackberry

- competition with the crop/pasture for light, nutrients, moisture and/or growing space
- reduced product quality of wool or meat due to thorns being present in these products
- reduced availability of farming land due to this weed taking over the landscape/field
- lost production, measured as reduced plant yield or lower livestock production, due to competitive effects
- reduced biodiversity as these weeds may become the dominant species in a suitable environment/location

Bridal creeper

- competition with the plants in orchards (for example, apple, pear and citrus) for light and nutrients
- reduced availability of farming land due to this weed taking over the landscape/field
- lost production, measured as reduced plant yield and quality, due to competitive effects
- reduced biodiversity as these weeds may become the dominant species in a suitable environment/location

Chilean needle grass

- competition with the pasture for light, nutrients, moisture and/or growing space
- reduced product quality of wool or meat due to weed seeds being present in these products
- reduced availability of farming land due to this weed taking over the landscape/field
- lost production, measured as reduced plant yield or lower livestock production, due to competitive effects
- reduced biodiversity as these weeds may become the dominant species in a suitable environment/location

Gorse/furse

- competition with the pasture for light, nutrients, moisture and/or growing space
- reduced product quality of wool or meat due to thorns being present in these products
- reduced availability of farming land due to this weed forming dense thickets and taking over the landscape/field
- lost production, measured as reduced plant yield or lower livestock production, due to competitive effects
- reduced biodiversity as these weeds may become the dominant species in a suitable environment/location

Paterson's curse

- poisoning of stock (Paterson's curse is toxic to livestock, due to the build-up of toxic alkaloids causing chronic liver damage)
- competition with the crop/pasture for light, nutrients, moisture and/or growing space
- reduced availability of farming land due to this weed taking over the landscape/field
- lost production, measured as reduced plant yield or lower livestock production, due to competitive effects
- reduced biodiversity as these weeds may become the dominant species in a suitable environment/location

Serrated tussock

- competition with the pasture for light, nutrients, moisture and/or growing space
- reduced product quality of wool or meat due to weed seeds being present in these products
- reduced availability of farming land due to this weed taking over the landscape/field
- lost production, measured as reduced plant yield or lower livestock production, due to competitive effects
- reduced biodiversity as these weeds may become the dominant species in a suitable environment/location

In order to receive two marks, students needed to describe (not just list) two effects of their chosen weed. Most students were able to list one or two effects, but few were able to explain the effect on production.

Question 2b.

Marks	0	1	2	3	4	Average
%	12	30	31	21	7	**1.8**

This question was not about prevention; the question stated that the property is already infested. Winter just gives a starting point for management of the weed. However, preventing reinfestation was important.

For Integrated Weed Management (IWM), the following steps should be considered:

- accurately identify the weed as being a problem
- assess the scale of the problem (economic threshold)
- prioritise the sequence for treating weedy areas
- plan the IWM program
- combine all available weed management options
- when herbicides are used, repeated applications may be required for several years, until the weed populations are below the economic injury level
- to avoid/delay the onset of herbicide resistance, herbicide products with different modes of activity must be used on a rotational basis to reduce weed populations
- monitor and review the performance of all IWM practices – modify practices to achieve optimum weed management.

