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Important information

**Accreditation period**

Units 1–4: 1 January 2020 – 31 December 2025.
Implementation of this study commences in 2020.

**Other sources of information**

The [*VCAA Bulletin*](https://www.vcaa.vic.edu.au/news-and-events/bulletins-and-updates/bulletin/Pages/index.aspx) is the only official source of changes to regulations and accredited studies. The Bulletin also regularly includes advice on VCE studies. It is the responsibility of each VCE teacher to refer to each issue of the Bulletin. The Bulletin is available as an e-newsletter via free subscription on the VCAA’s website at: [www.vcaa.vic.edu.au](https://www.vcaa.vic.edu.au/Pages/HomePage.aspx).

To assist teachers in developing courses, the VCAA publishes online the Advice for teachers, which includes teaching and learning activities for Units 1 to 4, and advice on assessment tasks and performance level descriptors for School-assessed Coursework in Units 3 and 4.

The current [*VCE and VCAL Administrative Handbook*](https://www.vcaa.vic.edu.au/administration/vce-vcal-handbook/Pages/index.aspx) contains essential information on assessment processes and other procedures.

**VCE providers**

Throughout this study design the term ‘school’ is intended to include both schools and other VCE providers.

**Copyright**

VCE schools may reproduce parts of this study design for use by teachers. The full VCAA Copyright Policy is available at: [www.vcaa.vic.edu.au/Footer/Pages/Copyright.aspx](https://www.vcaa.vic.edu.au/Footer/Pages/Copyright.aspx).

Introduction

Scope of study

VCE Agricultural and Horticultural Studies takes an interdisciplinary approach to the exploration of food and fibre production, with an overarching focus on land cultivation and the raising of plants and animals through evidence-based, sustainable and ethical practices. Students consider the role of agriculture and horticulture from local, state, national and global perspectives.

This study focuses on the rapid rate of change in the agriculture and horticulture industries and the increasing application of innovation and data-driven initiatives. The interdisciplinary nature of the study enables students to develop their decision-making and problem-solving skills by applying scientific methods of testing and monitoring, collecting and analysing relevant data, and researching current issues and best-practice case studies. Students conduct primary and secondary research to design and evaluate sustainable practices, understand challenges and current issues, propose solutions and determine best practice.

Practical tasks are integral to Agricultural and Horticultural Studies and may include: plant and/or animal management; experiential field trips; scientific trials, experiments and data analysis; business or entrepreneurial practices including value-adding activities; investigative reporting on best practice; and virtual reality experiences.

Rationale

Primary industries are an essential part of Australia’s economy, society and culture. As Australia faces a rising population and increasing urgency to conserve resources and mitigate the effects of climate change, the productivity and sustainability of its agricultural and horticultural sectors are critical to its future.

Sustainable management of food and fibre industries is vital for local, national and global markets. This study provides opportunities for students to experience and understand these primary industries, with a particular focus on the ways in which change and innovation are reshaping practices, careers and business opportunities.

VCE Agricultural and Horticultural Studies develops students' understanding of sustainable agricultural and horticultural systems within current economic, social and environmental contexts, and in view of ethical considerations.

The broad, applied nature of VCE Agricultural and Horticultural Studies prepares students for further studies and careers in agriculture, horticulture, land management, agricultural business practice and natural resource management. This study complements the skills focus of the competency-based nationally recognised VCE VET Agriculture, Horticulture, Conservation and Land Management program.

Aims

This study enables students to:

* gain an understanding of the role of agricultural and horticultural industries in local, state, national and global contexts
* develop awareness of the breadth and viability of career pathways and employment opportunities in food and fibre production
* develop understanding of ethical and sustainable land, water, plant and animal management
* analyse the drivers and effects of change in food and fibre industries and apply innovative technologies to practices
* engage in applied, experiential tasks to extend understanding of agricultural and horticultural practices
* apply scientific methodologies and data analysis to agricultural and horticultural planning and problem solving
* analyse challenges to food and fibre production including climate change, biological resistances and threats to biodiversity and biosecurity
* evaluate information and various points of view on issues relating to the food and fibre industries.

Structure

The study is made up of four units.

Unit 1: Change and opportunity

Unit 2: Growing plants and animals

Unit 3: Securing the future

Unit 4: Sustainable food and fibre production

Each unit deals with specific content contained in areas of study, and is designed to enable students to achieve a set of outcomes for that unit. Each outcome is described in terms of key knowledge and key skills.

Entry

There are no prerequisites for entry to Units 1, 2 and 3. Students must undertake Unit 3 and Unit 4 as a sequence. Units 1 to 4 are designed to a standard equivalent to the final two years of secondary education. All VCE studies are benchmarked against comparable national and international curriculum.

Duration

Each unit involves at least 50 hours of scheduled classroom instruction.

Changes to the study design

During its period of accreditation minor changes to the study will be announced in the [*VCAA Bulletin*](https://www.vcaa.vic.edu.au/news-and-events/bulletins-and-updates/bulletin/Pages/index.aspx). The Bulletin is the only source of changes to regulations and accredited studies. It is the responsibility of each VCE teacher to monitor changes or advice about VCE studies published in the Bulletin.

