



Agriculture

Stage 6 Syllabus

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Contents

1	The Higher School Certificate Program of Study.....	5
2	Rationale for Agriculture in the Stage 6 Curriculum	6
3	Continuum of Learning for Agriculture Stage 6 Students	8
4	Aim	9
5	Objectives	9
6	Course Structure	9
	6.1 Preliminary Course	10
	6.2 HSC Course	11
7	Objectives and Outcomes	12
	7.1 Table of Objectives and Outcomes.....	12
	7.2 Key Competencies	13
8	Content: Agriculture Stage 6 Preliminary Course.....	14
	8.1 Overview	14
	8.2 Farm Case Study	15
	8.3 Plant Production	16
	8.4 Animal Production	18
9	Content: Agriculture Stage 6 HSC Course	20
	9.1 Plant/Animal Production	20
	9.2 Farm/Product Study	22
	9.3 Optional Research Project.....	23
	9.4 Electives	24
10	Course Requirements	30
11	Post-school Opportunities	31
	11.1 Recognition of Student Achievement in Vocational Education and Training (VET).....	31
12	Assessment and Reporting	32
13	Glossary	33

1 The Higher School Certificate Program of Study

The purpose of the Higher School Certificate program of study is to:

- provide a curriculum structure which encourages students to complete secondary education;
- foster the intellectual, social and moral development of students, in particular developing their:
 - knowledge, skills, understanding and attitudes in the fields of study they choose
 - capacity to manage their own learning
 - desire to continue learning in formal or informal settings after school
 - capacity to work together with others
 - respect for the cultural diversity of Australian society;
- provide a flexible structure within which students can prepare for:
 - further education and training
 - employment
 - full and active participation as citizens;
- provide formal assessment and certification of students' achievements;
- provide a context within which schools also have the opportunity to foster students' physical and spiritual development.

2 Rationale for Agriculture in the Stage 6 Curriculum

Agriculture provides people with food, fibre, shelter and the possibility of diverse lifestyles. Agriculture is a composite of rural and urban industries that are structured to produce both raw and value-added materials from plants and animals to meet identified consumer needs.

Agriculture has a unique place in the history of human society. It underpins social structures and provides for basic human needs. It is fundamental to human progress.

Agricultural industries make a significant contribution to Australia's economy through investment, employment of skilled workers, consumption of products from other sectors of the economy and export. Agricultural products contribute significantly to Australia's export income. The total chain, from the farm and the research laboratory to the processing plant, retail outlet and exporter, accounts for a major portion of the nation's Gross Domestic Product. Australia's agricultural industries must undergo significant and continuous change to maintain and possibly enhance this contribution to the Australian economy.

The *Agriculture Stage 6 Syllabus* provides students with opportunities to understand and appreciate these essential aspects of agriculture.

Agriculture's dynamic nature results from the increase in knowledge and the application of technology to the production, processing and marketing of products in complex national and international marketplaces. This complexity has political, social, ethical, economic and environmental implications for Australia. Furthermore, the majority of consumers are isolated from the production and processing of food and fibre. This course provides students with an understanding of the relationships between production, processing and consumption to enable them to participate in debate on the impact of each upon society and the environment.

Agriculture Stage 6 has been designed to allow students to develop knowledge and understanding of the interaction between the component parts of agriculture and the scientific principles that explain the processes that take place when inputs are transformed into outputs. It caters for a diverse range of students and ability levels. It has the facility to challenge students academically as well as providing them with a wide range of practical skills and an awareness of technologies associated with agriculture.