Weed	Integrated Weed Management Approach
Blackberry	• introduce leaf rust, crown borer or leaf miner • buy certified seed • don't buy hay/livestock from contaminated areas • the most vigorous growth is in the spring and it can grow up from root parts in the soil • graze heavily with goats • cut down, dig out and burn • during winter, burn then deep rip accessible areas to remove canes • sow perennial pasture • use crop/pasture rotation • repeat-spray emerging leaves • spot-spray with registered herbicides: Knock-down, Roundup (glyphosate) • selective: metsulfuron-methyl (Brushoff, Trounce) or triclopyr (Garlon) products
Bridal creeper	• prevention is the best form of control of any weed • do not plant in gardens • if there are isolated plants or small infestations, dig out • if infestations are large and in natural vegetation, use fire and then follow up with herbicide • introduce natural enemies such as the leafhopper Zygina sp., rust fungus *Puccinia myrsiphyllum* or the leaf beetle *Crioceris sp*.
Chilean needle grass	• good hygiene can be effective in preventing human-assisted spread of Chilean needle grass • cleaning vehicles, machinery, equipment and other material is very important in preventing further spread, as is controlling the movement of livestock from infested to clean areas, particularly along roadsides • feed stock in controlled areas to minimise the risk of seed spread and to limit the area requiring control • reduce the risk of this and other weeds by requesting a Weed Hygiene Declaration from suppliers confirming that the material and livestock brought onto the property are free of weed seed • avoid overgrazing and leaving pasture areas bare • aim to maintain competitive perennial pastures that provide good ground cover • burn, then spray the regrowth • spot-spray with registered herbicides: Knock-down, Roundup (glyphosate) • selective: Fluazifop (212 g/L), for example, Fusilade; Flupropanate (745 g/L), for example, tussock herbicide
Gorse/Furse	• introduce gorse seed weevil, gorse thrips, gorse soft shoot moth • burn plants, spot-spray • bulldoze/rip/rotary hoe and/or plough infestations • follow-up with herbicide treatment • avoid overgrazing and leaving the pasture area bare • spot-spray with registered herbicides: Knock-down, Roundup (glyphosate) • selective: metsulfuron-methyl (Brushoff, Trounce) or triclopyr (Garlon) products
Paterson's Curse	• pasture phase: ○ apply hormone-type herbicides (such as MCPA, 2,4-D) at sub-lethal rates to vegetative plants as part of a spray-grazing program ○ use selective broadleaf control herbicides containing terbutryn and/or MCPA, bromoxynil • crop phase: ○ pre-emergent residual – Glean, Logran, Logran-B Power ○ post-emergent – apply hormone-type herbicides, such as MCPA, 2,4-D, 2,4-DB, Brominil, Jaguar, Tigrex, Agtryne, Igran, Terbutryne • fallow establishment and maintenance: ○ apply any product containing glyphosate or glyphosate + Ally ○ pre-sowing: apply any product containing glyphosate or Sprayseed ○ release crown borer

	○ release leaf miner ○ pre-sowing cultivation will reduce the weed population prior to sowing ○ in-fallow cultivation will reduce the weed population during the fallow period
Serrated tussock	• introduce rust fungus and/or smut fungus • arable land: plough in preparation for autumn sowing of perennial pastures species • for non-arable: aerial herbicide application, graze hard over summer and autumn, spell during winter and spring • do not overgraze – aim to maintain groundcover; spell pastures to allow native species to establish • establish tree belts to capture wind-blown seed and to prevent further spread of weed seed • spot-spray with registered herbicides: Knock-down, Roundup (glyphosate) • selective: Fluazifop (212 g/L), for example, Fusilade; Flupropanate (745 g/L), for example, tussock herbicide

Most students could list two or three techniques for their chosen weed. However, very few students could give a detailed management plan that incorporated all aspects of biological, chemical and/or management control as well as a time frame for application.

Question 2c.

Marks	0	1	2	3	Average
%	49	24	21	5	**0.9**

For full marks students needed to mention that the herbicide residue on dicots and monocots responds to different herbicides. The herbicide would have been a 'broad leaf' herbicide that only kills dicot plants, hence the grass is not affected.

This question was poorly done, with only around half of the students demonstrating the knowledge this question required.

Question 2d.

Marks	0	1	Average
%	43	57	**0.6**

Regionally controlled weeds are declared noxious weeds that are widespread and established in a region (for example, blackberry and ragwort). Land owners must take reasonable steps to prevent the growth and spread on or in relation to their land (for example, at the adjacent roadside).

Question 3a.

Marks	0	1	2	3	4	5	Average
%	8	24	36	13	11	8	**2.2**

3ai.

The withholding period is the period that must elapse between the last application of a chemical and the harvesting of plants, grazing or cutting for stock food or consumption by a human or an animal after post-harvest use.

3aii.

If the withholding period is not observed, product quality may be compromised by excessive residue of the pesticide in the product. The pesticide may be toxic if ingested. In the case of antibiotic use, the likelihood of antibiotic-resistant bacteria may be increased.

3aiii.

It is important to read the label for a pesticide to determine (any two of):

- the correct application rate
- the correct application method
- how to avoid resistance to active ingredients
- the correct pesticide for pest and/or mode of activity
- the correct frequency and timing of application
- health and safety considerations (for example, protective clothing)
- the correct disposal of unused product or container.

