Agricultural Systems

LEVEL 3	15 TCE CREDIT POINTS
COURSE CODE	AGR315117
COURSE SPAN	2017 — 2026
READING AND WRITING STANDARD	NO
MATHEMATICS STANDARD	NO
COMPUTERS AND INTERNET STANDARD	YES

This course was delivered in 2018. Use A-Z Courses to find the current version (if available).

Agricultural Systems Level 3 introduces learners to farming systems and operations through an integrated Science, Technologies, Engineering and Mathematics (STEM) inquiry

STEM education integrates concepts that are usually delivered as separate courses in different classes and emphasises the application of knowledge to real-life situations. STEM learning is typically based around finding a solution to a real-world problem and tends to emphasise project based learning. In this course learners explore the various systems and sub-systems that support agricultural production and maximise productivity. They learn the theory of food and fibre production, and associated agricultural industries, through a focus on ecosystems, plant and animal productions systems, business and financial management systems and agricultural technologies systems. Learner understanding is demonstrated by researching a case study and by developing an engineering solution to an agricultural problem or situation. Agriculture offers Tasmanians opportunities in a wide range of careers spanning aspects of science, business, tourism, design and engineering. Agricultural careers are many and varied in the government and private sectors on a state, national and international level. Agricultural Systems Level 3 enables learners to develop the skills and knowledge that can be transferred into a range of post-secondary options including: employment; self-employment; and further education or training.

Course Description

Animal production is dependent on plants, which in turn are dependent on the soil and water. Farmers aim to manage the physical and biological processes in soils, plants and animals to produce agricultural products in a sustainable manner. Learners examine the ways in which farmers manage and manipulate these processes and systems to maximise outputs.

Farms are a part of a broader sector in which products are marketed and processed. Learners examine marketing and processing of a product in terms of its quality and quantity and undertake a specific farm product study.

Learners explore the use of agricultural technologies and their purpose in optimising food and fibre production. Learners design and develop an engineering solution to an agricultural problem or situation.

Rationale

Agricultural Systems Level 3 introduces learners to farming systems and operations through an integrated Science, Technologies, Engineering and Mathematics (STEM) inquiry.

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In this course learners explore the various systems and sub-systems that support agricultural production and maximise productivity. They learn the theory of food and fibre production, and associated agricultural industries, through a focus on ecosystems, plant and animal productions systems, business and financial management systems and agricultural technologies systems. Learner understanding is demonstrated by researching a case study and by developing an engineering solution to an agricultural problem or situation.

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Aims

Agricultural Systems Level 3 introduces learners to the theories, systems and operations that support a farm enterprise. Learners apply their technical and theoretical understandings in a practical and authentic context. Student learning is both theoretical and experiential. Learners undertake an agribusiness case study and respond to an engineering challenge. Agricultural Systems Level 3 complements other Level 3 courses including Environmental Science and Society, Food and Nutrition, Biology and Information Systems and Digital Technologies.

Learning Outcomes

On successful completion of this course, learners will be able to:

SCIENCE

- explain the influence of the physical, biological, technological and economic factors on sustainable agricultural production
- describe the inputs, processes and interactions of plant and animal production systems.

TECHNOLOGY

- examine the technologies and technological innovations employed in the production and marketing of agricultural product
- apply systems thinking strategies and processes
- analyse the management of processes in agricultural systems.

ENGINEERING

- explain the impact of innovation, ethics and current issues on Australian agricultural systems
- apply appropriate engineering principles to agricultural problems and situations.

MATHEMATICS

- assess the general business principles and decision-making processes involved in sustainable farm management and marketing of farm products
- interpret data including financial information, inputs and outputs, rates of change, area, volume and capacity.

CORE SKILLS FOR WORK

- Make decisions
    - assess the factors that influence the marketing of a plant OR animal product.

Pathways

Agricultural Enterprise Level 2 provides a foundation for Agricultural Systems Level 3. Both courses may be used as a pathway to or studied alongside vocational education and training (VET) programs in Aquaculture, Horticulture, Conservation and Land Management, Agriculture and Animal Studies. Agricultural Systems furthers learner understandings established through the Food and Fibre Production context of the *Australian Curriculum*: *Technologies* (P-10).

Resource Requirements

The delivery of this course requires access to an agricultural holding (e.g. a school farm, orchard, aquaculture operation or commercial garden). This study may involve the handling of potentially hazardous substances and/or the use of potentially hazardous equipment and/or the handling of potentially hazardous plants and animals. It is the responsibility of the course provider to ensure that duty of care is exercised in relation to the health and safety of all learners undertaking the study.

Where animals are included in projects or educational activities compliance with the appropriate codes of practice for animal health and welfare, available from the Tasmanian Department of Primary Industries, Parks, Water and the Environment is **required**. These may be accessed via the 'Animal Health' and 'Animal Welfare' page within the 'Animal Biosecurity' section of the 'Biosecurity' area of the Department of Primary Industries, Parks, Water and the Environment website.

Course providers **must** also comply with codes of practice applicable to Plant Biosecurity.

Course Size And Complexity

This course has a complexity level of 3.

At Level 3, the learner is expected to acquire a combination of theoretical and/or technical and factual knowledge and skills and use judgement when varying procedures to deal with unusual or unexpected aspects that may arise. Some skills in organising self and others are expected. Level 3 is a standard suitable to prepare learners for further study at tertiary level. VET competencies at this level are often those characteristic of an AQF Certificate III.

This course has a size value of 15.

Relationship To Other TASC Accredited And Recognised Senior Secondary Course

Agricultural Enterprise Level 2 provides foundational learning for Agricultural Systems Level 3. Agricultural Enterprise Level 2 has a practical focus. It introduces learners to essential agricultural concepts and develops hands-on skills, knowledge and understandings within an enterprise setting. Agricultural Systems Level 3 is theoretical in focus and looks more holistically at animal and plant production through a systems thinking lens. Learners in this course develop high order understandings regarding ethical and sustainable agricultural practice.

Course Delivery

- The recommended delivery time for each Unit is indicated in brackets. Unit 1 **must** be delivered first. Units 2-4 can be delivered in any order. Units 5 and 6 are learner-directed activities and can be studied at any time throughout the course after Unit 1.
- A glossary of terms used in the Standards and throughout the course document is provided at Appendix 1.

Course Requirements

Agricultural Systems Level 3 is divided into six (6) **compulsory** units of study:

Unit 1: Introduction to Systems Thinking (10 hours)

Unit 2: Ecosystems (20 hours)

Unit 3: Plant Production Systems (25 hours)

Unit 4: Animal Production Systems (25 hours)

Unit 5: Agricultural Technologies (40 hours)

Unit 6: Agribusiness Case Study (30 hours).

Course Content

UNIT 1: INTRODUCTION TO SYSTEMS THINKING (10 HOURS)

This Unit introduces learners to the concepts and processes that support systems thinking. This will assist learners in appraising agri-foods operations and in finding solutions to identified agricultural problems or situations.

Definition of systems
Systems as an organised group of related objects or components that form a whole.

Definition of systems thinking
Systems thinking as a holistic approach to the identification and solving of problems where:

- the focal points are treated as components of a system and their interactions
- interrelationships are analysed individually to see how they influence the functioning of an entire system.

Types of systems thinking
Different approaches to support inquiry or research within a given field such as:

- scientific thinking
- design thinking
- computational thinking
- systems thinking in business.

Systems thinking concepts
Principles that support the systems thinking approach such as:

- interdependence
- holism
- inputs and outputs
- closed and open systems
- entropy
- regulation
- hierarchy
- differentiation
- soft and hard systems.