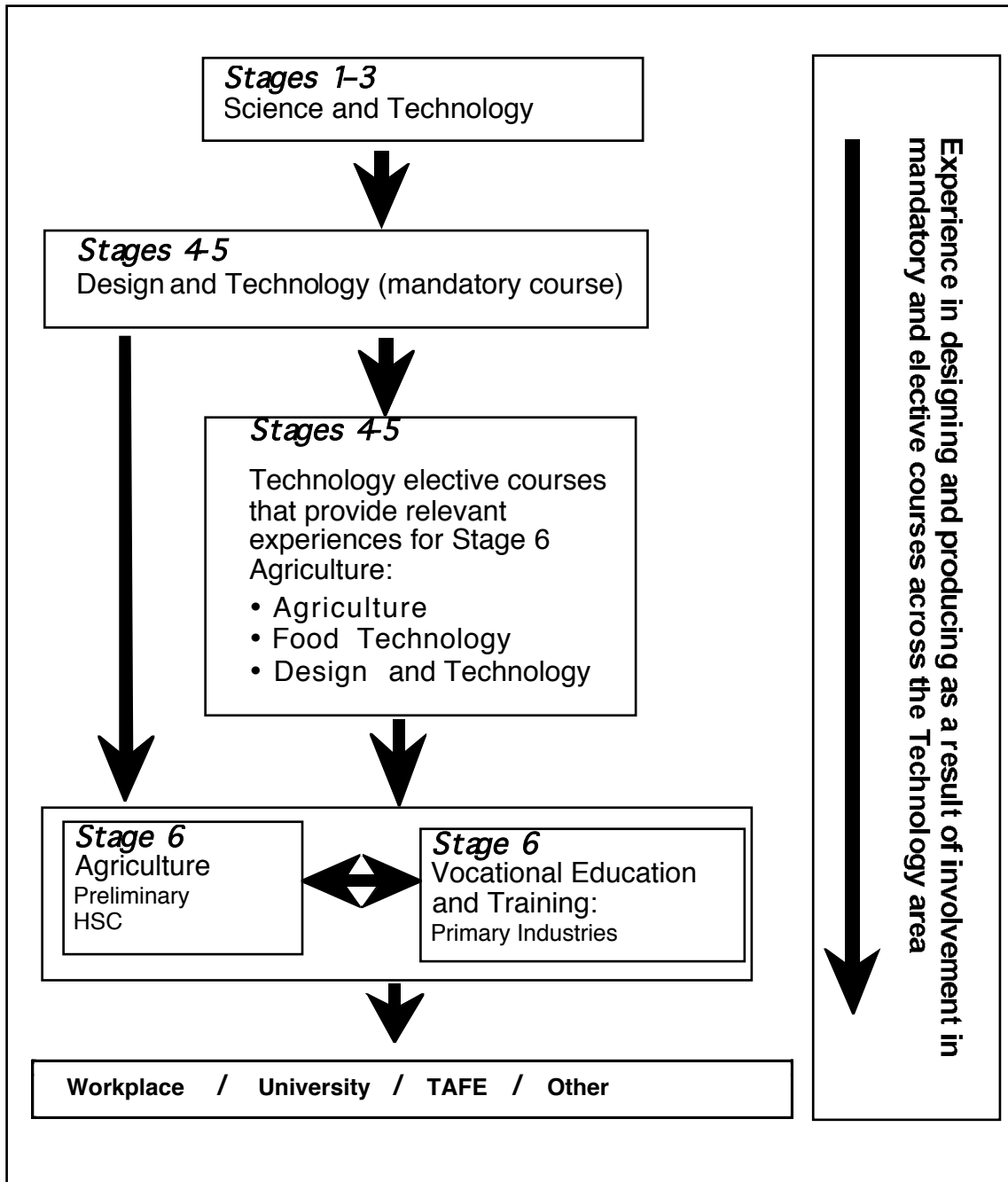
Opportunities are also provided for students to develop awareness of the welfare, ethical and legal issues relating to animal research.

Agriculture Stage 6 provides opportunities for multiple pathways to employment and further education. Some students may well be stimulated to move into post-secondary agricultural courses or to seek employment in rural and related industries.

The *Agriculture Stage 6 Syllabus* is designed to increase student understanding and capabilities in a continuum from the farm level through to the international markets in which agricultural commodities are traded. Because it includes the study of a farm and agricultural product of particular interest to the student, the relevance of the course is enhanced.

It is important that students realise that long-term benefits of agriculture can only accrue if systems can be sustained environmentally, economically and socially. Sustainability is critical if agriculture is to meet the food and fibre needs of society. An understanding of current land use must involve a historical perspective that extends back beyond the arrival of Europeans in 1788. Resolving issues of long-term profitability and sustainability is the challenge for agriculture and is the basis of this course.

3 Continuum of Learning for Agriculture Stage 6 Students



4 Aim

Agriculture Stage 6 is designed to develop students' knowledge and understanding about the production and marketing of both animal and plant products. Students should also develop the associated skills and responsible attitudes that are necessary to manage and market these products in a sustainable manner.

5 Objectives

Students will develop:

1. knowledge and understanding of the physical, chemical, biological, social, historical and economic factors that interact in agricultural production systems
2. knowledge, understanding and skills required to manage agricultural production systems in a socially and environmentally responsible manner
3. knowledge of, and skills in, decision-making and the evaluation of technology and management techniques used in sustainable agricultural production and marketing
4. skills in effective research, experimentation and communication
5. knowledge and understanding of the impact of innovation, ethics and current issues on Australian agricultural systems.

6 Course Structure

The *Agriculture Stage 6 Syllabus* has a Preliminary course and an HSC course.

It is intended that students engage in and reflect upon practical experience relevant to all aspects of the physical, chemical, biological, economic and social sciences embodied within Agriculture Stage 6. Some of this experience will be in the laboratory, some in small plot work and some on commercial farms or other components of the industry. In all cases, students should use these practical experiences to develop design, practical, management, observation, recording, interpretation and communication skills. Practical experiences may also be used to achieve coverage of the content statements not specifically related to skills. The practical experiences should occupy a minimum of 30 per cent of allocated course time.

6.1 Preliminary Course

120 indicative hours

The Preliminary course incorporates the study of the interactions between the components of agricultural production, marketing and management, while giving consideration to the issues of sustainability of the farming system. This is an 'on-farm', environment-orientated course.

Overview (15%)

- The dynamic nature of agriculture and its role in Australian society
- The components of agricultural production systems and factors that affect these systems

The Farm Case Study (25%)

- The farm as a unit of production
- Farm management
- Marketing
- Farm technology
- Agricultural workplaces

Plant Production (30%)

- Plants and their commercial production
- Animals, climate and resource interactions
- Microbes and pests
- Technology
- Research

Animal Production (30%)

- Animals and their commercial production
- Plants, climate and resource interaction
- Microbes and pests
- Technology
- Research

6.2 HSC Course

120 hours indicative time

The Higher School Certificate course builds upon the Preliminary course. It examines the complexity and scientific principles of the components of agricultural production, but places a greater emphasis on the place of the farm in the wider economic, environmental and social environment. The farm as a fundamental production unit provides a basis for analysing and addressing social, environmental and economic issues as they relate to sustainability, from a national and international perspective. This is achieved through the farm /product study.