Monitoring for quality

As part of ongoing monitoring and quality assurance, the VCAA will periodically undertake an audit of VCE Agricultural and Horticultural Studies to ensure the study is being taught and assessed as accredited. The details of the audit procedures and requirements are published annually in the [*VCE and VCAL Administrative Handbook*](https://www.vcaa.vic.edu.au/administration/vce-vcal-handbook/Pages/index.aspx). Schools will be notified if they are required to submit material to be audited.

Safety and wellbeing

It is the responsibility of the school to ensure that duty of care is exercised in relation to the health and safety of all students undertaking the study. This study may involve the handling of potentially hazardous substances and equipment, and engagement with food and fibre production practices that may present risks. See Cross-study specifications for further details on health and safety, and on animal welfare in schools.

Employability skills

This study offers a number of opportunities for students to develop employability skills. The *Advice for teachers* online resource provides specific examples of how students can develop employability skills during learning activities and assessment tasks.

Legislative compliance

When collecting and using information, the provisions of privacy and copyright legislation, such as the Victorian *Privacy and Data Protection Act 2014* and *Health Records Act 2001*, and the federal *Privacy Act 1988* and *Copyright Act 1968*, must be met.

Assessment and reporting

Satisfactory completion

The award of satisfactory completion for a unit is based on the teacher’s decision that the student has demonstrated achievement of the set of outcomes specified for the unit. Demonstration of achievement of outcomes and satisfactory completion of a unit are determined by evidence gained through the assessment of a range of learning activities and tasks.

Teachers must develop courses that provide appropriate opportunities for students to demonstrate satisfactory achievement of outcomes.

The decision about satisfactory completion of a unit is distinct from the assessment of levels of achievement. Schools will report a student’s result for each unit to the VCAA as S (Satisfactory) or N (Not Satisfactory).

Levels of achievement

Units 1 and 2

Procedures for the assessment of levels of achievement in Units 1 and 2 are a matter for school decision. Assessment of levels of achievement for these units will not be reported to the VCAA. Schools may choose to report levels of achievement using grades, descriptive statements or other indicators.

Units 3 and 4

The VCAA specifies the assessment procedures for students undertaking scored assessment in Units 3 and 4. Designated assessment tasks are provided in the details for each unit in VCE study designs.

The student’s level of achievement in Units 3 and 4 will be determined by School-assessed Coursework (SAC) as specified in the VCE study design, and external assessment.

The VCAA will report the student’s level of achievement on each assessment component as a grade from A+ to E or UG (ungraded). To receive a study score the student must achieve two or more graded assessments and receive S for both Units 3 and 4. The study score is reported on a scale of 0–50; it is a measure of how well the student performed in relation to all others who took the study. Teachers should refer to the current [*VCE and VCAL Administrative Handbook*](https://www.vcaa.vic.edu.au/administration/vce-vcal-handbook/Pages/index.aspx) for details on graded assessment and calculation of the study score. Percentage contributions to the study score in VCE Agricultural and Horticultural Studies are as follows:

Unit 3 School-assessed Coursework: 30 per cent

Unit 4 School-assessed Coursework: 30 per cent

End-of-year examination: 40 per cent.

Details of the assessment program are described in the sections on Units 3 and 4 in this study design.

Authentication

Work related to the outcomes of each unit will be accepted only if the teacher can attest that, to the best of their knowledge, all unacknowledged work is the student’s own. Teachers need to refer to the current [*VCE and VCAL Administrative Handbook*](https://www.vcaa.vic.edu.au/administration/vce-vcal-handbook/Pages/index.aspx) for authentication procedures.

Cross-study specifications

Cross-study specifications provide details of the concepts that underpin Units 1 to 4 of the study design.

Animal welfare

Across the study, the importance of animal welfare is implicit to any discussion or investigation of relevant agricultural practices.

All schools in Victoria must follow an approval process to use live animals for teaching.
In accordance with legislative requirements, every Victorian school using animals for scientific teaching and learning must be covered by a Scientific Procedures Premises Licence (SPPL). A single licence held by the Department of Education and Training covers all government schools.

Catholic and Independent schools must apply for individual licences obtained through Agriculture Victoria. Further information can be found at: <http://agriculture.vic.gov.au/agriculture/animal-health-and-welfare/animals-used-in-research-and-teaching/licensing/schools>.

The Victorian Schools Animal Ethics Committee (VSAEC) assists Victorian schools to comply with relevant legislation in the responsible care for animals used in teaching. VSAEC is available to government, Catholic and independent schools. Further information can be found on the Department of Education and Training’s Teaching with animals page at: [www.education.vic.gov.au/school/teachers/teachingresources/practice/Pages/animals.aspx](http://www.education.vic.gov.au/school/teachers/teachingresources/practice/Pages/animals.aspx).