Many students had no understanding of withholding periods and their implication with regards to quality assurance matters. Students could generally explain the reasons for reading the label on the pesticide container. With the increased demand by society to have clean and green produce, knowledge of the withholding periods for both animal and plant produce is critical in any quality assurance program.

Question 3b.

Marks	0	1	2	Average
%	20	62	19	**1.0**

For this question students were required to explain monitoring for the selected pest or disease.

Common name of pest or disease	Monitoring of pest or disease
Coccidiosis	• Problems are not common in chicks under three weeks of age because the parasites take time to build up. • Affected birds exhibit depression, loss of condition, paleness, ruffled feathers, drooping wings, pale and dry flanks, slight whitish soiling around the vent (only occasionally), diarrhoea and blood in the droppings. • Often a large percentage of the chickens are sick. Birds may die suddenly before the above symptoms are obvious.
Cabbage moth	• At the first sign of damage and throughout the growing season, from late winter to late spring, use a sweep net. • Look for leaf damage, small green larvae, white butterflies above the crop or lifting as the crop is disturbed. • Sampling should commence at the edge of the crop and at regular intervals as you move in towards the centre of the crop. At each selected site, take a sample of 10 sweeps of the net and count the number of DBM(diamondback moth) larvae collected. • Take a minimum of five sets of 10 sweeps and calculate the average number of larvae per 10 sweeps. • Remonitor five to seven days after a spray treatment.
Intestinal worms	• Look for scouring, loss of weight and failure to thrive. • Worm egg counts in dung can indicate the degree of the problem. Differences between worm infections of sheep and cattle • The major species involved are different, so paddocks grazed by cattle are of low-risk for sheep, and vice-versa. • Faecal worm egg counts are a useful guide to check the level of parasitism in sheep. A faecal worm egg count is simply a count of the number of worm eggs present in one gram of dung. The actual number at which worms become a problem varies with individual species. A larval culture may be needed to clarify the results. • Worm egg counts in the dung are not a reliable indicator of worm burdens after about six months of age, so monitoring egg counts is less useful in cattle than in sheep. • There are two types of disease in cattle caused by ostertagia. ○ **Type-1 disease** usually occurs in calves and young cattle that have high burdens of adult worms in winter and spring. This disease follows rapid infection with large numbers of larvae from heavily contaminated pastures in the autumn and winter after weaning. Dairy calves typically suffer type-1 disease at five to six months. Beef cattle are affected at 15 to 20 months. ○ **Type-2 disease** occurs especially in beef cows calving for the first or second time in the autumn and winter. This coincides with the stress of calving and the emergence of thousands of inhibited larvae from the lining of the fourth stomach. Severe scouring, loss of weight and even death may result.
Aphids	• Monitor using a sticky trap and plant leaf checks. Decide on a threshold level for aphids in your crop, above which you must spray and below which you can safely withhold spraying. • Plan the layout of traps to identify hot spots and estimate overall aphid levels