Core 70% (approximately 84 indicative hours)

Plant/Animal Production (45%)

- Sustainable agricultural production
- Plant and animal systems
- Microbes and invertebrates
- Experimental analysis and research

Farm/Product Study (25%)

- The farm as a business
- Marketing product/s from the farm
- Decision-making processes and management strategies
- Agricultural technology

Optional Components 30% (approximately 36 indicative hours)

Research project (30%)	OR	2 electives (15% each)
Components include both a project report and process journal		18 hours per topic <ul style="list-style-type: none"> • Agribusiness • Horticulture • Innovation and diversification • Animal management • Plant management • Sustainable land and resource management

7 Objectives and Outcomes

7.1 Table of Objectives and Outcomes

Objectives	Preliminary Course Outcomes	HSC Course Outcomes
<p>Students will develop:</p> <p>1. knowledge and understanding of the physical, chemical, biological, social, historical and economic factors that interact in agricultural production systems</p>	<p>A student:</p> <p>P1.1 describes the complex, dynamic and interactive nature of agricultural production systems</p> <p>P1.2 describes the factors that influence agricultural systems</p>	<p>A student:</p> <p>H1.1 explains the influence of physical, biological, social, historical and economic factors on sustainable agricultural production</p>
<p>2. knowledge, understanding and skills required to manage agricultural production systems in a socially and environmentally responsible manner</p>	<p>P2.1 describes the biological and physical resources and applies the processes that cause changes in plant production systems</p> <p>P2.2 describes the biological and physical resources and applies the processes that cause changes in animal production systems</p> <p>P2.3 describes the farm as a basic unit of production</p>	<p>H2.1 describes the inputs, processes and interactions of plant production systems</p> <p>H2.2 describes the inputs, processes and interactions of animal production systems</p>
<p>3. knowledge of, and skills in, decision-making and the evaluation of technology and management techniques used in sustainable agricultural production and marketing</p>	<p>P3.1 describes the role of decision-making in the management and marketing of agricultural products in response to consumer and market requirements</p>	<p>H3.1 assesses the general business principles and decision-making processes involved in sustainable farm management and marketing of farm products</p> <p>H3.2 critically assesses the marketing of a plant OR animal product</p> <p>H3.3 critically examines the technologies and technological innovations employed in the production and marketing of agricultural products</p> <p>H3.4 evaluates the management of the processes in agricultural systems</p>
<p>4. skills in effective research, experimentation and communication</p>	<p>P4.1 applies the principles and procedures of experimental design and agricultural research</p>	<p>H4.1 applies appropriate experimental techniques, technologies, research methods and data presentation and analysis in relation to agricultural problems and situations</p>
<p>5. knowledge and understanding of the impact of innovation, ethics and current issues on Australian agricultural systems</p>	<p>P5.1 identifies the role of associated technologies and technological innovation in producing and marketing agricultural products</p>	<p>H5.1 evaluates the impact of innovation, ethics and current issues on Australian agricultural systems</p>

7.2 Key Competencies

Agriculture provides a powerful context within which to develop general competencies considered essential for the acquisition of effective, higher-order thinking skills necessary for further education, work and everyday life.

Key competencies are embedded in the Agriculture syllabus to enhance student learning. The key competencies of **collecting, analysing and organising information** and **communicating ideas and information**, reflect core processes of agricultural inquiry and are explicit in the objectives and outcomes of the syllabus. The other key competencies are developed through the methodologies of the syllabus and through classroom pedagogy. Students work as individuals and as members of groups to conduct agricultural activities and investigations, and through this, the key competencies **planning and organising activities** and **working with others and in teams** are developed.

When students plan trials and analyse experimental data, they are developing the key competency **using mathematical ideas and techniques**. During research investigations, students will need to use appropriate information technologies and so develop the key competency of **using technology**. Finally, the exploration of current issues and the evaluation of technology and management techniques contributes towards the students' development of the key competency **solving problems**.

8 Content: Agriculture Stage 6 Preliminary Course

8.1 Overview

This component is focused on the interactive nature of agricultural production. The factors that influence agriculture and that are in turn influenced by agriculture are studied. The concepts raised in the overview are integrated throughout the course.

Outcomes

A student:

- P1.1 describes the complex, dynamic and interactive nature of agricultural production systems
- P1.2 describes the factors that influence agricultural systems
- P2.3 describes the farm as a basic unit of production.

Content

Students learn about:

- agricultural systems
 - the interaction between subsystems on a farm, resources, plants, animals, management and microbes
 - the patterns of climate and soil resources that influence the distribution of agricultural enterprises
 - the impact of physical, biological, social, historical and economic factors on systems
- agricultural history
 - the changes in the Australian environment that have occurred since the arrival of Europeans
 - Aboriginal land practices before the arrival of Europeans
- social aspects surrounding agriculture
 - the changing role of the family farm in Australian agriculture
 - the interaction between agriculture and Australian society.