Applied practical learning

The integration of applied practical tasks is integral to VCE Agricultural and Horticultural Studies. Practical programs are contingent on school settings, resources and capabilities. They take into consideration student interest and preferences, and can be undertaken as collaborative or individual activities. The VCE Agricultural and Horticultural Studies Advice for Teachers online resource provides examples of applied practical tasks.

Practical tasks focus on an aspect of food and fibre production relevant to the area of study being undertaken and may include:

* management of plants and/or animals
* field trips with participatory experiences
* scientific trials and experiments (field-based or in a laboratory)
* data collection, analysis and application
* business or entrepreneurial practices including value-adding activities
* investigation of best-practice case studies
* virtual reality experiences.

Health and safety

Risk and safety assessment, and the principles of occupational health and safety, are integral to agricultural and horticultural practices and systems and must underpin all practical tasks and theoretical responses. For the purposes of this study, mental health and wellbeing is an essential component of OH&S in agricultural and horticultural industries.

Innovation, technology and data

Contemporary agricultural and horticultural industries are subject to pervasive change and innovation, resulting in developments in technology, information sharing and communications. Demographics, climate, the role of large agribusinesses, the advent of automation and the widening use of data have transformed food and fibre production in recent decades, along with customer engagement and expectation.

Issues in food and fibre production

Many aspects of food and fibre production are subject to public scrutiny and to government action and regulation. Some aspects are contentious and/or politicised in public discourse and are therefore seen as ‘issues’. Issues may be entrenched and ongoing or flashpoints that demand resolution. Consequences for agricultural and horticultural practices can be sudden, unpredictable and costly. Conversely, positive change may occur and new business opportunities arise. Consideration of issues is integrated throughout each unit of this study to reflect the constant awareness and preparedness necessary in the food and fibre industries.

Scientific methodology

The development of skills in testing, measuring and monitoring conditions and practices in food and fibre production is both vital and ongoing. Evidence-based assessments and decisions are integral to everyday agricultural and horticultural practices and to long-term viable and sustainable production. It is essential that a scientific methodology is used when collecting, analysing and evaluating data for agricultural and horticultural contexts and applications. This evidence-based investigation should take the following form:

* develop aims and questions, formulate hypotheses and make predictions
* plan and undertake investigations
* comply with safety and ethical guidelines
* conduct investigations to collect and record data
* analyse and evaluate data, methods and scientific models
* draw evidence-based conclusions
* communicate and explain scientific ideas.

Sustainability

Sustainability is presented throughout this study as a complex, holistic concept with environmental, social and economic dimensions. The environmental dimension focuses on biodiversity and climate change, with investigation of protection, mitigation and rehabilitation strategies extending across land, soil, water and air. Social sustainability relates to individuals having a decent standard of living in a healthy environment. It includes human health incorporating wellbeing and resilience, democratic decision-making and fair employment conditions. It extends to land custodianship that is considerate of the broad community and future generations. Economic sustainability refers to managing agricultural and horticultural practices in a way that supports long-term economic production.

Unit 1: Change and opportunity

In this unit students develop their understanding of Australia’s agricultural and horticultural industries and research the opportunities and practical realities of working in the sector. They consider sources of food and fibre indigenous to Victoria prior to European settlement, and current and past perceptions of Australian agricultural and horticultural industries. Students explore contemporary career pathways and professional roles, with a focus on innovation and creative problem solving in the face of change and challenge. Students seek to understand socio-cultural influences on food and fibre practices, and best practice in agriculture and horticulture in terms of climate zones, soil quality, plant and animal selection, workplace health and safety, and the collection and analysis of quality-assurance data. Students undertake practical tasks reflecting best-practice understandings.

Area of Study 1

Food and fibre industries

In this area of study students are introduced to agriculture and horticulture as industries that are valued by Australians for cultural and social reasons, as well as being vital to Australia’s economic prosperity. They discuss change as a significant concept in agriculture and horticulture, and recognise how this underpins the importance of creative and innovative practices.

Students consider the use of land and the sourcing of food and fibre by Victoria’s first peoples prior to European settlement. They investigate agricultural and horticultural production from past and present perspectives. Students analyse a range of influences on the establishment of industries and explore career pathways and opportunities.

Outcome 1

On completion of this unit the student should be able to identify major food and fibre production industries in Australia, describe career pathways within these industries, discuss a range of influences on agricultural and horticultural practices, and undertake practical analysis of conditions required for food and fibre production.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 1.

Key knowledge

* the use of land as a source of food and fibre by Victoria’s first peoples and European settlers
* past and present perceptions of the cultural, social and economic roles of Australia’s agricultural and horticultural industries
* key sectors and industries producing food and fibre in Australia for domestic and export markets
* major climate zones in Australia and their key food and fibre industries
* influences on the establishment and location of particular food and fibre industries in Victoria: climatic conditions; soil quality; socio-cultural factors
* the changing nature of professional roles, career pathways and employment opportunities in agriculture and horticulture
* the drivers of change in Australian food and fibre industries, such as innovation and technology, consumer demand, retailer influence, ethical considerations, climate, availability of labour, urban encroachment and global markets
* current trends and movements in agriculture and/or horticulture, such as increased automation, factory farming, lot feeding, sustainable land management, agroecology, community-supported agriculture (CSA), farmers’ markets and urban agriculture.