	together with plant scouting. Place traps just above the plant tops. Do a weekly count of aphids on each trap and look for infected plants. Mark infected plants with tape for removal and replace sticky traps. • Note any aphid hot spots and check aphid numbers on nearby plants to find the size of hot spots. Check for biological control activity. Record trap and scouting details. Check numbers on marked plants one to two days after spraying to check the results.
Liver fluke	• Liver fluke commonly occurs around shallow, slow moving water courses, marshy areas, springs, irrigation channels and soaks where the parasite's intermediate host snail breeds. • Liver fluke is most prevalent in regions where annual rainfall is higher than 600 mm or where annual rainfall of around 400 mm is supplemented by irrigation. • Sheep and cattle producers should regularly monitor stock for liver fluke to identify problems before production losses are incurred. • Mature fluke infestation can be monitored by the use of laboratory tests such as 'Fluke Test', which will detect fluke eggs in faecal samples. Bulk milk and blood tests can detect immature as well as mature liver fluke infection. • Local abattoirs report that over time between 20 and 25 per cent of livers are fluke damaged; this can be useful long-term feedback. • When animals display symptoms, such as bottle jaw, more serious damage to production has already been done. Animals don't usually show symptoms when they are carrying immature fluke, but it's this two to four week stage while they are burrowing through the liver that causes chronic production losses, so it's best that stock is monitored for the parasite so they can be treated before this occurs.
Milk fever	• Jersey cows that are mature and fat and graze on lush, clover-dominant pasture before calving are most susceptible. • Regularly (at least twice daily) check cows that are close to calving and for about three days following calving. • In typical cases, cows show some initial excitement or agitation and a tremor in muscles of the head and limbs. Then they stagger and go down to a 'sitting' position, often with a 'kink' in the neck, and finally lie flat on their side before circulatory collapse, coma and death. • A dry muzzle, staring eyes, cold legs and ears, constipation and drowsiness are seen after going down. The heartbeat becomes weaker and faster. The body temperature falls below normal, especially in cold, wet, windy weather.
Red-legged earth mite	• Red-legged earth mite (RLEM) feeding damage results in the appearance of white or silvery patches on plant foliage. • Carefully inspect susceptible pastures and crops from autumn to spring for the presence of mites and evidence of damage. It is especially important to inspect crops regularly in the first three to five weeks after sowing. • Mites are best detected feeding on the leaves in the morning or on overcast days. In the warmer part of the day RLEM tend to gather at the base of plants, sheltering in leaf sheaths and under debris. They will crawl into cracks in the ground to avoid heat and cold. When disturbed during feeding they will drop to the ground and seek shelter.
Sheep blowfly	• Monitoring climatic conditions can help to predict blowfly activity. • The risk of flystrike increases once the temperature is above 17 °C, wind speeds are moderate (< 30 km per hour) and sheep fleece remains moist from rainfall for a few days. • Monitor blowfly populations through trapping. • Inspect sheep for maggots. • Catch, clip and treat individual blowfly-struck sheep.

Students could generally list the types of monitoring quite well. Fewer students could describe a well-planned strategy that included timing of events.

Question 3c.

Marks	0	1	2	3	4	Average
%	27	29	29	10	4	**1.4**

The outline of the main aspects of the farm biosecurity plan should have included:

- physical prevention activities (consider how the pest or disease could enter the property)
- a plan for monitoring
- a plan for preventative treatments
- a consideration of management options that are available if needed.

Common name of pest or disease	Biosecurity plan for prevention of pest or disease impacting on business
Coccidiosis	Disease agents and pests can be introduced to a poultry farm by the movement of eggs, birds, people, vehicles and equipment between farms, and by clothing, footwear, aerosols, water, feed, litter, wild birds, biting insects and vermin.
Liver fluke	• There are two conditions that need to be met for sheep to be at risk of liver fluke disease (fasciolosis). Firstly, they must graze an area that is constantly damp, such as a marshy area around a spring or seepage, land affected by a slow-running stream or even the wet areas around a farm dam or irrigation channels. Secondly, freshwater snails must be present in that area to act as intermediate hosts for the liver fluke. • Draining or fencing off fluke-prone areas will help reduce the risk of liver fluke disease. Chemical control of snails in fluke-prone areas is generally a poor option. Snails reproduce very quickly and will repopulate treated areas. The use of poisons so close to waterways is likely to be dangerous to the aquatic environment. • The aim in grazing management is to create 'safe' or low contamination pastures for the more susceptible sheep in a flock; that is, the weaners and lambing ewes. • Clean pastures are important for lambing. • Quarantine drench animals before introducing them onto your property.
Intestinal worms	• The worms that affect sheep are not the same worms that affect cattle, and vice versa. So, grazing a paddock with cattle only during the spring will help create a 'safe' paddock for your young sheep at weaning (assuming a spring lambing). In doing so, the cattle will 'vacuum up' the worm larvae at no risk to themselves, thereby reducing the larval contamination for at-risk sheep. • Clean pastures are important for lambing. • Quarantine drench animals before introducing them onto your property.
Cabbage moth	• The pest can survive on alternative weed hosts such as wild radish, wild turnip and turnip weeds. • Removal of all crucifers (especially weeds) at least four weeks prior to sowing may reduce bridging populations of cabbage moths. Reservoirs of moths may be avoided by planting the new crop at a distance from the previous year's crops. • Use white bird netting.
Aphids	• Control weeds on field edges if scouting indicates that aphids are present, and control weeds within crops. • Destroy old crops immediately after the harvest has finished. • Use a fallow period, if possible, when no crop is grown to clear pest populations. • Do not plant new crops near or close to neighbouring infested weeds or old crops (greenhouse and open field). • Use seedlings that have been grown away from infested areas; that is, start with a clean crop. • Avoid moving aphids around the crop by staff moving from infested to clean areas. Do not work in old crops on windy days, especially when prevailing winds are blowing towards new plantings. • Mesh screening has been shown to effectively exclude aphids in covered/protected crops and the use of reflective plastic soil mulch can be beneficial in reducing aphid numbers. Rolls of yellow sticky tape may be useful in some greenhouse designs if placed near entry points and hot spots. • Monitor pest populations for early control. Use yellow cards to alert you of new