Students learn to:

- construct an appropriate model showing interactions between subsystems on a farm
- access information relevant to Australian agriculture.

8.2 Farm Case Study

This component involves the study of farm production systems by investigating a selected farm or farms.

Outcomes

A student:

- P1.1 describes the complex, dynamic and interactive nature of agricultural production systems
- P1.2 describes the factors that influence agricultural systems
- P2.3 describes the farm as a basic unit of production
- P3.1 describes the role of decision-making in the management and marketing of agricultural products in response to consumer and market requirements
- P5.1 identifies the role of associated technologies and technological innovation in producing and marketing agricultural products.

Content

Students learn about:

- the farm as a production unit
 - the enterprises on a farm
 - the physical and biological environment of a farm
 - a calendar of operations for an enterprise production cycle
 - the physical resources of a farm
 - agricultural record-keeping
 - measures of performance on farms
 - problems associated with production on a farm
 - the role of the farm manager
 - the impact of consumers on marketing
- farm management
 - the key factors involved in the decisions made by the farm manager
 - current management practices, with reference to sustainability
- marketing
 - the various ways in which agricultural products are marketed on the farm
- farm technology
 - technology used in management and production on the farm
 - technology used in marketing the products of the farm
- the agricultural workplace
 - potential hazards in agricultural workplaces
 - safe work practices employed in agricultural workplaces
 - animal welfare requirements.

Students learn to:

- observe, collect, record information on the physical resources of the farm, such as soil, climate, vegetation, topography
- calculate measures of performance
- gather data using appropriate instruments to measure resources, such as weather and soils
- use safe work practices
- identify potential hazards in agricultural workplaces, eg unsafe machinery
- identify and report on land degradation problems on the farm.

8.3 Plant Production

This component focuses on production and management of plants for commercial purposes. Plants in agricultural systems cannot be studied without analysing their interactions with resources (soils, climate, farm structures etc) and microbes/pests that exist in most farm environments.

Outcomes

A student:

- P2.1 describes the biological and physical resources and applies the processes that cause changes in plant production systems
- P3.1 describes the role of decision-making in management and marketing of agricultural products in response to consumer and market requirements
- P4.1 applies the principles and procedures of experimental design and agricultural research
- P5.1 identifies the role of associated technologies and technological innovation in producing and marketing agricultural products.

Content

Students learn about:

- plants and their commercial production
 - basic morphology and function of leaves, stems, roots, flowers and fruits
 - regionally significant plants
 - consumer and market requirements for commercial plant products
 - propagation techniques
- animals, climate and resource interactions
 - effects of soil texture, structure, pH, fertility on plant production
 - cultivation and/or grazing practices
 - management for sustainable production
 - effective rainfall and the concept of the growing season
- microbes and pests
 - their nature and impact on plant production systems
- technology
 - use of technologies in producing and marketing plant products
- experimental design and research
 - the role of a control
 - the collection and simple analysis of data
 - recent findings that contribute to sustainable plant production systems.

Students are expected to conduct at least ONE plant OR animal trial.

Students develop the concept of the dynamic and interactive nature of plant enterprises by designing and developing models of plant enterprises where the interactions between their components are highlighted. Learning about the components and interaction of plant enterprises will be enhanced by developing practical skills in growing and monitoring plants or crops.

Students learn to:

- identify a range of regionally significant plants
- select fertiliser(s) appropriate to the soil and the requirements of crop/pasture
- select appropriate tillage implements and/or techniques to establish a crop or pasture
- collect and use meteorological data, eg temperature, rainfall, evaporation, effective rainfall
- grow and monitor a crop/pasture from planting through to harvest
- identify important diseases and pests of a selected crop/pasture
- use a variety of sources to gather information about a specific agricultural problem or situation
- design and/or conduct a simple trial using appropriate methodology
- measure and describe the features of soil, including colour, texture, structure, pH, parent material and water-holding capacity.

8.4 Animal Production

This component is focused on the production and management of animals for commercial purposes. Animals in agricultural systems cannot be studied without analysing their interactions with plants, climate, resources and microbes/pests that exist in most farm environments.

Outcomes

A student:

P2.2 describes the biological and physical resources and applies the processes that cause changes in animal production systems

P3.1 describes the role of decision-making in management and marketing of agricultural products in response to consumer and market requirements

P4.1 applies the principles and procedures of experimental design and agricultural research

P5.1 identifies the role of associated technologies and technological innovation in producing and marketing agricultural products.

Content

Students learn about:

- animals and their commercial production
 - basic anatomy and physiology of digestive and reproductive systems
 - basic nutritional requirements
 - growth and development
 - regionally significant animals
 - safe handling and management techniques for the care and welfare of animals
 - the legal requirements relating to the care and welfare of the animal
 - consumer and market requirements for commercial animal products
- plants, climate and resources interactions
 - management for sustainable production
- microbes and pests
 - their nature and impact on animal production systems
- technology
 - use of technologies in producing and marketing animal products within animal welfare guidelines
- experimental design and research
 - the role of a control
 - the collection and simple analysis of data
 - recent findings that contribute to sustainable animal production systems
 - the ethical, legal and animal welfare requirements.

Students are expected to conduct at least ONE plant OR animal trial.