Key skills

* consider the uses of land in Australia as a source of food and fibre, with reference to contemporary and historical perspectives
* identify key agricultural and horticultural industries in Australia
* analyse relationships between regional climate, soil quality and socio-cultural factors, and the establishment and location of the food and fibre industries
* analyse the changing nature of employment opportunities in Australia’s food and fibre production industries
* investigate the effects of change and innovation in Australian food and fibre production
* describe trends and movements in Australian agriculture and horticulture, drawing conclusions about their potential long-term influence
* demonstrate through practical tasks an analysis of conditions for agricultural and/or horticultural practices.

Area of Study 2

Food and fibre production

In this area of study students gain a broad understanding of agricultural and horticultural practices, with a focus on soil management and the selection of suitable plant and animal varieties. Students explore systems and production cycles, best practice for health and safety, and the factors that influence the growth and development of plants and animals. Through practical tasks, students make decisions about testing soils and selecting suitable plants and animals. Students also consider tools for and methods of testing and measuring quality and improvement in agricultural and horticultural practices.

Outcome 2

On completion of this unit the student should be able to identify safe and productive agricultural and horticultural systems, explain optimal selection of suitable plants and animals, and demonstrate the collection and application of data in a practical task/s.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 2.

Key knowledge

* key elements of agricultural and horticultural systems: inputs, processes and outputs
* economic, environmental, social and ethical considerations for sustainable agricultural and horticultural businesses
* best-practice health and safety principles in agricultural and horticultural practices, and in supporting the mental health of workers
* annual production cycles in horticultural and agricultural practices
* characteristics of productive soil, and techniques for testing soil quality
* techniques for improving soil quality and minimising soil degradation
* advantages and disadvantages of using alternative plant-growing media such as hydroponics and aquaponics
* types of plants and animals to suit particular objectives, regions and agricultural and/or horticultural production systems
* scientific methodology for gathering relevant evidence for planning, analysis of and quality assurance in food and fibre production, such as data collection and scientific experimentation.

Key skills

* describe practices and production cycles of agriculture and horticulture using a systems model
* assess the feasibility of agricultural and/or horticultural practices through economic, environmental and social sustainability, and ethical considerations
* describe and apply best-practice principles in promoting health and safety in agriculture and horticulture
* test for soil quality and apply techniques for soil improvement
* justify the use of alternative growth media in plant production
* justify selection of particular plants and animals for agricultural and/or horticultural practices
* evaluate case studies of agricultural and horticultural systems that rely on data collection and/or scientific experimentation
* demonstrate through practical tasks the collection and application of data in agricultural and/or horticultural practices.

Assessment

The award of satisfactory completion for a unit is based on whether the student has demonstrated the set of outcomes specified for the unit. Teachers should use a variety of learning activities and assessment tasks that provide a range of opportunities for students to demonstrate the key knowledge and key skills in the outcomes.

The areas of study, including the key knowledge and key skills listed for the outcomes, should be used for course design and the development of learning activities and assessment tasks. Assessment must be a part of the regular teaching and learning program and should be completed mainly in class and within a limited timeframe.

All assessments at Units 1 and 2 are school-based. Procedures for assessment of levels of achievement in Units 1 and 2 are a matter for school decision.

For this unit students are required to demonstrate two outcomes. As a set these outcomes encompass the areas of study in the unit.

Suitable tasks for assessment in this unit are:

* practical task/s relating to factors influencing the location and establishment of food and fibre industries, and the collection and application of data in an agricultural or horticultural setting.

Additionally, suitable tasks for assessment in this unit may be selected from the following:

* a short written report: media analysis, research inquiry, annotated infographic/concept map or feasibility study of agricultural or horticultural practice/s
* an oral presentation
* a case study analysis
* a video or podcast.

Where teachers allow students to choose between tasks they must ensure that the tasks they set are of comparable scope and demand.

Unit 2: Growing plants and animals

In this unit students research plant and animal nutrition, growth and reproduction. They develop an understanding of the conditions in which plants and animals grow and reproduce, and of related issues and challenges. They evaluate the effectiveness and sustainability of agricultural or horticultural practices. Students investigate the structure, function, nutrition and growth of plants. They explore animal nutrition and digestion, and growth and development, and make comparisons between production methods. Students research reproductive processes and technologies for both plants and animals within the contexts of food and fibre production. They undertake practical tasks relating to the growth and management of plants and animals.

Area of Study 1

Plant nutrition, growth and reproduction

In this area of study students focus on plant production in agriculture and/or horticulture. They investigate challenges and issues that affect practices and decisions in plant production, and develop an understanding of plant structure, function, nutrition, growth and reproduction. Practical tasks should focus on aspects of plant propagation and/or growth.