	infestations and scout plants by turning leaves to work out where they are. Control is simpler and less expensive when plants are young and spray coverage is not an issue.
Milk fever	• There is no infective agent, so normal biosecurity measures do not apply. • Milk fever is a disorder mainly of dairy cows close to calving. It is a metabolic disease caused by a low blood calcium level (hypocalcaemia). Between 3% and 10% of cows in dairying districts are affected each year, with much higher percentages occurring on some properties. Jersey cows that are mature and fat and graze lush, clover-dominant pasture before calving are most susceptible. • About 80% of cases occur within one day of calving because milk and colostrum production drain calcium (and other substances) from the blood, and some cows are unable to replace the calcium quickly enough. High producers are more susceptible because the fall in their blood calcium level is greater. Selecting cows for high production may, therefore, increase the problem with milk fever. Some individual cow families or breeds (for example, jerseys) are more susceptible than others. • Age is important. Heifers are rarely affected. Old cows increase in susceptibility up to the fifth or six calving because they produce more milk and are less able to replace blood calcium quickly. • The feeding management of dry cows in the two weeks before calving is very important, because it affects both the amount of calcium available to replace blood calcium and the efficiency with which the available calcium can be used. • When the amount of calcium in the diet is greater than is needed, the efficiency of absorbing calcium from the intestine and the efficiency of transferring calcium from the skeleton both become very sluggish and the chance of milk fever is greatly increased. • Also, grazing pastures in southern Australia in winter and spring results in alkaline blood which creates unfavourable conditions for the availability of calcium in the body and predisposes the cow to milk fever. Feeding hay prior to calving and restricting access to green feed results in acidic blood which favours calcium mobilisation from bone and improves calcium absorption from the intestines, both of which are important factors in preventing the occurrence of milk fever. • Fat cows are at a greater risk than thin cows. This is partly because their feed and calcium intake has been higher and partly because fat cows produce more milk at calving time. • Some cows get milk fever several days or even weeks before or after calving. This is usually due to the feed, especially the dietary calcium, being insufficient to meet the heavy demand due to the rapidly growing foetus or milk production in early lactation. • In early lactation, cows should receive as much calcium as possible, and clover-dominant pasture is therefore desirable. They will help to prevent both milk fever and grass tetany.
Red-legged earth mite (RLEM)	• Natural enemies residing in windbreaks and roadside vegetation have been demonstrated to suppress RLEM in adjacent pasture paddocks. • Rotating crops or pastures with non-host crops can reduce pest colonisation, reproduction and survival. For example, prior to planting a susceptible crop like canola, a paddock may be sown to cereals or lentils to help reduce the risk of RLEM population build-up. Cultivation can also help reduce RLEM populations by significantly decreasing the number of over-summering eggs. Hot stubble burns can provide a similar effect. • Clean fallowing and controlling weeds around crop and pasture perimeters can also act to reduce mite numbers. Controlling weeds, especially thistles and capeweed, is important, as they provide important breeding sites for RLEM. Where paddocks have a history of damaging, high-density RLEM populations, it is recommended that sowing pastures with a high clover content be avoided. • Appropriate grazing management can reduce RLEM populations to below damaging thresholds, possibly because shorter pasture results in lower relative humidity, which increases mite mortality and limits food resources. • Other cultural techniques, including modifying tillage practices, trap or border crops