Habits of a systems thinker
Techniques to help understand the 'big picture' and support effective analysis of system structures and outputs such as:

- observing how elements within systems change over time, generating patterns and trends
- identifying the circular nature of complex cause and effect relationships

- surfacing and testing assumptions
- identifying unintended consequences.

Thinking tools and processes
Strategies and processes to understand complex situations, enhance problem solving and project planning skills and support effective decision making such as:

- Political, Economic, Social and Technological (PEST) analysis
- Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis
- Drill Down
- cause and effect diagram
- systems diagrams
- risk analysis and risk management
- cost/benefit analysis
- the planning cycle
- Gantt charts.

UNIT 2: ECOSYSTEMS (20 HOURS)

Soil, nutrients and water

- chemical and physical characteristics of soil/water
- the role of nutrient cycles in Australian agricultural systems including the nitrogen cycle and the carbon cycle
- the role of microbes and invertebrates in the decomposition of organic matter
- sources of water on a farm and water management in a farm system (e.g. marine/recirculating systems for fin/shellfish).

Factors contributing to the degradation of soil and water

- the historical development of Australian land and water use practices, from Aboriginal practices to the present day
- farming practices that have contributed to soil degradation such as salination, acidification, soil structure decline, loss of soil organic matter and erosion and the effects of these on soil and water
- practices that have contributed to changes in water quality and availability
- government policies and resource management.

Sustainable resource management

- sustainable techniques to maintain and/or improve farming environments
- the role of individual farmers, the broader community and government in reducing the harmful environmental effects of agriculture and in conserving water, protecting waterways and managing water quality
- pest and weed management

- tension between sustainability and short-term profitability in farming systems.

Australia's variable climate

- causes of climate variability
- changes in climate that may be attributed to human activity
- managing resources
- management techniques available to the farmer to minimise risk and maximise opportunities from climate variability
- flexibility in land management
- appropriateness of climate for certain plant and animal breeds.

UNIT 3: PLANT PRODUCTION SYSTEMS (25 HOURS)

Plant production systems

- process of growth and development in plants
- processes of respiration, photosynthesis, net assimilation rate, water and nutrient uptake on the effects of plant growth
- beneficial relationships between microbes and plants including the fixing of atmospheric nitrogen in legumes
- the role of plant hormones on plant growth and development
- pasture production systems.

Constraints on plant production

- constraints imposed by environmental factors
- competition in plant communities
- complex interaction involving problem organisms (pathogenic microbe or invertebrate), the host and the environment in plant disease.

Managing plant production

- managing the constraints on plant growth and development to maximise production
- the interaction of genotype, environment and management
- responsible and strategic use of chemicals
- Integrated Pest Management (IPM).

UNIT 4: ANIMAL PRODUCTION SYSTEMS (25 HOURS)

Animal nutrition

- digestive systems (e.g. ruminant, monogastric, bivalve)
- beneficial relationships between microbes and animals including the role of microbes in animal digestion

- the fate of energy in animal nutrition
- managing the nutritional requirements of animals in terms of their digestive physiology
- relationship between animal feed practices and impact on the environment.

Animal growth and development

- changes in the proportion of muscle, fat and bone during the life of an animal
- management practices to optimise growth and development.

Animal reproduction and genetics

- the role of hormones in the regulation of animal reproduction and behaviour
- factors that limit the fertility of farmed animals
- reproductive techniques
- breeding systems and their genetic basis to improve quality and production of animals.

Animal pests and diseases

- animal disease
- Integrated Pest Management (IPM).

Animal ethics and welfare

- ethics, welfare, and legal issues and requirements.

UNIT 5: AGRICULTURAL TECHNOLOGIES (40 HOURS)

Agricultural technologies
The impact scientific research and associated technology has had on agricultural production and marketing:

- the role of biosecurity
- current areas of development in biotechnology
- ethical considerations in the use of biotechnology in agricultural production
- issues relating to research and development
- developments in agricultural technologies:
    - computer technologies (e.g. climate/weather forecasting, laser technologies and computer record keeping systems)
    - biotechnologies (e.g. genetically modified organisms)
    - electronic identification systems (e.g. National Livestock Identification System (NLIS))
    - robotics (e.g. milking, shearing and animal management)
    - marine farm based or land based recirculating aquaculture systems
- Precision Agriculture technology:
    - satellite technologies (e.g. global positioning systems, global and regional imaging)

    - farm equipment technologies (e.g. vehicle and implement guidance, variable rate application, yield measurement)
    - drone technology (e.g. stock and crop monitoring)
    - computer mapping and data modelling systems (e.g. input/yield mapping, site-specific management)

- marketing of technology developments
- reasons for adopting technologies
- moral and ethical considerations with adopting new technologies.

Engineering systems
An overview of engineering systems and their potential application to agri-foods industries such as:

- Biomedical Engineering (e.g. veterinarian)
- Structural Engineering
- building systems
- Transport Engineering
- Mechanical Engineering
- Aeronautical Engineering (e.g. drones)
- Telecommunications Engineering
- mechatronics and robotics
- sensing systems
- renewable energy systems
- Software Engineering
- Aquaculture Engineering technologies.

Engineering Design Cycle
An introduction to the engineering design process and skills and techniques that support the resolution of design ideas such as:

- the Engineering Design Process (EDP)
- standard drawing practices to communicate ideas graphically
- use of mathematical, scientific and graphical methods, and computer simulation and other digital tools, to analyse and solve problems
- properties and selection of materials and processes for engineering solutions
- communication of decisions based on engineering principles
- evaluation and modification of engineering/design solutions.

UNIT 6: AGRIBUSINESS CASE STUDY (30 HOURS)

The farm as a business

- the place of the farm in the wider agri-business sector.

Decision-making processes and management strategies

- factors of quality and quantity that influence decision-making
- the impact of financial pressures on farmers.

Business design

- components of a business plan for a small agricultural and/or horticultural business project, including production, marketing and financial strategies
- strategies for production to meet requirements of local, national and international markets with consideration of market specifications
- tools and strategies for monitoring the cost of production
- business analysis for value adding opportunities in the supply chain
- routine and regular activities that need to be performed to operate the business
- factors influencing the productivity and sustainability of the business, including risk analysis
- strategies for managing a production system to appropriate quality standards for the small business
- health and safety issues associated with the small business
- methods of reporting on the progress of a small business against its business plan, including written and photographic evidence of production.

Marketing

- agricultural commodities, markets and supply
- marketing strategies/targets
- competition analysis
- the marketing chain for a product
- government and other influences on production and marketing
- quantity and quality criteria for a product
- the importance of product specification in the marketing of a product
- problems that may occur in meeting market specifications of a product and methods used to meet requirements
- processing raw agricultural commodities
- the nature and potential for value adding to a product
- the role of advertising and promotion in the marketing of a product
- supply of and demand for a product
- evidence of market research
- customer analysis

- marketing and corporate social responsibility
- public and private advocacy for the agricultural sector.

Work Requirements

UNIT 1: INTRODUCTION TO SYSTEMS THINKING

Learners keep a journal of systems thinking strategies and processes. They test thinking strategies and generate and use visual organisers such as flowcharts, systems diagrams, mind maps and charts.

UNIT 2: ECOSYSTEMS

Research Study
Learners research ecosystems including soil, nutrients, water and climate variability. They:

- analyse a research study of management strategies related to soil, nutrients, water and/or climate variability in terms of:
    - design of the study
    - methodology of the study
    - collection of data for the study
    - presentation of data
    - analysis of the data
    - conclusions and recommendations
    - explain the need for research in climate variability or management strategies for climate variability.

Written report (1200 words).