Outcome 1

On completion of this unit the student should be able to analyse the growth stages of plants, describe plant genetics and reproduction, and demonstrate the propagation of plants and the measurement of plant growth.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 1.

Key knowledge

* challenges, issues and proposed solutions affecting plant production in agricultural or horticultural industries
* the structure of plants and the functions of photosynthesis, respiration and transpiration
* the growth stages of common horticultural and/or agricultural plants and the role of hormones in the growth cycle
* functions of macronutrients and micronutrients in plant production, and their role in achieving sustainable yields and preventing nutrient deficiencies
* climatic and seasonal influences on the growth and reproduction of plants
* processes, advantages and disadvantages of asexual and sexual plant reproduction or propagation and selection of genes through plant breeding
* use of technology and post-harvest processing to improve plant production.

Key skills

* explain challenges and issues in plant production and analyse proposed solutions
* describe the structure and function of plants and the stages of plant growth
* demonstrate understanding of plant nutrients and hormones and their role in the growth of plants
* debate the importance of seasonality in the production of plants for food
* compare asexual and sexual plant reproduction or propagation
* justify the selection of particular genes for plant breeding
* evaluate technologies used in agriculture and/or horticulture to improve plant production
* demonstrate techniques of plant propagation and the monitoring of plant growth.

Area of Study 2

Animal nutrition, growth and reproduction

In this area of study students focus on animal production in agricultural contexts. They investigate challenges and issues that affect practices and decisions in managing animal production. Students study animal nutrition, digestion, growth, development and reproduction, including principles of genetics and selective breeding, and the use of reproductive technologies.

Outcome 2

On completion of this unit the student should be able to compare animal production methods, explain animal digestion, nutrition, growth and reproduction, and demonstrate practical aspects of managing animals in agriculture.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 2.

Key knowledge

* challenges, issues and proposed solutions affecting animal production in food and fibre industries
* extensive and intensive animal production and the advantages and challenges of each method
* digestive systems: ruminant, monogastric and avian
* nutrient requirements of animals across various stages of growth and development
* the structure and function of mammalian and avian reproductive systems
* the processes and developmental stages of animal reproduction
* techniques used to manipulate the reproductive cycles of animals
* the use of reproductive technologies in animal production
* principles of animal genetics and the purposes of breeding programs.

Key skills

* explain challenges and issues in animal production and analyse proposed solutions
* compare extensive and intensive animal production and draw conclusions about the advantages and disadvantages of each
* compare ruminant, monogastric and avian digestive systems
* explain mammalian and avian reproductive systems
* describe the stages of animal growth and development, and the nutrient requirements
of each stage
* evaluate the use of reproductive technologies in animal production
* explain basic animal genetics
* describe the purposes of agricultural breeding programs
* demonstrate through practical tasks the management of animals in agriculture.

Assessment

The award of satisfactory completion for a unit is based on whether the student has demonstrated the set of outcomes specified for the unit. Teachers should use a variety of learning activities and assessment tasks that provide a range of opportunities for students to demonstrate the key knowledge and key skills in the outcomes.

The areas of study, including the key knowledge and key skills listed for the outcomes, should be used for course design and the development of learning activities and assessment tasks. Assessment must be a part of the regular teaching and learning program and should be completed mainly in class and within a limited timeframe.

All assessments at Units 1 and 2 are school-based. Procedures for assessment of levels of achievement in Units 1 and 2 are a matter for school decision.

For this unit students are required to demonstrate two outcomes. As a set, these outcomes encompass the areas of study in the unit.

Suitable tasks for assessment in this unit are:

* practical task/s relating to aspects of plant propagation and/or the measurement of plant growth and aspects of animal management in an agricultural industry.

Additionally, suitable tasks for assessment in this unit may be selected from the following:

* a short written report: a research inquiry, a response to an issue or an infographic or annotated chart
* an oral presentation
* a case study analysis
* a video or podcast.

Where teachers allow students to choose between tasks they must ensure that the tasks they set are of comparable scope and demand.

Unit 3: Securing the future

In this unit students examine the role of research and data, innovation and technology in Australia’s food and fibre industries. They also look at practices that mitigate risk and protect the viability of these industries. Innovation is considered in the context of problem solving and finding solutions to challenges faced by food and fibre producers in Australia and globally. Students research Australia’s past responses to such challenges, analysing responses leading to successful outcomes as well as those with unforeseen consequences. Students consider the everyday role of innovation and technology in agriculture and/or horticulture and research the impacts of new and emerging developments over the past six years. They explore the influence of market demands and social expectations as drivers of change. Emphasis is placed on the importance of biosecurity: the protection of agricultural and horticultural industries against pests, diseases and weeds, and measures to combat the serious threat posed by biological resistances. Students undertake practical tasks reflecting awareness of innovative, sustainable and safe agricultural and/or horticultural practices.