	and mixed cropping, can reduce overall infestation levels to below the economic control threshold, particularly when employed in conjunction with other measures.
Sheep blowfly	• Any flystrike prevention program must be aimed mainly at *Lucilia cuprina*. As this fly breeds almost exclusively on susceptible living sheep, prevention of flystrike will reduce the numbers of this fly. This in turn reduces the pressure on any sheep that do become susceptible to flystrike. • Small flystrikes early in the season provide the means for numbers of *Lucilia cuprina* to build up from the relatively few maggots that survive the winter. These can be greatly reduced by: ○ correct tail docking ○ mulesing of sheep kept for wool (surgical mulesing ceased in 2010, but non-surgical alternatives are under development) ○ preventing scouring by using a good worm control program ○ breeding breech-strike resistant sheep ○ selection away from harsh-woolled, wrinkly sheep. • Destruction of flystruck crutchings kills many maggots that would otherwise survive. Jetting should not be used as a substitute for other management practices, but can be a valuable aid. Trapping • The LuciTrap system consists of a specifically designed trap with a patented blend of chemicals to attract and capture the Australian sheep blowfly (*Lucilia cuprina*). • It is designed to reduce blowfly numbers and fly strike. • The LuciTrap system is an adjunct to other blowfly control procedures and must be combined with them in an IPM program to minimise pesticide use and residues on wool.

Students demonstrated a basic understanding of biosecurity plans but needed to explain these in greater detail to be awarded full marks. For example, the majority of students could list examples of preventative measures but failed to outline a coordinated plan.

Question 3d.

Marks	0	1	2	Average
%	64	31	6	**0.4**

One mark was awarded for mention of more accurate planning for effective timing and selection of appropriate management options in terms of how modelling software could assist with managing a pest or disease. Two marks were awarded for a more detailed response.

This question was poorly answered. Teachers need to make sure that examples of software programs that help predict pest and disease outbreaks are covered. An example is the online program Timerite, which is used for the red-legged earth mite.

Question 4a.

Marks	0	1	2	3	4	Average
%	18	42	26	12	3	**1.5**

Advantages of using this type of biotechnology (genetically modified Roundup Ready Canola) include:

- time saving
- simpler spray equipment and regime
- crop not contaminated with weeds
- crop not harmed
- no, or less, tillage and fewer herbicide applications
- higher yielding genetically modified varieties
- earlier sowing
- reduced traffic, resulting in less compaction
- reduced fuel, labour and machinery
- use of cheaper, broad-spectrum herbicides.

Disadvantages of using this type of biotechnology (genetically modified Roundup Ready Canola) include:

- higher volumes of spray used
- not allowed to save seeds
- drift to other areas
- safety risks with greater use of herbicide
- potential for cross species pollination
- escaped canola may be a problem elsewhere (for example, for neighbours)
- higher seed prices
- need for buffer zones
- threat to organic growers
- diminished gene pool
- weed resistance to herbicide may be increased
- may reduce the saleability of the product.

Most students were able to list some advantages and disadvantages of using this form of biotechnology. More detailed descriptions were generally limited.

Question 4b.

Marks	0	1	2	Average
%	70	26	4	**0.4**

Two risks of genetically modified organisms include:

- risks of spray drift causing damage to the environment, neighbouring crops/pastures, people, fauna, flora and or soil/water
- cross pollination with neighbouring crops or related wild species resulting in herbicide resistance.

Students could not generally explain the effect on organic growers or the environment. When covering various aspects of biotechnology it is important to cover both advantages and disadvantages with regard to impacts on the environment.

Question 5a.

Marks	0	1	2	3	4	5	6	7	Average
%	39	6	10	9	12	11	8	5	**2.4**

5ai.

Students were required to describe a new or emerging technology, including relevant components, structures, functions and or procedures.

If the technology or innovation was not new or emerging, no marks were awarded. Examples of technologies that were not accepted were artificial insemination, animal breeding, auto sprinkler system, electronic ear tags, laser levelling, no-till farming, solar heating and refrigerated trucks. General terms such as GPS were also not accepted.

This type of question has been on many past exams. It is surprising that approximately half of the students were not able to list an appropriate new or emerging technology. It is important that students study a range of new and emerging technologies as required in the study design.

5aii.