UNITS 3 AND 4: PLANT AND ANIMAL PRODUCTION SYSTEMS

Plant OR Animal Trial
Learners design and conduct a simple plant or animal trial using appropriate methodology. They:

- outline the role of a control, randomisation, replication and standardisation of conditions in a simple plant or animal trial
- analyse and interpret agricultural data by calculating a mean and a measure of variability (standard deviation)
- explain the need for a test of significance to be performed before valid comparisons can be made
- present data in an appropriate form
- propose recommendations based on the interpretation of the results of agricultural experiments
- outline the impact of research on agricultural production systems.

Written report (1200 words).

UNIT 5: AGRICULTURAL TECHNOLOGIES

Research into Technological Developments
Learners assess the likely impact of a selected innovation on the sustainability of a specific agricultural and/or horticultural business. They:

- describe and critique current technologies and management practices used in a specific agricultural and/or horticultural operation
- analyse the drivers that influence the adoption of new or emerging technologies
- undertake research to analyse new or emerging technologies
- compare current with new and emerging technologies and management practices, and assess their impacts on the sustainability of an agricultural and/or a horticultural business

- select and justify appropriate new or emerging technologies for a specific agricultural and/or horticultural business and evaluate their likely social, economic and environmental impacts.

Evidence for the Unit 5 work requirement will take the form of a practical presentation such as: an annotated visual display; website presentation; multimedia presentation; an oral report.

Engineering solution
Learners develop an engineering solution to an agricultural problem or situation using existing or emerging technologies. They:

- generate a design solution
- use technology skills, processes and systems
- apply management and planning skills to an engineering challenge
- implement risk assessment and mitigation strategies
- evaluate and justify engineering solutions
- suggest modifications and improvements to the engineered solution.

Project folio
The project folio will outline and explain the engineering design and development and must reflect:

- a design brief (problem/challenge, background, requirements and limitations)
- research (analysis/comparison, survey, feedback)
- concept sketches, notes, annotations
- tools, materials, techniques and experiments/prototype/testing
- production stages
- evaluation of outcomes (of requirements from initial design brief).

UNIT 6: AGRIBUSINESS CASE STUDY

Case Study
Learners use a case study approach to analyse an agricultural and/or a horticultural system from 'producer to consumer'. Learners investigate the factors that influence the enterprise conducted at that location. They collect and evaluate the following data to determine which factors have influenced the business:

- the inputs into the production
- production processes and timelines
- risks involved with the production process
- environmental considerations such as waste minimisation strategies, climatic influences
- outputs – both intended and unintended
- factors that influenced the operation of the small business project
- budgeting – planned and actual
- marketing of products

- success of the business and aspects for future improvement.

Written report (2000 - 3000 words).

Assessment

Criterion-based assessment is a form of outcomes assessment that identifies the extent of learner achievement at an appropriate end-point of study. Although assessment – as part of the learning program – is continuous, much of it is formative, and is done to help learners identify what they need to do to attain the maximum benefit from their study of the course. Therefore, assessment for summative reporting to TASC will focus on what both teacher and learner understand to reflect end-point achievement.

The standard of achievement each learner attains on each criterion is recorded as a rating 'A', 'B', or 'C', according to the outcomes specified in the standards section of the course.

A 't' notation must be used where a learner demonstrates any achievement against a criterion less than the standard specified for the 'C' rating.

A 'z' notation is to be used where a learner provides no evidence of achievement at all.

Providers offering this course must participate in quality assurance processes specified by TASC to ensure provider validity and comparability of standards across all awards. To learn more, see TASC's quality assurance processes and assessment information.

Internal assessment of all criteria will be made by the provider. Providers will report the learner's rating for each criterion to TASC.

TASC will supervise the external assessment of designated criteria which will be indicated by an asterisk (*). The ratings obtained from the external assessments will be used in addition to internal ratings from the provider to determine the final award.

Quality Assurance Process

The following processes will be facilitated by TASC to ensure there is:

- a match between the standards of achievement specified in the course and the skills and knowledge demonstrated by learners
- community confidence in the integrity and meaning of the qualification.

Process – TASC gives course providers feedback about any systemic differences in the relationship of their internal and external assessments and, where appropriate, seeks further evidence through audit and requires corrective action in future.

External Assessment Requirements

The external assessment for this course will comprise:

- a folio assessing criteria 2, 5, 6, 8 and 9. The folio will include the Agri-foods Case Study and the Engineering Solution project folio.

For further information see the current external assessment specifications and guidelines for this course available in the Supporting Documents below.

Criteria

The assessment for Agricultural Systems Level 3 will be based on the degree to which the learner can:

1. use systems thinking strategies and processes
2. analyse physical and biological systems that support sustainable agricultural production*
3. analyse inputs, processes and interactions of plant production systems
4. analyse inputs, processes and interactions of animal production systems
5. assess general business principles and decision-making processes involved in sustainable farm management and marketing of farm products*
6. examine technologies and technological innovations employed in the production and marketing of agricultural products*
7. interpret data including financial information, inputs and outputs, rates of change, area, volume and capacity
8. apply appropriate engineering principles to agricultural problems and situations*
9. explain the impact of innovation, ethics and current issues on Australian agricultural systems*

* = denotes criteria that are both internally and externally assessed

Standards

Criterion 1: use systems thinking strategies and processes

The learner:

Rating A	Rating B	Rating C
applies systems thinking as a holistic approach to the identification and solving of problems in a range of contexts	uses systems thinking as a holistic approach to the identification and solving of problems	identifies systems thinking as a holistic approach to the identification and solving of problems
applies types of systems thinking appropriate to agricultural contexts (e.g. scientific, design thinking, computational thinking, business thinking)	uses types of systems thinking appropriate to agricultural contexts (e.g. scientific, design thinking, computational thinking, business thinking)	identifies types of systems thinking appropriate to agricultural contexts (e.g. scientific, design thinking, computational thinking, business thinking)
applies systems thinking concepts (e.g. interdependence, inputs and outputs, closed and open systems, entropy, regulation, hierarchy)	uses systems thinking concepts (e.g. interdependence, inputs and outputs, closed and open systems, entropy, regulation, hierarchy)	identifies systems thinking concepts (e.g. interdependence, inputs and outputs, closed and open systems, entropy, regulation, hierarchy)
uses systems thinking strategies to enhance the effectiveness of agricultural systems	uses systems thinking strategies to diagnose the effectiveness of agricultural systems	uses systems thinking strategies to identify the effectiveness of agricultural systems
uses systems thinking tools and processes to solve agricultural problems or situations.	uses systems thinking tools and processes to explain agricultural problems or situations.	identifies agricultural problems or situations and uses systems thinking tools to distinguish contributing factors.

Criterion 2: analyse physical and biological systems that support sustainable agricultural production

This criterion is both internally and externally assessed.

The learner:

Rating A	Rating B	Rating C
evaluates roles of microbes and invertebrates in decomposition and nutrient cycling	analyses roles of microbes and invertebrates in decomposition and nutrient cycling	describes roles of microbes and invertebrates in decomposition and nutrient cycling
analyses the nitrogen cycle and the carbon cycle	explains the nitrogen cycle and the carbon cycle	describes the nitrogen cycle and the carbon cycle
analyses implications of climate variability for agricultural production	explains implications of climate variability for agricultural production	describes implications of climate variability for agricultural production
evaluates the principles and strategies of biosecurity measures used in food and fibre production	describes the principles and strategies of biosecurity measures used in food and fibre production	identifies the principles and strategies of biosecurity measures used in food and fibre production
analyses the physical, chemical and biological properties of soil, air or water and how they relate to agriculture	describes the physical, chemical and biological properties of soil, air or water and how they relate to agriculture	identifies the physical, chemical and biological properties of soil, air or water and how they relate to agriculture
evaluates the issues associated with monocultural production system	describes the issues associated with monocultural production systems	identifies the issues associated with monocultural production systems
analyses tensions between sustainability and short-term profitability in farming systems.	explains tensions between sustainability and short-term profitability in farming systems.	describes tensions between sustainability and short-term profitability in farming systems.