Area of Study 1

Innovations and solutions

In this area of study students focus on the dynamic and innovative nature of Australia’s food and fibre production industries. They reflect on the rate of change, the rise of new challenges, and the sector’s ever-increasing engagement with innovation and technology. Students inquire into the broad role of innovation and technology in food and fibre production, and consider the impacts of new and emerging tools and applications, as well as innovative research projects. Students reflect on past initiatives, contemporary responses to consumer concerns and ways to evaluate the effectiveness of particular innovations in agricultural and horticultural practices.

Outcome 1

On completion of this unit the student should be able to describe the role of innovation and technology in agricultural and horticultural practices, analyse past and current initiatives, including unforeseen consequences, and apply innovative processes to agricultural and/or horticultural practices.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 1.

Key knowledge

* the role of innovation and technology in everyday agricultural and horticultural practices in Australia
* the impacts of new and emerging innovations in Australia’s food and fibre industries
* current Australian agricultural and/or horticultural research projects and/or partnerships that aim to find solutions to the challenges of climate change, waste of food produce, and increased demand due to population growth
* past initiatives by Australian agricultural and/or horticultural industries to control a threat or problem, including examples leading to both successful outcomes and to unforeseen consequences
* techniques for measuring and assessing the effectiveness of innovations and/or technology in agricultural and/or horticultural practices
* points of view relating to safe, ethical and sustainable food and fibre production in Australia, including genetically modified organisms (GMO), animal welfare and the use of pesticides and herbicides.

Key skills

* discuss the changing role of technology and innovation in agricultural and horticultural industries
* describe the impacts of new and emerging innovations and evaluate their potential value to the food and fibre industries
* explain current research into challenges faced by Australia’s food and fibre industries and evaluate proposed solutions
* evaluate the success of past initiatives in the management and/or eradication of threats to Australia’s food and fibre production
* justify industry responses to various consumer demands for ethical and sustainable food and fibre production in Australia
* demonstrate principles of safe, ethical and sustainable food and/or fibre production
* apply innovative processes and/or solutions to agricultural and/or horticultural practices.

Area of Study 2

Risks and resilience

In this area of study students focus on biosecurity, the protection of agricultural and horticultural industries against pests, diseases and weeds, and measures to combat the serious threat posed by biological resistances. Students develop their understanding of specific pests, diseases and weeds that threaten Victorian agriculture and horticulture. Emphasis is placed on principles of integrated pest and weed management.

Outcome 2

On completion of this unit the student should be able to identify and describe pests, diseases and weeds of concern to Victorian food and fibre industries, describe principles of integrated pest and weed management, analyse the problem of biological resistances and discuss the role of biosecurity.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 2.

Key knowledge

* characteristics of metabolic, metazoal and microbial pests and diseases that threaten Victorian agricultural and horticultural plants and/or animals
* strategies for prevention and control of the following common pests and diseases of plants and/or animals:
* pests: aphids; western flower thrips; intestinal worms
* diseases: footrot; fungal rusts; milk fever
* principles of integrated pest management
* strategies for prevention and control of the following weeds commonly affecting agricultural and/or horticultural production: flickweed; gorse; wild radish
* principles of integrated weed management
* reasons for, impacts of, and strategies to combat biological resistance to herbicides, pesticides and antibiotics in Australian food and fibre industries.
* the role of national and property biosecurity measures and laws governing Australian agriculture and horticulture.

Key skills

* investigate and apply principles of integrated pest and weed management for measuring and controlling risk factors in agriculture and/or horticulture
* describe common agricultural and/or horticultural pests and diseases and explain their impact on the food and fibre industries
* describe common agricultural and/or horticultural weeds and explain their impact on the food and fibre industries
* discuss strategies of prevention and control for common agricultural and/or horticultural pests, diseases and weeds
* demonstrate practical tasks concerning integrated pest and weed management
* analyse potential solutions to the problem of biological resistances in agriculture and/or horticulture
* explain national and property biosecurity measures and laws affecting Australian agriculture and horticulture.

School-based assessment

Satisfactory completion

The award of satisfactory completion for a unit is based on whether the student has demonstrated the set of outcomes specified for the unit. Teachers should use a variety of learning activities and assessment tasks to provide a range of opportunities for students to demonstrate the key knowledge and key skills in the outcomes.

The areas of study and key knowledge and key skills listed for the outcomes should be used for course design and the development of learning activities and assessment tasks.

Assessment of levels of achievement

The student’s level of achievement in Unit 3 will be determined by School-assessed Coursework. School-assessed Coursework tasks must be a part of the regular teaching and learning program and must not unduly add to the workload associated with that program. They must be completed mainly in class and within a limited timeframe.

Where teachers provide a range of options for the same School-assessed Coursework task, they should ensure that the options are of comparable scope and demand.

The types and range of forms of School-assessed Coursework for the outcomes are prescribed within the study design. The VCAA publishes *Advice for teachers* for this study, which includes advice on the design of assessment tasks and the assessment of student work for a level of achievement.

Teachers will provide to the VCAA a numerical score representing an assessment of the student’s level of achievement. The score must be based on the teacher’s assessment of
the performance of each student on the tasks set out in the following table.

