

BSc (Hons) Agriculture (Specialisation: Land and Water Management) – A300

1. Objectives

Agriculture, being an important pillar of the Mauritian economy, the Government has developed plans and incentives to increase agricultural production. However, in the past few decades, the negative impacts of agricultural activities on the environment have been highlighted at both international and national level. This program has been designed specifically for the learners to have a broad knowledge on agricultural production, with a specialization in natural resources management in line with the national goal of protecting the environment.

The agricultural element of this program covers agricultural production and new emerging crop technologies, animal production and health, biotechnology, and agricultural economics, management and extension.

The land and water management components focus on the soil/water interface and how to manage it for maximum productivity within the environmental requirements of long-term sustainability and overall ecosystem health. It encompasses the areas of Hydrology, Irrigation and drainage, soil science and soil mechanics, Remote sensing, Land Surveying, Geographic Information System, Soil and Water Conservation and Management, Hydrologic Modelling and Climate Change.

By the end of this programme, graduates will have developed knowledge and skills to:

- Identify and employ effective agricultural techniques in the crop and animal sectors, in order to optimize production;
- Evaluate the hydro-physical characteristics of soil and soil mechanics;
- Propose measures to conserve and manage the soil for decreasing soil degradation and optimal use of the land resource;
- Analyse the soil water movement, the different soil hydrological processes involved, water stress, evaluate field soil-water balance and to determine evapotranspiration and water use efficiency under various circumstances;
- Propose measures to conserve and manage water for increase in agricultural productivity;
- Use hydrological model to evaluate the movement of water in the soil and evaluate the impact of climate change and different landuse in water resource use;
- Face the challenge of providing safe food, clean water while alleviating the negative impacts on the environment and health by carrying out research in this field.

2. General Entry Requirements

In accordance with General Entry Requirements for Admission to the University for Undergraduate Degrees.

3. Programme Requirements

Credit in Mathematics and Chemistry.

2 GCE 'A' Level passes in related approved Science subjects (Mathematics, Botany, Zoology, Chemistry, Physics, Biology, Food Studies, Computer Science or Computing).

Preference will be given to candidates holding an 'A' Level in Physics, Chemistry or Biology.

4. Programme Duration

	Normal (Years)	Maximum (Years)
Degree	3	5

5. Credits per Year

Minimum 18 credits, Maximum 48 credits subject to Regulation 4.

6. Minimum Credits Required for the Award of Undergraduate Degree: 107

Breakdown as follows:

	Credits from		
	Core Taught Modules	Project	Gem
Degree	92	9	6

The Practical Training Component and the “Scientific Communication Skills” module must be completed satisfactorily for the award of the degree.

Students may exit with

- (a) a Certificate after having earned 30 credits in core modules.
- (b) a Diploma after having earned 60 credits in core modules.

7. Assessment

Each module will be assessed over 100 marks (i.e. expressed as %) with details as follows (unless otherwise specified):

Assessment will be based on a Written Examination of 2-3 hour duration, carrying a weighting of 70%, and Continuous Assessment carrying 30% of total marks for AGRI modules. Modules from other Faculties/Departments/Centres will carry weighting in the Written Examination and the Continuous Assessment as specified by the concerned Faculties/Departments/Centres. Continuous Assessment will be based on laboratory/field works, and/or assignments, and should include at least 1 class test. Written examinations for all AGRI modules will normally be carried out at the end of the academic year.

An overall total of 40% for combined continuous assessment and written examination components would be required to pass a module, without minimum threshold within the individual continuous assessment and written examination.

Modules will carry the weightings of 1, 3 or 5 depending on their status (Introductory, Intermediate or Advanced). Weighting for a particular module is indicated within parentheses in the module code.

Each module will carry credits ranging from 3 to 6 credits and the Project will carry 9 credits.

Assessment of practical training placement will be based on the on-site supervisor's evaluation and the student's portfolio. For satisfactory completion of the training placement, a minimum of 40% should be attained.

Assessment of the "scientific communication skills" module will be based on continuous assessment of students throughout the module and/or submission of a portfolio. The module carries no credits. For satisfactory completion of the module, a minimum of 40% should be attained.