Criterion 3: analyse inputs, processes and interactions of plant production systems

The learner:

Rating A	Rating B	Rating C
evaluates effects on plant growth of the processes of respiration, photosynthesis, net assimilation rate, water and nutrient uptake	analyses effects on plant growth of the processes of respiration, photosynthesis, net assimilation rate, water and nutrient uptake	identifies effects on plant growth of the processes of respiration, photosynthesis, net assimilation rate, water and nutrient uptake
analyses how light, temperature, available moisture, oxygen/carbon dioxide ratios, wind and biotic factors affect plant growth, development and production	describes how light, temperature, available moisture, oxygen/carbon dioxide ratios, wind and biotic factors affect plant growth, development and production	identifies how light, temperature, available moisture, oxygen/carbon dioxide ratios, wind and biotic factors affect plant growth, development and production
analyses and explains how farmers can manage plant production systems to overcome environmental constraints	describes how farmers manage plant competition through plant density and weed control strategies	identifies sources of competition in plant communities
analyses and evaluates the significance of a diverse pasture mix	describes the significance of a diverse pasture mix	identifies the significance of a diverse pasture mix
analyses how plant breeding is used to develop new plant varieties to improve product quality, yield and environmental adaptation	describes how plant breeding is used to develop new plant varieties to improve product quality, yield and environmental adaptation	identifies how plant breeding is used to develop new plant varieties to improve product quality, yield and environmental adaptation
analyses Integrated Pest Management (IPM) systems' ability to reduce the problems of pesticides and chemical resistance in target organisms.	describes Integrated Pest Management (IPM) systems' ability to reduce the problems of pesticides and chemical resistance in target organisms.	correctly defines Integrated Pest Management (IPM) systems.

Criterion 4: analyse inputs, processes and interactions of animal production systems

The learner:

Rating A	Rating B	Rating C
evaluates similarities and differences in the physiology of ruminant and monogastric digestion	analyses similarities and differences in the physiology of ruminant and monogastric digestion	explains similarities and differences in the physiology of ruminant and monogastric digestion
analyses the proportions of bone, muscle and fat at various stages of development in an animal and relates these to consumer needs	compares the proportions of bone, muscle and fat at various stages of development in an animal and relates these to consumer needs	identifies the proportions of bone, muscle and fat at various stages of development in an animal and relates these to consumer needs
explains how hormones regulate reproduction and behaviour in animals	describes how hormones regulate reproduction and behaviour in animals	identifies how hormones regulate reproduction and behaviour in animals
explains factors that limit fertility of farm animals including genetics, environment, pests and diseases, management and nutrition	describes factors that limit fertility of farm animals including genetics, environment, pests and diseases, management and nutrition	identifies factors that limit fertility of farm animals including genetics, environment, pests and diseases, management and nutrition
analyses the use of breeding systems in animal production systems including crossbreeding and line breeding	describes the use of breeding systems in animal production systems including crossbreeding and line breeding	identifies the use of breeding systems in animal production systems including crossbreeding and line breeding
illustrates how knowledge and understanding of animals' physical and behavioural characteristics can assist in the management of a particular animal species.	describes how knowledge and understanding of animals' physical and behavioural characteristics can assist in the management of a particular animal species.	identifies how knowledge and understanding of animals' physical and behavioural characteristics can assist in the management of a particular animal species.

Criterion 5: assess general business principles and decision-making processes involved in sustainable farm management and marketing of farm products

This criterion is both internally and externally assessed.

The learner:

Rating A	Rating B	Rating C
analyses financial pressures that may impact on farmers including the irregular nature of income, high expenditure on inputs, the dynamic nature of markets and interest rates and risk management	assesses financial pressures that may impact on farmers including the irregular nature of income, high expenditure on inputs, the dynamic nature of markets and interest rates and risk management	describes financial pressures that may impact on farmers including the irregular nature of income, high expenditure on inputs, the dynamic nature of markets and interest rates and risk management
applies techniques to analyse the financial situation of a farm enterprise including calculating gross margin	applies techniques to interpret the financial situation of a farm enterprise including calculating gross margin	uses techniques to identify the financial situation of a farm enterprise including calculating gross margin
evaluates government influence on the production and marketing of an agricultural product such as legislation, regulations, codes of practice, low cost loans, tax incentives	explains government influence on the production and marketing of an agricultural product such as legislation, regulations, codes of practice, low cost loans, tax incentives	describes government influence on the production and marketing of an agricultural product such as legislation, regulations, codes of practice, low cost loans, tax incentives

determines and justifies the marketing chain for an agricultural product	explains various marketing options for an agricultural product	describes various marketing options for an agricultural product
schedules the timing of operations in a production cycle to meet market specifications	explains the management strategies used to assess and meet market specifications	describes market specifications for an agricultural product
analyses marketing information such as a sales report for an agricultural product.	interprets marketing information such as a sales report for an agricultural product.	describes marketing information such as a sales report for an agricultural product.

Criterion 6: examine technologies and technological innovations employed in the production and marketing of agricultural products

This criterion is both internally and externally assessed.

The learner:

Rating A	Rating B	Rating C
evaluates the role of ongoing research related to agricultural industries	examines the role of ongoing research related to agricultural industries	identifies the role of ongoing research related to agricultural industries
evaluates recent technologies and their impact on agricultural production and/or marketing	describes recent technologies and their impact on agricultural production and/or marketing	identifies recent technologies and their impact on agricultural production and/or marketing
describes implications of biotechnology in the agri-foods, fibre and fuel industries	describes current developments in biotechnology	identifies current developments in biotechnology
evaluates the role of biosecurity in food and fibre production and associated agricultural industries	examines the role of biosecurity in food and fibre production and associated agricultural industries	identifies the role of biosecurity in food and fibre production and associated agricultural industries
evaluates biofuel production with respect to world food demands and sustainable and efficient use of carbon	examines biofuel production with respect to world food demands and sustainable and efficient use of carbon	describes biofuel production with respect to world food demands and sustainable and efficient use of carbon
discusses issues related to the research and development of technologies including funding sources, patents, plant breeders' rights, animal welfare, legislation and contracts	examines issues related to the research and development of technologies including funding sources, patents, plant breeders' rights, animal welfare, legislation and contracts	identifies issues related to the research and development of technologies including funding sources, patents, plant breeders' rights, animal welfare, legislation and contracts
evaluates a range of new technological developments that may assist agricultural industries.	examines a range of new technological developments that may assist agricultural industries.	identifies a range of new technological developments that may assist agricultural industries.

Criterion 7: interpret data including financial information, inputs and outputs, rates of change, area, volume and capacity

The learner:

Rating A	Rating B	Rating C
evaluates farm production systems based on	assesses farm production systems	describes farm production systems based on

measurements of quality and quantity	based on measurements of quality and quantity	measurements of quality and quantity
analyses mean and standard deviation of rainfall and maximum and minimum temperature for the local area of the course provider and for a contrasting region in Australia	interprets mean and standard deviation of rainfall and maximum and minimum temperature for the local area of the course provider	calculates mean and standard deviation of rainfall and maximum and minimum temperature for the local area of the course provider
extrapolates from climate variability data to determine the effects of climate change on production	interprets climate variability data to calculate the effects of climate change on production	uses climate variability data to describe the effects of climate change on production
monitors and maintains data to enhance production (e.g. timing of planting, soil moisture monitoring, crop density, grazing strategies, stocking rates and financial analysis)	interprets data to enhance production (e.g. timing of planting, soil moisture monitoring, crop density, grazing strategies, stocking rates and financial analysis)	uses data to enhance production (e.g. timing of planting, soil moisture monitoring, crop density, grazing strategies, stocking rates and financial analysis)
evaluates farm production systems based on measurements of quality and quantity.	assesses farm production systems based on measurements of quality and quantity.	describes farm production systems based on measurements of quality and quantity.