Students develop the concept of the dynamic and interactive nature of animal enterprises by developing models of animal enterprises whereby the interactions between components are highlighted. Learning about the components and interactions of animal enterprises will be enhanced by developing practical skills in growing and monitoring animals.

Students learn to:

- identify a range of regionally significant farm animals
- manage and monitor the growth and development of a farm animal
- select and perform appropriate and safe handling and management techniques for the care and welfare of farm animals
- identify important pests and diseases of an animal enterprise
- monitor the physical aspects of the environment of a selected farm animal
- design and/or conduct a simple trial using appropriate methodology within animal welfare guidelines.

All practical activities involving animals must comply with the *Animal Research Act 1985* (NSW) as described in the current edition of *Animals in Schools: Animal Welfare Guidelines for Teachers*, produced on behalf of the Schools Animal Care and Ethics Committee by the NSW Department of Education and Training.

9 Content: Agriculture Stage 6 HSC Course

9.1 Plant/Animal Production

Outcomes

A student:

H1.1 explains the influence of the physical, biological, social, historical and economic factors on sustainable agricultural production

H2.1 describes the inputs, processes and interactions of plant production systems

H2.2 describes the inputs, processes and interactions of animal production systems.

Content

Students learn about:

- sustainable agricultural production
 - the historical development of Australian land use practices, including Aboriginal practices, up to the present day
 - the chemical and physical characteristics of soil
 - techniques to maintain and/or improve soil fertility, including alternative strategies to the application of inorganic fertilisers
 - the role of soil nutrient cycles in Australian agricultural systems
 - the farming practices that have led to soil degradation, such as salination, acidification, soil structure decline and erosion, and the effects of these on soil and water
 - sustainable farming practices, including minimum tillage and crop rotation
 - the role of individual farmers, the broader community and government in reducing the harmful environmental effects of agriculture and in conserving water and protecting waterways
 - the tension between sustainability and short-term profitability in farming systems
- plant production systems
 - the processes of respiration and photosynthesis and net assimilation rate
 - the constraints imposed by environmental factors, including light, temperature, available moisture, oxygen/carbon dioxide ratios, wind and biotic factors on plant growth, development and production
 - the interaction of genotype with environment and the consequent opportunities for plant productivity
 - breeding systems and their genetic basis to improve quality and production of plants
 - the major components of interference in plant communities, ie plant competition, allelopathy, environmental modification of plants and plants acting as alternative hosts
 - the role of native and introduced pasture species in pasture management systems

- animal production systems
 - the similarities and differences in the anatomy and physiology of ruminants and monogastrics
 - the nutritional requirements of a selected animal
 - the fate of energy in animal nutrition
 - the processes of growth and development in animals in terms of the proportion of muscle, fat and bone
 - breeding systems and their genetic basis to improve quality and production of animals
 - the role of hormones in the regulation of animal reproduction and behaviour
 - the factors that limit the fertility of farm animals
 - ethics, welfare and legal issues and requirements
- microbes and invertebrates
 - the role of microbes and invertebrates in the decomposition of organic matter and the fixing of atmospheric nitrogen via their association with legumes
 - the complex interaction involving problem organisms (pathogenic microbe or invertebrate), the host and the environment in plant and animal disease
 - the problems of pesticides and chemical resistance in target organisms
 - the importance of agricultural chemical labels as they relate to safe practice and correct usage
 - the use and potential for integrated pest management (IPM)
- experimental analysis and research in plant/animal systems
 - the role of a control, randomisation, replication and standardisation of conditions
 - the collection and analysis of data
 - impact of research on agricultural production systems.

Students learn to:

- use nutritional data to determine the suitability of animal feeds
- use a computer to simulate agricultural problem situations and test solutions
- interpret a chemical label and relate it to safe practice and correct usage
- research an integrated pest management program for a plant or animal production system
- measure and monitor plant and animal production systems within animal welfare guidelines
- analyse and interpret agricultural data, for example animal performance measures, climatic information and crop production data
- investigate examples of plant interference, including weeds and planting density
- calculate a measure of variability (standard deviation) using a calculator/computer
- make recommendations based on the interpretation of the results of agricultural experiments.

All practical activities involving animals must comply with the *Animal Research Act 1985* (NSW) as described in the current edition of *Animals in Schools: Animal Welfare Guidelines for Teachers*, produced on behalf of the Schools Animal Care and Ethics Committee by the NSW Department of Education and Training.

9.2 Farm/Product Study

Outcomes

A student:

H3.1 assesses the general business principles and decision-making processes involved in sustainable farm management and marketing of farm products

H3.2 critically assesses the marketing of a plant OR animal product

H3.3 critically examines the technologies and technological innovations employed in the production and marketing of agricultural products

H3.4 evaluates the management of the processes in agricultural systems.

Content

Students learn about:

- the farm as a business
 - the place of the farm in the wider agribusiness sector
 - the range of marketing strategies, for example vertical integration, contract selling, direct marketing, cooperatives, marketing boards, available to producers
 - the interaction between the farm and the market
 - ways in which governments can intervene in aspects of agricultural production and marketing
- the marketing of a specific farm product
 - the quality criteria for the product
 - the importance of product specification in the marketing of the product
 - the processes involved in turning the raw agricultural commodity into various forms to satisfy consumer demand
 - the role of advertising and promotion in the marketing of the product
 - the nature and potential for value adding on the product
- decision-making processes and management strategies
 - assessment of the performance of systems and decision-making based on measurements of quality and quantity
 - the financial pressures that have an impact on farmers, including the irregular nature of income, high expenditure on inputs, the dynamic nature of markets and interest rates, risk management
 - the problems that may occur in meeting market specifications
- agricultural technology
 - the impact that scientific research and associated technology has had on agricultural production and marketing.