8. Important Note

The rules as stipulated in this Programme Structure and Outline Syllabus will replace all other rules and regulations.

9. Academic Teaching in Case of an Emergency

To ensure minimal disruption of normal academic teaching in case of an emergency (eg closure of the University for more than 2 weeks), the Moodle e-Learning Platform of VCILT will be used to deliver Teaching and Learning content. Relevant learning resources will be posted on the Platform. Assignments (if any) will be submitted using the online submission box. Arrangements will be made to register students on the Moodle platform at the beginning of the academic year.

10. List of Modules - BSc (Hons) Agriculture (Specialisation: Land and Water Management)

Code	Module Name	Hr / Yr L+P	Credits
CSE 1003(1)	Computer Programming	30 + 30	3
AGRI 1018Y(1)	Agricultural Chemistry and Soil Science	45+ 60	5
AGRI 1019Y(1)	Crop Science	45+ 60	5
AGRI 1022Y(1)	Animal Science	45+ 60	5
AGRI 1023Y(1)	Animal Production	45+ 60	5
AGRI 1035Y(1)	Agronomy and Horticultural Crop Production I	45+60	5
AGRI 1066Y(1)	Introduction to Civil Engineering	60+45	5
AGRI 1067Y(1)	Introductory Agricultural Management, Economics, Extension and Systems	60+ 60	6
AGRI 2045Y(3)	Statistical Methods for Agricultural Sciences	60+ 60	6
AGRI 2086Y(3)	GIS, Remote Sensing, Engineering Drawing and Land Surveying	60+45	5
AGRI 2087Y(3)	Farm Structures and Farm Mechanisation	30+30	3
AGRI 2088Y(3)	Biochemistry and Biotechnology	60+ 60	6
AGRI 2089Y(3)	Pests, Diseases and Weeds Control	45+ 60	5
AGRI 2090Y(3)	Agrometeorology, Hydrology, Irrigation and Drainage	45+ 45	4
AGRI 2091Y(3)	Advanced Soil Science and Soil Mechanics	45+ 45	4
AGRI 2100	Scientific Communication skills	20+0	-
AGRI 3000Y(5)	Project	-	9
AGRI 3027Y(5)	Animal Production and Health	60+45	5
AGRI 3061Y(5)	Emerging Technologies in Crop Production	60+45	5
AGRI 3083Y(5)	Soil Conservation and Management	60+45	5
AGRI 3084Y(5)	Water Conservation and Management, Hydrologic Modelling and Climate Change	60+45	5

AGRI2000 - Practical Training can be undertaken either in Year 1 or in Year 2

GEM (1) - 6

Total no. of credits : 107

11. Programme Plan

Year 1			
<u>Code</u>	<u>Module Name</u>	<u>Hr / Yr</u> <u>L+P</u>	<u>Credits</u>
CSE 1003(1)	Computer Programming	30+30	3
AGRI 1018Y(1)	Agricultural Chemistry and Soil Science	45+60	5
AGRI 1019Y(1)	Crop Science	45+60	5
AGRI 1022Y(1)	Animal Science	45+60	5
AGRI 1023Y(1)	Animal Production	45+60	5
AGRI 1035Y(1)	Agronomy and Horticultural Crop Production I	45+60	5
AGRI 1066Y(1)	Introduction to Civil Engineering	60+45	5
AGRI 1067Y(1)	Introductory Agricultural Management, Economics, Extension and Systems	60+60	6
Year 2			
AGRI 2045Y(3)	Statistical Methods for Agricultural Sciences	60+60	6
AGRI 2086Y(3)	GIS, Remote Sensing, Engineering Drawing and Land Surveying	60+45	5
AGRI 2087Y(3)	Farm Structures and Farm Mechanisation	30+30	3
AGRI 2088Y(3)	Biochemistry and Biotechnology	60+60	6
AGRI 2089Y(3)	Pests, Diseases and Weeds Control	45+60	5
AGRI 2090Y(3)	Agrometeorology, Hydrology, Irrigation and Drainage	45+45	4
AGRI 2091Y(3)	Advanced Soil Science and Soil Mechanics	45+45	4
AGRI 2100	Scientific Communication skills	20+0	-
Year 3			
AGRI 3000Y(5)	Project	-	9
AGRI 3027Y(5)	Animal Production and Health	60+45	5
AGRI 3061Y(5)	Emerging Technologies in Crop Production	60+45	5
AGRI 3083Y(5)	Soil Conservation and Management	60+45	5
AGRI 3084Y(5)	Water Conservation and Management, Hydrologic Modelling and Climate Change	60+45	5
GEM (1)		-	6