Criterion 8: apply appropriate engineering principles to agricultural problems and situations

This criterion is both internally and externally assessed.

The learner:

Rating A	Rating B	Rating C
solves routine or non-routine problems,	solves routine problems and generates creative	solves routine problems and

generates, justifies and evaluates creative design solutions	design solutions	generates design solutions
uses and develops a wide range of technology skills, processes and systems to enable the detailed production of quality engineering solutions and maintains appropriate WHS procedures	uses and develops a range of technology skills, processes and systems to enable the detailed production of quality engineering solutions and maintains appropriate WHS procedures	uses technology skills, processes and systems, to enable the production of engineering solutions and maintains appropriate WHS procedures
evaluates and justifies engineering solutions with supportive evidence	applies engineering solutions with supportive evidence	describes engineering solutions with some justification
applies management and planning skills related to engineering	explains management and planning skills related to engineering	describes management and planning skills related to engineering
implements risk assessment and mitigation strategies across all stages of a project	implements risk assessment and mitigation strategies in appropriate contexts	implements risk assessment and mitigation strategies with guidance
evaluates system through interpretation of measurements, and use of their established evaluation criteria	tests, measures, diagnoses, repairs or modifies, and records appropriate system parameters to optimise system performance	undertakes a limited range of tests, measures, diagnoses, modifications, and records to improve system performance
identifies and undertakes modifications, analysing and justifying the factors which have influenced the development of the system and its use.	identifies and undertakes modifications, justifying the factors which have influenced the development of the system and its use.	suggests modifications and improvements; and identifies how the factors that influenced the development of the system and its use have been taken into account.

Criterion 9: explain the impact of innovation, ethics and current issues on Australian agricultural systems

This criterion is both internally and externally assessed.

The learner:

Rating A	Rating B	Rating C
analyses issues about development and use of biotechnology in food and fibre production, with reference to appropriate regulations	discusses issues relating to food and fibre production using biotechnology	identifies and describes issues relating to food and fibre production using biotechnology
analyses research evidence in relation to long-term climate variability, and explains implications for agricultural production including the impact of La Niña and El Niño	explains implications of climate variability for agricultural production including the impact of La Niña and El Niño	describes implications of climate variability for agricultural production, including the impact of La Niña and El Niño
analyses methods used to store and trade water resources	explains methods used to store and trade water resources	describes methods used to store and trade water resources
issues related to water storage and trading including river flows and aquifer depletion	explains issues related to water storage and trading including river flows and aquifer depletion	describes issues related to water storage and trading including river flows and aquifer depletion
explains the effect of greenhouse gases on atmospheric temperature and climate change	identifies and describes sources of greenhouse gas emissions	identifies carbon dioxide, methane and nitrous oxides as the three main greenhouse gases
evaluates reasons for adopting emerging technologies and their impact in agriculture	explains reasons for adopting emerging technologies in agriculture	describes reasons for adopting emerging technologies in agriculture
clearly differentiates the information, images, ideas and	clearly differentiates the information,	differentiates the information, images,

words of others from the learner's own	images, ideas and words of others from the learner's own	ideas and words of others from the learner's own
referencing conventions and methodologies are followed with a high degree of accuracy	referencing conventions and methodologies are followed correctly	referencing conventions and methodologies are generally followed correctly
creates appropriate, well structured reference lists/bibliographies.	creates appropriate, structured reference lists/bibliographies.	creates appropriate reference lists/bibliographies.

Qualifications Available

Agricultural Systems Level 3 (with the award of):

EXCEPTIONAL ACHIEVEMENT

HIGH ACHIEVEMENT

COMMENDABLE ACHIEVEMENT

SATISFACTORY ACHIEVEMENT

PRELIMINARY ACHIEVEMENT

Award Requirements

The final award will be determined by the Office of Tasmanian Assessment, Standards and Certification from 14 ratings (9 from the internal assessment, 5 from the external assessment).

The minimum requirements for an award in Agricultural Systems Level 3 are as follows:

EXCEPTIONAL ACHIEVEMENT (EA)
11 'A' ratings, 3 'B' ratings (4 'A' ratings, 1 'B' rating from external assessment)

HIGH ACHIEVEMENT (HA)
5 'A' ratings, 5 'B' ratings, 4 'C' ratings (2 'A' ratings, 2 'B' ratings, 1 'C' rating from external assessment)

COMMENDABLE ACHIEVEMENT (CA)
7 'B' ratings, 6 'C' ratings (2 'B' ratings, 2 'C' ratings from external assessment)

SATISFACTORY ACHIEVEMENT (SA)
12 'C' ratings (4 'C' ratings from external assessment)

PRELIMINARY ACHIEVEMENT (PA)
7 'C' ratings.

A learner who otherwise achieves the ratings for a CA (Commendable Achievement) or SA (Satisfactory Achievement) award but who fails to show any evidence of achievement in one or more criteria ('z' notation) will be issued with a PA (Preliminary Achievement) award.

Course Evaluation

The Department of Education's Curriculum Services will develop and regularly revise the curriculum. This evaluation will be informed by the experience of the course's implementation, delivery and assessment.

In addition, stakeholders may request Curriculum Services to review a particular aspect of an accredited course.

Requests for amendments to an accredited course will be forwarded by Curriculum Services to the Office of TASC for formal consideration.

Such requests for amendment will be considered in terms of the likely improvements to the outcomes for learners, possible consequences for delivery and assessment of the course, and alignment with Australian Curriculum materials.

A course is formally analysed prior to the expiry of its accreditation as part of the process to develop specifications to guide the development of any replacement course.

Course Developer

The Department of Education acknowledges the significant leadership of Marie Phillips, Melinda Williams, Peter Wright, John Lehman and Dr Adam Grover in the development of this course.

Expectations Defined By National Standards In Content Statements Developed by ACARA

There are no content statements developed by ACARA that are relevant to this course.

Accreditation

The accreditation period for this course has been renewed from 1 January 2022 until 31 December 2026.

During the accreditation period required amendments can be considered via established processes.

Should outcomes of the Years 9-12 Review process find this course unsuitable for inclusion in the Tasmanian senior secondary curriculum, its accreditation may be cancelled. Any such cancellation would not occur during an academic year.

Version History

Version 1 – Accredited on 21 November 2016 for use from 1 January 2017.

Version 1.a – Minor amendment to Criterion 9 standards. 5 April 2017.

Version 1.1 – Renewal of accreditation on 13 August 2017 for use in 2018.

Version 1.1.a - Change to Agribusiness Case Study scope from 2000 words to 2000-3000 words, and additions to Glossary. 22 December 2017.

Accreditation renewed on 22 November 2018 for the period 1 January 2019 until 31 December 2021.

Version 2 - Amendment 14 December 2018. Removal of 'and return to capital' from second standard element of Criterion 5.

Version 2.a - Renewal of Accreditation on 14 July 2021 for the period 31 December 2021 until 31 December 2026, without amendments.