Contribution to final assessment

School-assessed Coursework for Unit 3 will contribute 30 per cent to the study score.

|  |  |  |
| --- | --- | --- |
| **Outcomes** | **Marks allocated** | **Assessment tasks** |
| **Outcome 1**Describe the role of innovation and technology in agricultural and horticultural practices, analyse past and current initiatives, including unforeseen consequences, and apply innovative processes to agricultural and/or horticultural practices. | **50****50** | Student performance will be assessed by:* practical task/s related to innovative processes and/or problem solving in agriculture and/or horticulture.

ANDAny one or a combination of the following:* a short written report: research inquiry, media analysis, case study analysis, or field/laboratory experiment
* an annotated visual report
* an oral presentation or practical demonstration
* a video or podcast.
 |
| **Outcome 2**Identify and describe pests, diseases and weeds of concern to Victorian food and fibre industries, describe principles of integrated pest and weed management, analyse the problem of biological resistances and discuss the role of biosecurity. | **50****50** | Student performance will be assessed by:* practical task/s related to integrated pest and/or weed management.

ANDAny one or a combination of the following:* a short written report: research inquiry, media analysis, case study analysis or field/laboratory experiment
* an annotated visual report
* an oral presentation or practical demonstration
* a video or podcast.
 |
| **Total marks** | **100****100** |  |

External assessment

The level of achievement for Units 3 and 4 is also assessed by an end-of-year examination, which will contribute 40 per cent to the study score.

Unit 4: Sustainable food and fibre production

In this unit students examine sustainability in terms of land management, as well as its role in food and fibre industries. Sustainability is a holistic concept with environmental, economic and social dimensions. Students research the effects of climate change on food and fibre production through case studies of effective responses to this and other environmental challenges. Students investigate environmental degradation and approaches to sustainable land management and rehabilitation. They study ecosystems, the importance of biodiversity and the applicability of environmental modification techniques. In particular, students consider the constant monitoring of environmental indicators. Within the context of agricultural and/or horticultural practices, sustainability is viewed as both a challenge and an opportunity, with students extending their thinking across the entire production chain from resource suppliers through to consumers. They research strategies for securing sustainable markets, for adding value to primary produce, and for ensuring and promoting the high quality of Australian-grown products. Students undertake practical tasks reflecting all dimensions of sustainable management of agricultural and/or horticultural practices as well as ethical considerations.

Area of Study 1

Sustainable land management

In this area of study students examine sustainable land management, including property management, with a focus on the prevention and mitigation of environmental degradation and the impacts of climate change. Students investigate appropriate and sustainable strategies, adaptations and modifications, evaluating associated safety and risk factors. Comparisons are made between natural and managed ecosystems, with inquiry into the significance of biodiversity for sustainable food and fibre production. Students research and apply techniques for testing and monitoring of environmental health in agricultural and/or horticultural contexts.

Outcome 1

On completion of this unit the student should be able to analyse the impacts of climate change and environmental degradation on food and fibre production, evaluate strategies for environmental protection and rehabilitation, and discuss techniques for monitoring the sustainability of agricultural and/or horticultural practices.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 1.

Key knowledge

* the impacts of climate change on food and fibre production
* sustainable strategies in agricultural and/or horticultural industries to address the impacts of climate change
* the role of sustainable property management in determining appropriate land use
* types of environmental degradation: erosion, salinity, waterlogging, compaction, soil acidity, soil nutrient depletion
* techniques for the prevention of environmental degradation and the rehabilitation of land, soil, water and air
* issues of water quality related to food and fibre production: levels of nitrogen, phosphorus and dissolved oxygen; acidity or alkalinity (pH); electrical conductivity (EC); turbidity
* sustainable strategies in agricultural and/or horticultural industries to manage and conserve water and finite energy resources
* natural and managed ecosystems including the importance of biodiversity to the sustainability of agriculture and/or horticulture
* techniques and rationale for environmental control and modification in agriculture and/or horticulture: modification of microclimate; soil or growing media; topography
* indicators and techniques for testing and monitoring environmental health.

Key skills

* explain principles of sustainable land management
* analyse impacts of climate change on Australia’s food and fibre production
* evaluate examples of property management that relate to effective prevention and mitigation of the effects of climate change on food and fibre production
* identify types of environmental degradation and propose action for prevention and control
* justify techniques of environmental control and modification in agriculture and/or horticulture and evaluate the sustainability of these techniques
* explain relationships between biodiversity and sustainable agriculture and/or horticulture
* demonstrate techniques for testing and monitoring sustainable management practices.

Area of Study 2

Sustainable business practices

In this area of study students examine business challenges and opportunities across the food and fibre supply chain, with a focus on sustainability. Students consider sustainability as a multi-dimensional influence on the decisions of agricultural and/or horticultural producers. They consider the role of strategic business planning and the effective use of marketing and communications tools. Students research quality assurance programs and government regulation relating to sustainable food and fibre industries.