AGRI2000 - Practical Training can be undertaken either in Year 1 or in Year 2

Total no. of credits : 107

12. Outline Syllabus

CSE 1003(1) - COMPUTER PROGRAMMING

Variables, Data Types, Flowcharts and Pseudo-codes, Simple Programming Constructs, Functions, Control Structures, Arrays, File-Access, User-Defined Types, introduction to Classes.

AGRI 1018Y(1) – AGRICULTURAL CHEMISTRY AND SOIL SCIENCE

Agrochemicals, their properties, metabolism, and mode of action. Chemistry of fertilisers: straight, complex, compound mixed, blended fertilisers. Fertiliser solutions. Foliar fertilisers. Manures, municipal sewage, compost. New sources of soil amendments : seaweed, raw and transformed wastes from various sources, minerals, etc.

Chemistry of pesticides: Organochlorines, organophosphates, carbamates, pyrethroids, dinitrophenols, phthalimides, substituted ureas, triazines, inorganics, botanical pesticides, bio-pesticides. Analysis of pesticides, fertilisers, growth promoters, etc.

Soil as a natural body. Weathering. Factors and processes in soil formation. Physical, physico-chemical, biological and mineralogical properties of soil. Soil profile. Soil air, water, temperature, soil organic matter and soil organisms. Concepts of soil fertility and land suitability. Soil taxonomy. Soil biology. Soil amendments. Soil pollution. Heavy metals. Polyaromatic hydrocarbons (PAH), persistent organic pollutants (POP) in soils. Soil bioremediation.

AGRI 1019Y(1) - CROP SCIENCE

Classification, identification, morphology, ecology and uses of economically important crops.

Mendelian Inheritance. Qualitative genetics. Monohybrid, dihybrid, trihybrid ratios. Gene interaction. Linkage and chromosome mapping. Sex linked and extra-nuclear inheritance. Sex reversal. Quantitative genetics. Heritability. Inbreeding. Linebreeding. Heterosis. Population genetics. Hardy-Weinberg Law.

Objectives of plant breeding. Selection techniques. Methods of crop improvement. Genetic variation and manipulation of variability. Breeding of selected crops. Legislative framework.

Environmental influences on crop growth and development. Vegetative and reproductive plant physiology. Plant water relations. Plant growth substances. Plant growth analysis. Yield determination and crop productivity.

AGRI 1022Y(1) - ANIMAL SCIENCE

Anatomy of non ruminant and ruminant animals digestive systems. Principles of nutritional physiology and biochemistry. Meeting nutritional objectives of farm animals. Feeds and feed evaluation. Production of compound feeds: quality assurance framework.

Avian Reproductive Systems and The mammary gland structure. Endocrine effects on animal products: Milk production, egg production.

Muscle structure and biology. Growth and body composition. Farm Animal Reproductive systems (Male and Female). Reproductive physiology (Oestrous cycles, puberty, pregnancy and parturition. Genetic and physiological adaptation to the environment, especially in hot climate.

Principles of Meat science: chemical composition. Post Mortem Muscle Chemistry. Effects of pre and post slaughter treatments on carcass /meat quality and hygiene. Carcass appraisal.

An introduction to the basic principles of quantitative and qualitative genetics. Breeding systems of various farm animals.

Disease causing agents. Major Pests and diseases of farm animals. The impact of diseases at the animal, enterprises and national and global levels. Spread and transmission of diseases. The immune system: structure and function. Natural and acquired immunity. Food Borne Diseases. Zoonotic diseases.

AGRI 1023Y(1) - ANIMAL PRODUCTION

Role and importance of animal production systems in agricultural enterprises: poultry, pigs, beef and dairy cattle, deer, sheep, goats rabbits, production potential of novel species. Constraints to animal productivity and production. Public concerns over animal production practices.