Appendix 1

GLOSSARY

Term	Explanation
Acidification	change in natural chemical balance caused by an increase in the concentration of acidic elements
Administrative controls	Processes and procedures that contribute to a safe and efficient working environment, often implemented as part of a risk-management process. Examples include codes of behaviour, job descriptions, workplace guidelines, responsibilities and expectations, inductions, training, documentation, ongoing monitoring and review.
Agribusiness	agriculture conducted on strictly commercial principles; the group of industries dealing with agricultural produce and services required in farming
Agricultural holding	is a single unit, in both technical and economic terms, operating under a single management, which undertakes agricultural activities
Agriculture	the science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and other products
Analyse	to examine, scrutinise, explore, review, consider in detail for the purpose of finding meaning or relationships, and identifying patterns, similarities and differences
Anatomy	the branch of science concerned with the bodily structure of humans, animals, and other living organisms
Animal production	the technology applied to the keeping of animals for profit, including feeding, breeding, housing and marketing
Animal welfare	the physical and psychological welfare of animals
Apply	use or employ knowledge and skills in a particular situation
Aquaculture	the cultivation of aquatic animals and plants, especially fish, shellfish, and seaweed, in natural or controlled marine or freshwater environments; underwater agriculture
Assess	make a judgement about, to rate, weigh up, to form an opinion
Atmospheric	relating to the atmosphere of the earth
Avian	relating to birds

Term	Explanation
Basic	essential or elementary
Beneficial organism	any organism that benefits the growing process
Biodynamics	a method of organic farming that incorporates certain astrological and spiritual principles and practices
Biofuel	a fuel derived immediately from living matter
Biology	the study of living organisms, divided into many specialised fields that cover their morphology, physiology, anatomy, behaviour, origin, and distribution
Biomedical	relating to both biology and medicine
Biosecurity	procedures or measures designed to protect the population against harmful biological or biochemical substances
Biotechnology	the use of biological processes, organisms, or systems to manufacture products
Biotic	relating to or resulting from living organisms
Broad acre	land suitable for farms practicing large-scale crop operations
Business plan	a written document that describes in detail how a new business is going to achieve its goals

Term	Explanation
Calendar	a chart or series of pages showing the days, weeks, and months of a particular year, or giving particular seasonal information
Carbohydrate	any of a large group of organic compounds occurring in foods and living tissues and including sugars, starch, and cellulose
Carbon cycle	the process by which carbon moves from the atmosphere into the Earth and its organisms and then back again
Case study	a process or record of research into the development of a particular person, group, or situation over a period of time
Cause and effect	a relationship between events or things, where one is the result of the other or others

Clear	easy to understand, fully intelligible, without ambiguity; explicit
Climate	the weather conditions prevailing in an area in general or over a long period
Closed and open systems	in a closed system inputs are determined once and constant; in an open system additional inputs are admitted from the environment
Code of practice	set of written regulations issued by a professional association or an official body that explains how people working in a particular profession should behave
Coherent	orderly, logical and internally consistent relation of parts
Communicate	convey information about, clearly reveal or make known
Compare	estimate, measure or note how things are similar or dissimilar
Consider	formed after careful thought
Consumer trends	habits or behaviours currently prevalent among consumers of goods or services
Cost/benefit analysis	a process by which business decisions are analysed. The benefits of a given situation or business-related action are summed, and then the costs associated with taking that action are subtracted.
Crop	a cultivated plant that is grown on a large scale commercially, especially a cereal, fruit, or vegetable
Crop rotation	the successive planting of different crops on the same land to improve soil fertility and help control insects and diseases
Cultivation	to prepare and work on (land) in order to raise crop

Term	**Explanation**
Data	facts and statistics collected together for reference or analysis
Decomposition	the state or process of rotting; decay
Define	state meaning and identify essential qualities
Degradation	the condition or process of degrading or being degraded; the wearing down of rock by disintegration
Describe	recount, comment on, and provide an account of characteristics or features
Detailed	meticulous, specific, precise
Develop	construct, elaborate or expand on an opinion or idea
Diagnose	to analyse the nature or cause
Dicotyledon	a flowering plant with an embryo that bears two cotyledons (seed leaves)
Differentiation	specialised units that perform specialised functions
Discuss	talk or write about a topic, taking into account different issues and ideas
Drill down	a technique for breaking complex problems down into progressively smaller parts
Dynamic	(of a process or system) characterised by constant change, activity, or progress

Term	**Explanation**
Effective	producing a deep or vivid impression; striking
Effluent	sewage or other liquid waste that is discharged
El Niño	the extensive warming of the central and eastern tropical Pacific that leads to a major shift in weather patterns across the Pacific
Electrical	concerned with, operating by, or producing electricity
Energy	power derived from the utilisation of physical or chemical resources, especially to provide light and heat or to work machines
Engineering	the branch of science and technology concerned with the design, building, and use of engines, machines, and structures
Enterprise	a project undertaken or to be undertaken; a company organised for commercial purposes
Entropy	the amount of disorder or randomness present in any system
Erosion	the process of eroding or being eroded by wind, water, or other natural agents
Ethical	right and wrong in conduct; being in accordance with the rules or standards for right conduct or practice, especially the standards of a profession
Evaluate	appraise, measure, examine and judge the merit, significance or value of something
Evaporation	the process of a liquid changing into a gas; evaporation is a fundamental part of the water cycle and is constantly

	occurring throughout nature
Experimental design	planning and implementing a study in a way that is most likely to achieve the intended goal
Explain	provide additional information that demonstrates understanding and reasoning; present a meaning with clarity, precision, completeness, and with due regard to the order of statements in the explanation

Term	Explanation
Farming system	a decision making unit comprising the farm household, cropping and/or livestock system that transform land, capital and labour into useful products that can be consumed or sold
Fertiliser	a chemical or natural substance added to soil or land to increase its fertility
Fertility	the quality of being fertile; productiveness; the ability to conceive offspring or young
Food and fibre production	a process of producing food or fibre as natural materials for the design and development of a range of products

Term	Explanation
Gantt chart	a chart in which a series of horizontal lines shows the amount of work done or production completed in certain periods of time in relation to the amount planned for those periods
Genotype	the genetic constitution of an individual organism
GMO	genetically modified organism; an organism (i.e. plants, animals or microorganisms) in which the genetic material (DNA) has been altered in a way that does not occur naturally
Goal seeking	the principle that systemic interaction must result in some goal or final state
Grazing	a method of feeding in which a herbivore feeds on plants such as grasses
Grazing management	the manipulation of livestock grazing to accomplish a desired result; where and when to move grazing animals
Green manure	a fertiliser consisting of growing plants that are ploughed back into the soil
Gross margin	the difference between revenue and cost of goods sold divided by revenue, expressed as a percentage
Growth	the process of increasing in size

Term	Explanation
Hierarchy	an arrangement of items (objects, names, values, categories, etc...) in which the items are represented as being "above", "below", or "at the same level as" one another
Holism	the idea that systems (physical, biological, chemical, social, economic, mental, linguistic, etc...) and their properties should be viewed as wholes, not as collections of parts
Holistically	emphasising the importance of the whole and the interdependence of its parts; concerned with wholes rather than analysis or separation into parts
Horticulture	the cultivation of a garden, orchard, or nursery
Humidity	the amount of water vapour in the atmosphere or in a gas
Hydraulic	denoting or relating to a liquid moving in a confined space under pressure
Hydroponics	the process of growing plants in sand, gravel, or liquid, with added nutrients but without soil

Term	Explanation
Identify	name, list and establish or indicate who or what something is
Implement	to put into effect
Infrastructure	the basic physical and organisational structures and facilities needed for the operation of a society or enterprise
Innovation	a new method, idea or product
Inorganic	not consisting of, or deriving from, living matter
Input	what is put in, taken in, or operated on by any process or system
Inputs and outputs	inputs are the signals or data received by the system and outputs are the signals or data sent from it
Interactive	(of two people or things) influencing each other