Outcome 2

On completion of this unit the student should be able to analyse dimensions of sustainability concepts across the food and fibre supply chain, evaluate strategies to improve the sustainability of agricultural and/or horticultural businesses, and discuss the role of dimensions of sustainability in business practices.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 2.

Key knowledge

* social, economic and environmental sustainability and ethical considerations as related to agricultural and horticultural business practices
* challenges and opportunities presented by dimensions of sustainability across the food and fibre supply chain: food provenance; carbon footprint; healthy rural and regional communities; food safety standards; safe work practices; commodity prices for primary producers
* strategies for broadening markets for food and fibre produce, including value-adding, growing for export and targeting niche markets
* marketing and communications tools to support and promote Australian food and fibre production and businesses
* the influence of mainstream and social media, pressure groups and consumers on decisions made by food and fibre producers
* quality assurance programs and the work of organisations responsible for testing and maintaining the quality of Australian food and fibre products
* state and federal government regulations and policies affecting the sustainability of Australian agricultural and/or horticultural businesses: *Environment Protection Authority Act 1970*; *Occupational Health and Safety Act 2004*; *Catchment and Land Protection Act 1994*.

Key skills

* evaluate agricultural and/or horticultural business practices by applying dimensions of sustainability and ethical considerations
* explain challenges and opportunities presented by dimensions of sustainability concepts across the food and fibre supply chain
* describe and evaluate strategies for increasing and broadening markets for Australian primary produce
* investigate and analyse marketing and communications strategies to promote Australian food and fibre products
* explain quality standards and quality assurance programs in food and fibre production
* evaluate a range of influences on the decisions of food and fibre producers and business owners.

School-based assessment

Satisfactory completion

The award of satisfactory completion for a unit is based on whether the student has demonstrated the set of outcomes specified for the unit. Teachers should use a variety of learning activities and assessment tasks to provide a range of opportunities for students to demonstrate the key knowledge and key skills in the outcomes.

The areas of study and key knowledge and key skills listed for the outcomes should be used for course design and the development of learning activities and assessment tasks.

Assessment of levels of achievement

The student’s level of achievement in Unit 4 will be determined by School-assessed Coursework. School-assessed Coursework tasks must be a part of the regular teaching and learning program and must not unduly add to the workload associated with that program. They must be completed mainly in class and within a limited timeframe.

Where teachers provide a range of options for the same School-assessed Coursework task, they should ensure that the options are of comparable scope and demand.

The types and range of forms of School-assessed Coursework for the outcomes are prescribed within the study design. The VCAA publishes *Advice for teachers* for this study, which includes advice on the design of assessment tasks and the assessment of student work for a level of achievement.

Teachers will provide to the VCAA a numerical score representing an assessment of the student’s level of achievement. The score must be based on the teacher’s assessment of the performance of each student on the tasks set out in the following table.

Contribution to final assessment

School-assessed Coursework for Unit 4 will contribute 30 per cent to the study score.

|  |  |  |
| --- | --- | --- |
| **Outcomes** | **Marks allocated** | **Assessment tasks** |
| **Outcome 1**Analyse the impacts of climate change and environmental degradation on food and fibre production, evaluate strategies for environmental protection and rehabilitation, and discuss techniques for monitoring the sustainability of agricultural and/or horticultural practices. | **50****50** | Student performance will be assessed by:* practical task/s related to sustainable management of land and/or water.

ANDAny one or a combination of the following:* a short written report: research inquiry, a case study analysis, or field/laboratory experiment
* an annotated visual report
* an oral presentation or practical demonstration
* a video or podcast.
 |
| **Outcome 2**Analyse dimensions of sustainability concepts across the food and fibre supply chain, evaluate strategies to improve the sustainability of agricultural and/or horticultural businesses, and discuss the role of dimensions of sustainability in business practices. | **50****50** | Student performance will be assessed by:* practical task/s related to sustainable business practices

ANDAny one or a combination of the following:* a short written report: research inquiry, media analysis, or case study analysis
* an annotated visual report
* an oral presentation or practical demonstration
* a video or podcast.
 |
| **Total marks** | **100****100** |  |

External assessment

The level of achievement for Units 3 and 4 is also assessed by an end-of-year examination.

Contribution to final assessment

The examination will contribute 40 per cent to the study score.

End-of-year examination

Description

The examination will be set by a panel appointed by the VCAA. All the key knowledge and key skills that underpin the outcomes in Units 3 and 4 are examinable.

Conditions

The examination will be completed under the following conditions:

* Duration: one and a half hours.
* Date: end-of-year, on a date to be published annually by the VCAA.
* VCAA examination rules will apply. Details of these rules are published annually in the [*VCE and VCAL Administrative Handbook*](https://www.vcaa.vic.edu.au/administration/vce-vcal-handbook/Pages/index.aspx).
* The examination will be marked by assessors appointed by the VCAA.

Further advice

The VCAA publishes specifications for all VCE examinations on the VCAA website. Examination specifications include details about the sections of the examination, their weighting, the question format/s and any other essential information. The specifications are published in the first year of implementation of the revised Unit 3 and 4 sequence together with any sample material.