Fundamental stockmanship for managing farm animals: rationing; weighing and tagging; usage of preventive and diagnostic equipment; handling and restraining animals, animal's environment; evaluation of body condition score; performance records. Diagnosing farm animal abnormal behaviour. Animal housing evaluation. Pasture management.

AGRI 1035Y(1) - AGRONOMY AND HORTICULTURAL CROP PRODUCTION I

Principles of field crop agronomy. Crop-environment interactions. Cropping systems. Crop propagation. Plant Nutrition. Nutrient deficiency symptoms and their corrections. Nutrient requirements and fertiliser recommendations for specific crops / cropping systems.

Applied crop physiology. Husbandry and production of economically important horticultural crops. Field operations and techniques in crop production.

AGRI 1066Y(1) – INTRODUCTION TO CIVIL ENGINEERING

Introduction to Basic Engineering Science. Properties of materials: hydraulic and bituminous binders; plastics; glass; ceramics and composite materials. Materials Science – crystal structure; plastic deformation. Behaviour of materials.

Structures, structural behaviour and loading. Section properties, forces in structure, tension and compression, torsion, shearing force and bending moment. Stresses in beams and columns, 2-D stresses and strains.

Properties of fluids, hydrostatics. Stability of floating bodies. Basic Law of Continuous Media Continuity. Introduction to thermodynamics. Energy and Momentum Principles and Applications. Pipe flow. Dimensional Analysis. Hydrodynamics.

AGRI 1067Y(1) – INTRODUCTORY AGRICULTURAL MANAGEMENT, ECONOMIC, EXTENSION AND SYSTEMS I

An overview of farming systems in the World with particular reference to the SADC region. Agricultural economics: demand and supply; principles of production economics. Agricultural management: framework of farm management; farm budgeting. Agricultural marketing: marketing functions; marketing channels and costs. Introduction to agricultural systems concepts: holistic approach to agriculture. Introduction to agricultural extension.

AGRI 2045Y(3) - STATISTICAL METHODS FOR AGRICULTURAL SCIENCES

Introducing statistics in agriculture. Descriptive statistics – displaying and summarising data. Probability distributions. Point and interval estimation. Hypothesis testing. Analysis of categorical data. Correlation and regression analysis. Design and analysis of experiments: Principles of agricultural experimentation. Analysis of variance. Completely randomized design, Randomized block design, Latin square design. Factorial treatment structure. Non-parametric methods. Data entry and analysis using EXCEL and MINITAB.

Introduction to research methodology. Qualitative and quantitative research. Sampling methods. Questionnaire development, design and administration. Data coding and processing using SPSS. Elements of scientific and technical writing.

AGRI 2086Y(3) – GIS, REMOTE SENSING, ENGINEERING DRAWING AND LAND SURVEYING

Principle and components of Geographic Information Systems (GIS) and Remote Sensing. Overview of photogrammetry and GIS, concepts and foundations of remote sensing; principles of air-photo interpretation, principles of photogrammetry; types of sensors and image data in remote sensing; image processing and interpretation. Applications of GIS, using ArcInfo, and spatial analysis techniques to the presentation and analysis of land and water information, including sources and capture of spatial data; characterizing, transforming, displaying spatial data; spatial analysis and data interpretation to solve resource management problems. Practical work involves visual aerial photo and satellite image interpretation, digital image processing, ortho-photo and digital elevation model generation. Introduction to precision agriculture.

Introduction to the drawing office. Geometrical construction. Introduction to orthographic projection. Orthographic projection II. Sectional views. Isometric projection. Principle of land surveying and survey instruments. Linear and angular measurements. Ordinary levelling. Introduction to aerial photograph and satellite images.

AGRI 2087Y(3) – FARM STRUCTURES AND FARM MECHANISATION

Farm structures and farm buildings: selection of structural members. Farm roads. Introduction to controlled environment technology: insulation and heat flow, heating, ventilation and air conditioning. Waste management technology: farm waste handling and waste disposal.

Agricultural mechanization. Coarse and fine derocking. Soil tillage. Farm machinery: tractors, mechanical seeders and planters and harvesters, rotovators, pesticide sprayers, and fertigators. Tractor technology. Post harvest technology: seed cleaning, crop drying, grain storage equipment, equipment for milk production.