This question required students to describe a current technology that would be replaced or describe the problem that inspired the new technology or innovation.

5aiii.

Students were required to evaluate one way that this technology or innovation impacts on the local community, local employment or the environment.

Question 5b.

Marks	0	1	2	3	4	5	6	7	8	Average
%	47	8	10	11	5	7	6	4	2	**2.0**

5bi.

This question required students to describe a second new or emerging technology, including relevant components, structures, functions and or procedures.

If the technology or innovation was clearly old, no marks were awarded.

5bii.
Students were required to explain why an agriculturalist or horticulturalist would choose to invest in this technology or innovation.

5biii.
Students were required to explain the disadvantages, apart from cost, of the technology or innovation.

Question 6a.

Mark	0	1	Average
%	36	64	**0.7**

One practice to confirm that the soil has a problem with soil acidification is to test the pH of the soil in random samples across paddocks.

This question was generally well done. Most students had some understanding of the use of pH kits or probes. Just stating that the soil can be tested was not accepted.

Question 6b.

Marks	0	1	2	Average
%	26	42	32	**1.1**

Practices that could lead to soil acidification included (any two of):

- regular nitrogenous fertiliser application
- fowl manure application
- not liming
- removal of crop
- regular irrigation.

Students could generally identify at least one cause for the acidification. Fewer students could identify a second.

Question 6c.

Marks	0	1	Average
%	53	47	**0.5**

A management practice that would help prevent reduced yields and malformed plants could include (any of):

- add lime regularly
- rotate crops
- strategically apply fertiliser.

Less than half of the students could identify a management strategy. Students should be encouraged to read the information carefully.

Question 6d.

Marks	0	1	2	3	4	5	Average
%	63	16	10	9	3	0	**0.8**

The main components of a scientific experiment to help in deciding the most sustainable combination of chemical application and or manure include:

- an aim or purpose for the investigation or formulation of an investigable question
- the design of the method to be undertaken to carry out the investigation
- identification of the variables within the experiment
- establishment of the controls against which the data is compared
- selection and use of appropriate materials
- safe and ethical processes when performing the investigation
- application of randomisation and repeatability when necessary
- recognition and elimination of experimental errors whenever possible
- identification of the relevant data to be recorded
- an understanding of how the data would be interpreted and analysed.

Full marks were awarded for a description of an experiment that could produce information relating to the most sustainable combination of chemical applications and/or manure. The experiment needed to include most of the points relating to scientific methodology, and the last dot point had to be present. Partial marks were awarded for less detailed responses.

The majority of students demonstrated a poor understanding of how to answer this question. This question covered a new aspect of the study design and highlights the need by teachers to keep up to date and make sure all key knowledge and key skills are covered.

Question 6e.

Marks	0	1	2	3	4	5	6	Average
%	10	26	28	20	8	5	2	**2.2**

6ei.

Not to cause any deterioration in the quality of waterways

6eii.

Acceptable land management practices included (any three of):

- minimise fertiliser applications
- minimise runoff from irrigation
- plant filtering buffer in riparian zone
- exercising care in the amount of water taken for irrigation
- regularly testing water quality for excess nutrients
- minimise pesticides and/or herbicides application
- considering turbidity issues.

Five marks were awarded if students could describe three quite separate practices relating to contaminant runoff, irrigation use and monitoring.

The quality of the responses varied widely. Some students mentioned keeping livestock from the creek even though the property was a 100-hectare property predominantly growing broccoli. Quite a few students stated minimising fertilisers entering the creek as a strategy; however, most failed to make a connection to the potential resultant problems.

Question 7a.

Marks	0	1	2	3	4	Average
%	34	17	23	14	13	**1.6**

Ways that agricultural and horticultural processes and/or operations could contribute to climate change include (any two of):

- emissions from machinery or animals
- nitrous oxide from rice fields and nitrogenous fertilisers
- transport of product
- ruminants producing methane
- clearing of agricultural land and trees.

Most students demonstrated some understanding of the agricultural and horticultural processes by listing them, but few students were able to describe the processes. A few students gave excellent responses.

Question 7b.

Marks	0	1	2	Average
%	29	61	10	**0.8**

As climate changes, possible impacts on production could include (any two of):

- reduced yields
- more watering needed
- increased risk of fungal infections
- early bolting
- high, intense rainfall episodes resulting in flash flooding that could damage crops/lettuces
- an increase in the incidence of pests and diseases.