Students learn to:

- assess the quality of the product of a plant or animal system
- calculate a gross margin for an enterprise
- schedule the timing of operations in a production cycle
- determine the marketing chain for a particular product
- evaluate marketing information, such as a sales report, for a product
- interpret supply and demand information for the product.

9.3 Optional Research Project

Outcomes

A student:

H3.4 evaluates the management of the processes in agricultural systems

H4.1 applies appropriate experimental techniques, technologies, research by methods and data presentation and analysis in relation to agricultural problems and situations

H5.1 evaluates the impact of innovation, ethics and current issues on Australian agricultural systems.

Content

Students learn about:

- processes in agricultural systems by:
 - conducting an independent investigation in an agricultural situation
 - using data/information from research to evaluate the management of agricultural processes
- research methodology and presentation of research by:
 - identifying a research question that could be investigated
 - accessing and evaluating sources of information pertinent to the question being investigated, eg a review of the literature
 - selecting appropriate research methods to find answers to the questions being investigated
 - collecting, presenting and interpreting data in a way appropriate to the research methods used
 - evaluating and communicating the processes and results of research in a formal report and through a process journal
- innovation, ethics and current issues by:
 - identifying issues relevant to the ethical behaviour and responsibilities of agricultural researchers
 - considering issues of ethics and welfare in the design of the research
 - making some recommendations from the research that could be of use to others and lead to further research.

9.4 Electives

Each elective has one or more content statements that suit individual research by students. While not intended to be as complex and self-directed as the optional research project, students should attempt to undertake an investigation involving research, data collection and use an appropriate form of presentation.

Elective 1 – Agribusiness

For the purpose of this study, *Agribusiness is the food and fibre business. It includes all the activities involved in the production, processing and distribution of food and fibre products; input supply, agricultural production, marketing and processing together with related activities in government and education (Agribusiness Association of Australia and New Zealand).*

This elective examines the farm as part of agribusiness. It describes the impact of international and domestic forces on farm business. The role of a large organisation (corporation or company) in the agricultural sector is examined.

Outcomes

A student:

H3.4 evaluates the management of the processes in agricultural systems

H4.1 applies appropriate experimental techniques, technologies, research methods and data presentation analysis in relation to agricultural problems and situations

H5.1 evaluates the impact of innovation, ethics and current issues on Australian agricultural systems.

Content

Students learn about:

- processes in agricultural systems by:
 - analysing the financial situation of a farm using a variety of techniques
 - describing the choices available for a farm business to obtain finance for its operations
 - explaining the strategies that could be used for a farm business to obtain finance for its operations
 - assessing the role of farm advisory services in farm management decision-making
 - investigating the impact of the organisation on the biological and physical components of the industry
- research methodology and presentation of research by:
 - analysing a study of the impact of a large rural business organisation on the agricultural industries in which it is involved
- innovation, ethics and current issues by:
 - outlining an example of a successful value adding, niche marketing, product diversification strategy that has been used to vary the marketing opportunities for a particular agricultural product
 - critically evaluating alternative selling systems and marketing options for a particular agricultural product
 - evaluating the impact of international markets on farm businesses
 - investigating methods that are employed to develop new domestic and international markets.

Elective 2 – Animal Management

This elective examines the principles of animal production. This study is based on an understanding of the biology of animals and their interactions with the environment.

Outcomes

A student:

H3.4 evaluates the management of the processes in agricultural systems

H4.1 applies appropriate experimental techniques, technologies, research methods and data presentation analysis in relation to agricultural problems and situations

H5.1 evaluates the impact of innovation, ethics and current issues on Australian agricultural systems.

Content

Students learn about:

- processes in agricultural systems by:
 - relating knowledge of animal hormonal systems and reproductive anatomy to breeding techniques and reproductive management
 - evaluating management techniques available to farmers to manipulate the rates of growth, development and reproduction in farm animals, including the use of chemicals and hormones
 - outlining the role of objective measurement and heritability on the breeding programs of farms, using at least one specific program used in one animal industry
 - describing the nature of the immune system in terms of antibody, antigen, vaccine, immunity, antitoxin and linking it to the prevention of diseases by vaccination
- research methodology and presentation of research by:
 - analysing a study of a current technique/technology which is advancing productivity in animal production systems
- innovation, ethics and current issues by:
 - discussing the impact or potential impact of genetic engineering and associated genetic technologies on animal production systems
 - evaluating changes being made to breeding systems and techniques in terms of their impact on reproductive efficiency, product quality, individual farm breeding programs and animal adaptability in a wide range of commercial industries
 - discussing the advantages and disadvantages of various management practices associated with disease control, with emphasis on animal welfare issues, environmental protection, chemical resistance in target organisms and human safety
 - outlining some of the issues (for example economic, management, social, legal and ethical) that may have an impact on the successful implementation of new technologies in animal production systems.