Interdependence	the mutual reliance between two or more groups
Interest	money paid regularly at a particular rate for the use of money lent, or for delaying the repayment of a debt
Interpret	explain the meaning of information or actions
Invertebrate	an animal lacking a backbone
Ion	an atom or molecule with a net electric charge due to the loss or gain of one or more electrons
Irrigation	the method in which water is supplied to plants at regular intervals for agriculture

Term	Explanation
La Niña	a cooling of the water in the equatorial Pacific, which occurs at irregular intervals, and is associated with widespread changes in weather patterns complementary to those of El Niño, but less extensive and damaging in their effect
Language	the method of human communication, either spoken or written, consisting of the use of words in structured and conventional ways
Legislation	the process of making or enacting laws
Livestock	farm animals regarded as an asset

Term	Explanation
Macronutrient	a chemical element of which relatively large quantities are essential to the growth and health of a plant or animal
Mammal	a warm-blooded vertebrate animal of a class that is distinguished by the possession of hair or fur, females that secrete milk for the nourishment of the young, and (typically) the birth of live young
Managed system	documented and tested step-by-step method aimed at smooth functioning of an enterprise or business
Marketing	the action or business of promoting and selling products or services, including market research and advertising
Mean deviation	the average of absolute differences (differences expressed without plus or minus sign) between each value in a set of values
Mechanical	operated by a machine or machinery
Mechatronics	technology combining electronics and mechanical engineering
Methodology	a system of methods used in a particular area of study or activity
Microbe	a microorganism, examples include bacteria, yeasts, viruses, protozoans and some algae
Micronutrient	a chemical element or substance required in trace amounts for the normal growth and development of living organisms
Mineral	an inorganic element, such as calcium, iron, potassium, sodium, or zinc, that is essential to the nutrition of humans, animals, and plants
Monocotyledon	a flowering plant with an embryo that bears a single cotyledon (seed leaf)
Monogastric	monogastric animals have a stomach that has a single compartment
Morphology	the study of the form and structure of animals and plant
Mulch	a covering, as of straw, compost, or plastic sheeting, spread on the ground around plants to prevent excessive evaporation or erosion, enrich the soil and inhibit weed growth

Term	Explanation
Natural system	a natural system is one that exists in nature, independent of any human involvement. The natural system consists of all the physical and biological materials and their intertwined processes. Agriculture is an example of an artificial (man-made) system that is introduced into an existing natural system.
Net assimilation rate	a measure of the photosynthetic efficiency of plants
Niche	a small area of trade within the economy, often involving specialised products; the role and position a species has in its environment; how it meets its needs for food and shelter, how it survives, and how it reproduces
Nitrogen cycle	the series of processes by which nitrogen and its compounds are interconverted in the environment and in living organisms
Non-verbal (communication)	behaviours such as facial expressions, eyes, touching, and tone of voice, as well as less obvious messages such as dress, posture and spatial distance between two or more people
Nursery	a place where young plants and trees are grown for sale or for planting elsewhere

Nutrient	a substance that provides nourishment essential for the maintenance of life and for growth
Nutrition	nourishment or energy that is obtained from food consumed or the process of consuming the proper amount of nourishment and energy

Term	Explanation
Obvious	easily seen or recognised, predictable
Operational plan	a detailed plan used to provide a clear picture of how a team, section or department will contribute to the achievement of the organisation's goals
Organic	relating to, or derived from, living matter
Organise	systematically order and arrange
Outline	give the main features or aspects of
Output	the amount of something produced by a person, machine, or industry

Term	Explanation
Parent material	the underlying geological material (generally bedrock or a superficial or drift deposit) in which soil horizons form
Patent	the exclusive right granted by a government to an inventor to manufacture, use, or sell an invention for a certain number of years
Pathogen	a bacterium, virus, or other microorganism that can cause disease
Percentage	a portion of a whole expressed as a number between 0 and 100 rather than as a fraction
Permaculture	the development of agricultural ecosystems intended to be sustainable and self-sufficient
Pest	a destructive insect or other animal that attacks crops, food or livestock
PEST analysis	PEST is an acronym for Political, Economic, Social and Technological factors, which are used to assess the market for a business or organisational unit
Pest management	prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties
pH	a number between 0 and 14 that indicates if a chemical is neutral, an acid or a base
Photosynthesis	the process by which green plants and some other organisms use sunlight to synthesize nutrients from carbon dioxide and water
Physiology	the branch of biology that deals with the normal functions of living organisms and their parts
Planning cycle	the process of combining different aspects of planning into one synthetic unit
Plant production	the multiplication and/or propagation of more plants by either sexual (seed) or asexual propagation methods (cuttings)
Pneumatic	containing or operated by air or gas under pressure
Porosity	the quality of being porous, or full of tiny holes
Poultry	domestic fowl, such as chickens, turkeys, ducks, and geese
Precipitation	rain, snow, sleet, or hail that falls to or condenses on the ground
Problem	a question proposed for solution
Process	a series of actions or steps taken in order to achieve a particular end
Production cycle	the period during which the objects of labour (raw products and materials) remain in the production process, from the beginning of manufacturing through the output of a finished product
Production rate	the number of goods that can be produced during a given period of time; the amount of time it takes to produce one unit of a good
Production system	a manufacturing subsystem that includes all functions required to design, produce, distribute, and service a manufactured product
Profitability	the ability of a business to earn a profit; what is left of the revenue a business generates after it pays all expenses
Project	in the Technologies learning area, a project is a set of activities undertaken by learners to address specified content, involving understanding the nature of a problem, situation or need; creating, designing and producing a solution to the project task; and documenting the process. Project work has a benefit, purpose and use; a user or audience who can provide feedback on the success of the solution; limitations to work within; and a real-world technologies context influenced by social, ethical and environmental issues.
Project	in the Technologies learning area, project management means the responsibility for planning, organising,

management	controlling resources, monitoring timelines and activities and completing a project to achieve a goal that meets identified criteria for judging success
Propagation	the reproduction or spreading of organisms/ideas
Protein	a nutrient found in food (as meat, milk, eggs, and beans) that is made up of many amino acids joined together
Protocol	a system of rules that explain the correct conduct and procedures to be followed in formal situations

Term	**Explanation**
Randomisation	to order or select in a random manner
Range	a number of different things of the same general type; breadth
Ratio	the relative sizes of two or more values
Regulation	the management of complex systems according to a set of rules and trend
Relevant	applicable and pertinent
Renewable energy	energy from a source that is not depleted when used, such as wind or solar power
Replication	the action of copying or reproducing something
Reproductive system	the organs and glands in the body that aid in the production of new individuals
Respiration	a process in living organisms involving the production of energy, typically with the intake of oxygen and the release of carbon dioxide from the oxidation of complex organic substances
Revegetation	the process of replanting and rebuilding the soil of disturbed land
Risk analysis	the review of the risks associated with a particular event or action
Risk analysis	a technique used to identify and assess factors that may jeopardise the success of a project or achieving a goal
Risk management	the forecasting and evaluation of risks together with the identification of procedures to avoid or minimise their impact
Ruminant	a type of animal that has a stomach with four distinct compartments, the largest being the rumen, for example a cow, sheep, or deer

Term	**Explanation**
Safe work practices	methods outlining how to perform a task with minimum risk to people, equipment, materials, environment, and processes
Salinification	the process of becoming saline
Select	choose in preference to another or others
Simple	easy to understand and deal with; involving few elements, components or steps; obvious data or outcomes; may concern a single or basic aspect; limited or no relationships
Smallgoods	small meat products such as sausage or bacon
Social responsibility	the obligation of an organisation's management towards the welfare and interests of the society in which it operates
Soft and hard systems	hard systems thinking is a problem-solving approach that assumes that the problems associated with systems are well defined; soft systems thinking treats all problems as ill-defined or not easily quantified
Soil texture	the look and feel of a soil; the relative proportions of sand, silt, or clay in a soil
Standard deviation	a measure that is used to quantify the amount of variation or dispersion of a set of data values
Standardisation	the condition in which a standard has been successfully established
Statement	a sentence or assertion
Stocking rate	the number of animals on a given amount of land over a certain period of time
Subsystem	a self-contained system within a larger system
Sustainable	able to be maintained at a certain rate or level
SWOT analysis	a study undertaken by an organisation to identify its internal strengths and weaknesses, as well as its external opportunities and threats
System	a set of things working together as parts of a mechanism or an interconnecting network; a complex whole
Systematic	methodical, organised and logical
Systems	a diagram that defines the boundary between the system, or part of a system, and its environment, showing the

diagrams	entities that interact with it
Systems thinking	a holistic approach to the identification and solving of problems where parts and components of a system, their interactions and interrelationships are analysed individually to see how they influence the functioning of the whole system. This approach enables learners to understand systems and work with complexity, uncertainty and risk.