Most students identified one impact, but only a small group could identify a second.

Question 7c.

Marks	0	1	2	3	4	Average
%	30	23	28	13	6	**1.4**

Possible changes that could be made to an agricultural or horticultural business to better cope with expected climate change could include (any two of):

- changing variety/breed
- altering housing, shade cloth over dairies
- timing of planting
- keeping cows cool while waiting to be milked
- climate control systems for greenhouses
- improved strategies for better use of water on the property.

Most students could list one or two changes that a business could make, but fewer students could expand on their answer to gain full marks. This question asked students to give a response from their own knowledge of the subject matter on climate change, not related specifically to lettuce growing.

Question 8a.

Marks	0	1	2	3	4	Average
%	3	18	42	26	11	**2.3**

8ai.

Students were required to state what product or service their chosen business type provided.

Most students could list a product or service relevant to the business type.

8aii.

Students were required to state what the main inputs, processes and outputs were of their enterprise.

Many students were able to list some of the inputs, processes and outputs; however, few were able to list the majority of these. This was surprising as the small business that students undertake include many inputs, processes and outputs. It is important that teachers stress that students have a detailed knowledge of the commercial business that their business is aligned with.

Question 8b.

Marks	0	1	2	3	4	Average
%	30	31	21	10	**7**	**1.4**

Students were required to explain the key sections of a business plan that would need to be included in the selected business. These include:

- a production plan, including timeline (especially time to first returns) and quality assurance
- a marketing plan, including market requirements of quality and supply
- establishment costs and ongoing costs
- expected cash flow and returns on production.

For full marks, one mark was required for each aspect.

Students could generally list only one or two of sections of a business plan. This is disappointing as students are required to cover all these aspects in their business proposal that they undertake.

Question 8c.

Marks	0	1	2	3	4	5	Average
%	26	30	23	12	7	2	**1.6**

8ci.

Students were required to identify specific areas of their particular business type that needed to be regularly monitored to ensure the product or service meets market specifications. Responses needed to discuss measures such as:

- appropriate weight range (for example, prime lamb, fat depth)

- micron diameter, cleanliness of fleece
- degrees of blemish on apples
- somatic cell count.

8cii.
Students needed to explain how a quality assurance program would help to maintain the quality of their product or service. This included things such as regular audits/inspections/checks built in to the farm management schedule and made on all aspects of production that could lead to the lower quality of their product or service or environmental or OH&S problems.

Question 8d.

Marks	0	1	2	Average
%	57	38	5	**0.5**

Steps or checks that a business owner should undertake to ensure that the business is economically sustainable include:

- the availability of a regularly accessible market for the product
- the costs of production are lower than sale price
- finance is available to ensure next inputs
- resources are not degraded.

Students could generally state only one way of ensuring that the business is viable. Most responses listed having income greater than costs.

Question 8e.

Marks	0	1	2	3	4	Average
%	31	34	20	11	5	**1.3**

Students were required to analyse how climate change may affect their chosen business type. They needed to consider the strengths, weaknesses, opportunities and threats presented by the likely changes in climate.

In their response students needed to include the following predictions:

- average temperatures increasing
- up to 25% less rainfall (in Victoria) on average
- high rates of evaporation and higher humidity
- less reliable seasonal rainfall and temperatures
- increase in extreme weather events and more regular periods of drought.

Full marks were awarded if the student related the above points to the specific business type and at least four effects were explained. Partial marks were awarded for less detailed responses.

The majority of students could identify at least two effects they should consider. However, detailed analysis was lacking which resulted in few students gaining full marks.

Question 8f.

Marks	0	1	2	Average
%	77	15	8	**0.3**

The main act is the *Catchment and Land Protection Act* 1994. In addition to being required to protect water resources, control pest animals and eradicate weeds, landowners are required to take all reasonable steps to:

- avoid causing or contributing to land degradation that causes or may cause damage to another landowner
- conserve soil
- control pests and vermin.

This question was poorly answered. Few students could identify a relevant Act. Students are required to study several Acts and how they relate to resource management. The study design clearly states that this needs to be covered.