Elective 3 – Horticulture

This elective involves the study of horticulture, including the amenity, floriculture and production industries. It investigates the role of technology and innovation in one horticultural industry and shows the potential of improving market share by innovative marketing of horticultural products.

Outcomes

A student:

H3.4 evaluates the management of the processes in agricultural systems

H4.1 applies appropriate experimental techniques, technologies, research methods and data presentation analysis in relation to agricultural problems and situations

H5.1 evaluates the impact of innovation, ethics and current issues on Australian agricultural systems.

Content

Students learn about:

- processes in agricultural systems by:
 - explaining the relationship between the level of output in intensive horticulture and the nature and level of input
 - critically analysing the role of the manager in manipulating parts of the horticultural system to balance economic viability, environmental sustainability and new or developing markets
 - describing how the characteristics of plants affect their use in horticulture
 - discussing how plant physiology and plant response to environment (including pests and disease) affect the production cycle of a horticultural system
- research methodology and presentation of research by:
 - analysing a study of one technological innovation aimed at improving productivity in a particular horticultural industry
- innovation, ethics and current issues by:
 - describing the existing and potential economic importance of horticulture at the domestic and international levels
 - relating plant physiology to techniques of plant propagation and reproduction
 - describing how factors such as quarantine and market proximity affect production and post-production strategies for horticultural products
 - assessing the influence of changing markets, both domestic and international, on the types of products, production techniques and post-harvest handling in horticulture.

Elective 4 – Innovation and Diversification

While Australian agriculture is still composed of many traditional agricultural industries, new or alternative industries or production methods are emerging, either on existing farms or on new farming enterprises. Both plant and animal systems are involved and a knowledge of the biology and associated management of the new enterprise or technologies is essential for the economic viability of that enterprise.

Research, development and trialling of potential industries prior to full implementation is an ongoing process in Australian agriculture.

Outcomes

A student:

H3.4 evaluates the management of the processes in agricultural systems

H4.1 applies appropriate experimental techniques, technologies, research methods and data presentation analysis in relation to agricultural problems and situations

H5.1 evaluates the impact of innovation, ethics and current issues on Australian agricultural systems.

Content

Students learn about:

- processes in agricultural systems by:
 - appraising the production systems or technological innovations available for some existing agricultural enterprises
 - appraising economic, environmental and managerial factors of one alternative agricultural production system or technology
 - applying knowledge of the biology of a plant or animal to the management of alternative production systems or technology
 - discussing the techniques that may be used to market the innovation, for example niche markets in alternative agricultural production
- research methodology and presentation of research by:
 - analysing a study of the development and implementation of one alternative agricultural production system or technology
- innovation, ethics and current issues by:
 - outlining the diversity of new agricultural enterprises or technologies
 - explaining the need for research in the development of alternative enterprises
 - outlining legal or other institutional requirements that must be met in order to establish alternative agricultural systems and enterprises or technologies
 - evaluating trends in marketing, production or technologies and development of alternative agricultural systems and enterprises and any social barriers that may need to be overcome.

Elective 5 – Plant Management

This elective examines the principles of plant production. This study is based on an understanding of the biology of plants and their interactions with the environment.

Outcomes

A student:

H3.4 evaluates the management of the processes in agricultural systems

H4.1 applies appropriate experimental techniques, technologies, research methods and data presentation analysis in relation to agricultural problems and situations

H5.1 evaluates the impact of innovation, ethics and current issues on Australian agricultural systems.

Content

Students learn about:

- processes in agricultural systems by:
 - relating the cellular anatomy of plants to the functions of the main organs (roots, stems and leaves)
 - explaining the plant physiological processes: photosynthesis, water and nutrient uptake and reproduction
 - outlining the role of plant hormones in plant growth and development
 - describing the vegetative and reproductive anatomy of commercially grown plants in relation to their function
 - explaining how plant density may affect the vegetative and reproductive yields
- research, methodology and presentation of research by:
 - analysing a study of the role of plant breeding or related research in advancing productivity in plant production systems
- innovation, ethics and current issues by:
 - outlining technologies that produce and distribute new plant genetic material, including genetic engineering, tissues, grafting, budding and hybridising
 - explaining how environmental factors, such as mineral nutrients, soil moisture, temperature, pests and disease, light and photoperiod, can be managed to manipulate plant production
 - analysing the management of plant/cropping systems, in relation to nutrient cycles and soil fertility
 - describing how plant hormones may be used to manipulate plant production. Consider their use in herbicides, inducing or inhibiting fruit set, cuttings, tissue culture, inhibiting stem elongation, ripening.

Elective 6 – Sustainable Land and Resource Management

This elective examines the principles involved in the long-term sustainability of resources, such as land and water, in farming systems. It deals with both the historical factors and current management techniques related to sustainable farming systems. Whole-farm planning should ensure the sustainability of a farm is covered in terms of the environment, its financial status and its social context.

Outcomes

A student:

H3.4 evaluates the management of the processes in agricultural systems

H4.1 uses appropriate experimental techniques, technologies, research methods and data presentation analysis in relation to agricultural problems and situations

H5.1 evaluates the impact of innovation, ethics and current issues on Australian agricultural systems.