Term	Explanation
Temperature	a measure of warmth or coldness
Tillage	the practice of working land by ploughing, sowing, and raising crops
Topography	the arrangement of the natural and artificial physical features of an area

Term	Explanation
Vegetation	plants considered collectively, especially those found in a particular area or habitat
Veterinary	the study of procedures used in the medical care of animals
Viability	the ability to survive; in a business sense, that ability to survive is ultimately linked to financial performance and position
Vitamin	any of a group of organic compounds which are essential for normal growth and nutrition and are required in small quantities in the diet because they cannot be synthesised by the body
Viticulture	the cultivation of grapevines
Volume	the amount of space that a substance or object occupies, or that is enclosed within a container

Term	Explanation
Wages	a fixed regular payment earned for work or services, typically paid on a daily or weekly basis
Waste management	the collection, transportation, disposal or recycling and monitoring of waste
Weight	a measurement that indicates how heavy a person or object is
WHS	workplace health and safety; the safety, health and welfare of people engaged in work or employment

Term	Explanation
Yield	an amount produced of an agricultural or industrial product

Appendix 2

SYSTEMS THINKING

Agricultural activity is dependent on an understanding of systems. Students learn about systems from a scientific and technological perspective.

Systems thinking in science

Science frequently involves thinking, modelling and analysing in terms of systems in order to understand, explain and predict events and phenomena. Learners explore, describe and analyse increasingly complex systems.

They learn to identify and describe relationships between components within systems, and that components within living and non-living systems are interdependent. Learners recognise that within systems, interactions between components can involve forces and changes acting in opposing directions and that for a system to be in a steady state, these factors need to be in a state of balance or equilibrium. They are increasingly aware that systems can exist as components within larger systems, and that one important part of thinking about systems is identifying boundaries, inputs and outputs.

Systems thinking in technologies and business

A system is an organised group of related objects or components that form a whole. Systems thinking is a holistic approach to the identification and solving of problems where the focal points are treated as components of a system, and their interactions and interrelationships are analysed individually to see how they influence the functioning of the entire system.

In a Technologies approach, the success of designed solutions includes the generation of ideas and decisions made throughout the design processes. It requires learners to understand systems and work with complexity, uncertainty and risk. Learners recognise the connectedness of and interactions between people, places and events in local and wider world contexts and consider the impact their designs and actions have in a connected world.

Participating in and shaping the future of information and digital systems is an integral part of learning in Digital Technologies. Understanding the complexity of systems and the interdependence of components is necessary to create timely solutions to technical, economic and social problems. Implementation of digital solutions often has consequences for the people who use and engage with the system, and may introduce unintended costs or benefits that impact the present or future society.

Likewise, systems thinking is used in business, economics and geographical studies to understand the interactions and dynamics of complex systems and analyse their effects of inputs and outputs.

Computational thinking

Computational thinking is a problem-solving method that is applied to create solutions that can be implemented using digital technologies. It involves integrating strategies, such as organising data logically, breaking down problems into parts, interpreting patterns, and models and designing and implementing algorithms.

This type of thinking is used during different phases of a design process when computation is needed to quantify data and solve problems. Examples include when calculating costs, testing materials and components, comparing performance or modelling trends.

Appendix 3

LINE OF SIGHT – Agricultural Systems Level 3

Learning Outcomes	**Criteria**	**Criteria and Elements**	**Content/Work Requirements**
	Which criteria?	*Which elements of which criteria*?	*Which (top level) content areas*? *Which work requirements*?
• explain the influence of the physical, biological, technological and economic factors on sustainable agricultural production	C1, C2, C3, C4, C5, C6, C7, C8, C9	C1 - E1 to E7, C2 - E1 to E6, C3 - E1 to E6, C4 - E1 to E6, C5 - E1 to E7, C6 - E1 to E5, C7 - E1 to E7, C8 - E1 to E6, C9 - E1 to E5	Unit 2, 3, 4, 5, 6 WR 2, 3/4, 6
• describe the inputs, processes and interactions of plant and animal production systems	C2, C3, C4, C5, C6, C7	C2 - E1 to E7, C3 - E1 to E6, C4 - E1 to E6, C5 - E1 to E6, C6 - E1 to E7, C7 - E1 to E5	Unit 3, 4 WR 2, 3, 4, 6
• examine the technologies and technological innovations employed in the production and marketing of agricultural products	C6, C7, C8, C9	C6 - E1 to E7, C7 - E1 to E5 C8 - E1 to E7, C9 - E1 to E8	Unit 5 WR 5
• analyse the management of processes in agricultural systems	C1, C2, C3, C4, C5, C6, C7, C8, C9	C1 - E1 to E7, C2 - E1 to E6, C3 - E1 to E6, C4 - E1 to E6, C5 - E1 to E7, C6 - E1 to E5, C7 - E1 to E7, C8 - E1 to E6, C9 - E1 to E5	Unit 1, 2, 3, 4, 5, 6 WR 2, 3/4, 6
• explain the impact of innovation, ethics and current issues on Australian agricultural systems	C9	C9 - E1 to E8	Unit 5 WR5
• apply appropriate engineering principles to agricultural problems and situations	C8	C8 - E1 to E7	Unit 1, 5 WR 5
• assess the general business principles and decision-making processes involved in sustainable farm management and marketing of farm products	C5, C7	C5 - E1 to E6 C7 - E1 to E5	Unit 1, 3, 4, 6 WR 6
• interpret data including financial information, inputs and outputs, rates of change, area, volume and capacity	C7	C7 - E1 to E5	Unit 3, 4, 5, 6 WR 3/4, 6

• apply systems thinking strategies and processes	C1	C1 - E1 to E5	Unit 1 WR1
• assess the factors that influence the marketing of a plant OR animal product	C5, C7	C5 - E1 to E6	Unit 6 WR 6

Supporting documents including external assessment material

- AGR315117 Assessment Report 2017.pdf (2018-02-28 03:39pm AEDT)
- AGR315117 - Assessment Panel Report 2018.pdf (2019-02-01 11:29am AEDT)
- AGR315117 Assessment Report 2019.pdf (2020-01-24 02:37pm AEDT)
- Agricultural Systems AGR315117 - External Assessment Specifications.pdf (2020-03-20 03:18pm AEDT)
- TASC Student Folio Declaration form Information Sheet.pdf (2020-09-10 07:11pm AEST)
- AGR315117 Assessment Report 2020.pdf (2021-01-13 10:23am AEDT)
- 2021 AGR315117 TASC Student Folio Declaration Form.pdf (2021-02-15 11:28am AEDT)

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