Content

Students learn about:

- processes in agricultural systems by:
 - applying the Australian land capabilities system to the local area in order to compare existing land use to that suggested by a land capability assessment, to ensure sustainable land use
 - discussing the effects of soil degradation on agricultural productivity and sustainability
 - discussing the issues related to water quality, supply and regulation
 - examining the causes of the following types of soil degradation: soil erosion, dryland salinity, irrigation salinity, soil acidification and soil structure decline (with special reference to those arising from farming practices)
 - explaining in detail the processes that have led to **one** of the above types of soil degradation and outlining the extent of this soil degradation problem in Australia, with specific reference to effects on plant and animal production
- research methodology and presentation of research by:
 - analysing a study of innovative technologies or practices that are assisting with the conservation and efficient use of water in agricultural production systems
- innovation, ethics and current issues by:
 - examining and evaluating the current recommended procedure to alleviate the problem studied above with special reference to the physical and biological processes occurring in the soil
 - analysing the strategies and innovative activities occurring in programs related to total catchment management landcare and whole-farm planning as a means of dealing with sustainability in agriculture
 - discussing the importance of the attitudes of farmers and the wider community to effectively achieve environmental, economic and social sustainability in agricultural systems
 - appreciating the role of the government in land and resource management.

10 Course Requirements

For the Preliminary course:

- 120 indicative hours are required to complete the course
- practical experiences should occupy a minimum of 30% of course time.

For the HSC course:

- the Preliminary course is a prerequisite
- 120 indicative hours are required to complete the course
- practical experiences should occupy a minimum of 30% of course time
- if the research project option is undertaken, a project report and process diary must be submitted to the Board of Studies.

11 Post-school Opportunities

The study of Agriculture Stage 6 provides students with knowledge, understanding and skills that form a valuable foundation for a range of courses at university and other tertiary institutions.

In addition, the study of Agriculture Stage 6 assists students to prepare for employment and full and active participation as citizens. In particular, there are opportunities for students to gain recognition in vocational education and training. Teachers and students should be aware of these opportunities.

11.1 Recognition of Student Achievement in Vocational Education and Training (VET)

Wherever appropriate, the skills and knowledge acquired by students in their study of HSC courses should be recognised by industry and training organisations.

Recognition of student achievement means that students who have satisfactorily completed HSC courses will not be required to repeat their learning in courses in TAFE NSW or other Registered Training Organisations (RTOs).

Registered Training Organisations, such as TAFE NSW, provide industry training and issue qualifications within the Australian Qualifications Framework.

The degree of recognition available to students in each subject is based on the similarity of outcomes between HSC courses and industry training packages endorsed within the Australian Qualifications Framework (AQF). Training packages are documents that link an industry's competency standards to AQF qualifications. More information about industry training packages can be found on the National Training Information Service (NTIS) website (www.ntis.gov.au).

Recognition by TAFE NSW

TAFE NSW conducts courses in a wide range of industry areas, as outlined each year in the *TAFE NSW Handbook*. Under current arrangements, the recognition available to students of Agriculture in relevant courses conducted by TAFE is described in the *HSC/TAFE Credit Transfer Guide*. This guide is produced by the Board of Studies and TAFE NSW and is distributed annually to all schools and colleges. Teachers should refer to this guide and be aware of the recognition available to their students through the study of Agriculture Stage 6. This information can be found on the TAFE NSW website (www.tafensw.edu.au/mchoice).

Recognition by other Registered Training Organisations

Students may also negotiate recognition into a training package qualification with another Registered Training Organisation. Each student will need to provide the RTO with evidence of satisfactory achievement in Agriculture Stage 6 so that the degree of recognition available can be determined.

12 Assessment and Reporting

Advice on appropriate assessment practice in relation to the Agriculture syllabus is contained in *Assessment and Reporting in Agriculture Stage 6*. That document provides general advice on assessment in Stage 6 as well as the specific requirements for the Preliminary and HSC courses. The document contains:

- suggested components and weightings for the internal assessment of the Preliminary course
- mandatory components and weightings for the internal assessment of the HSC course
- the HSC examination specifications, which describe the format of the external HSC examination.

The document and other resources and advice related to assessment in Stage 6 Agriculture are available on the Board's website at www.boardofstudies.nsw.edu.au/syllabus_hsc

13 Glossary

agriculture	The range of activities aimed at producing food, fibre and other plant and animal derivatives to meet the demands of society
animal production	The raising of animals in order to acquire products used by society, eg the raising of sheep to produce meat and wool
electives	A series of six options, two of which can be selected for study as an alternative to the research project, in the HSC course
enterprise	An agricultural activity aimed at producing a particular commodity, eg the growing of carnations to produce cut flowers
farm case study	The study of a particular farm production system incorporating at least one visit to the selected farm. This is carried out in the Preliminary course
farm/product study	An extension of the farm case study. It is designed to develop the understanding of the sustainability of the farm, economically, culturally and environmentally. Emphasis should be put on both the marketing of the product and how management of the system improves the efficiency of production. This is carried out in the HSC course
plant production	The growing of plants in order to acquire products used by society, eg the growing of cotton to be used as a fibre for clothing
research project	An individual piece of work undertaken by HSC students as an alternative to the study of two electives. The research project requires students to explore a particular agricultural issue or perspective of their choice