AGRI 2088Y(3) – BIOCHEMISTRY AND BIOTECHNOLOGY

Structure and functions of cells and organelles; Biomolecules: Polysaccharides, sugars; storage polysaccharides; Lipids, classification and properties, biological membranes; Proteins, amino acids, covalent and three-D structure of proteins; Enzymes, properties and mechanism of actions, enzyme kinetics; Metabolic pathways, thermodynamics, Energy metabolism: pathways respiration and ATP synthesis. Photosynthesis. Nucleic acids and protein synthesis.

Concept and basis of biotechnology. Application of biotechnology in agriculture and food science. Cell and tissue culture technology. Crop improvement through the application of new techniques. . Genetic improvement of crops for introduction of new genes: their evaluation and potential risks. Managing plant and animal diseases: use of molecular methods of pathogen diagnosis, characterization and monitoring. Transgenic animals. Animal Embryo transfer and associated techniques. Cloning. Vaccine development. Legislative framework.

AGRI 2089Y(3) - PESTS, DISEASES AND WEEDS CONTROL

Taxonomy, systematic, biology, ecology and economic importance of pests, plant pathogens and weeds affecting crops. Control and management of pests, diseases and weeds of crop plants. Concept and principles of IPM. Biological, physical, chemical, cultural, biology-based, genetic, biotechnological and legal methods of pest control. Botanical pesticides and biopesticides. Pest-resistant transgenic crops (GMOs). Economics of crop protection.

Quarantine for plant health and biological control agents; pest-free areas; Sanitary & phytosanitary issues; the SPS Agreement of the WTO; Pest risk assessment, surveillance and mitigation; Phytosanitary inspection, quarantine treatments and disposal of plants/produce; Standards, certification and legislation. Climate change and crop protection. GIS and Remote Sensing for crop protection.

AGRI 2090Y(3) – AGROMETEOROLOGY, HYDROLOGY, IRRIGATION AND DRAINAGE

Radiation and surface energy balance. Soil and its heat balance. Hydrological cycle: precipitation, interception, depression storage, evapotranspiration, infiltration, surface runoff and percolation. Hydrologic measurements and data sources. Hydrograph theory and analysis.

Soil-water-plant relationships and soil water movement: infiltration rate, hydraulic conductivity of soil. Crop water requirements. Irrigation Methods: surface, overhead irrigation and drip Irrigation. Planning and design of various irrigation systems based on soil-water-plant relationships. Use and maintenance of irrigation systems. Irrigation scheduling, efficient water use and measurement of irrigation water. Drainage and water logging system: tile drainage and subsurface irrigation. Pumps and irrigation equipments.

AGRI 2091Y(3) – ADVANCED SOIL SCIENCE AND SOIL MECHANICS

Origin and classification of soils, soil survey and interpretation for selected land uses, soil mapping techniques and guidelines for compiling soil maps. Geology. Geomorphology. Geological and soil maps of Mauritius. Soil water: characteristics and behaviour, permeability and flow. Stability of slopes. Unsaturated soil.

Soil shear strength: stresses and strains. Shallow foundations. Water flow in soils. Slope stability. Lateral earth pressures. Soil erosion and protection. Soil cutting and tillage. Soil compaction. Geotextiles. Soil freezing.

AGRI 2100 - SCIENTIFIC COMMUNICATION SKILLS

Avenues of communication in science. Scientific and technical writing. Oral and poster presentations. Ethics of scientific publishing.

The dissertation guidelines. Planning and managing the dissertation writing up process – effective literature search and review, introduction, methodology, results, discussion, conclusions, referencing rules and plagiarism.

AGRI 2000 - PRACTICAL TRAINING

Students are required to undergo a full-time practical training of 6-8 week duration during the winter vacation, in year 2. The practical training placement may take place in the various agricultural institutions and industries in the private or public sector. The aim is to contextualise learning within real-life work environments related to your course. Students are required to submit a training placement portfolio. This module does not carry any credit, but training must be completed satisfactorily for the award of the degree.

AGRI 3000Y(5) - PROJECT

This is a very important component of the programme, allowing students to develop high level skills and cognitive abilities. Every student will be allocated a research topic and the research work will be carried out under supervision. The student is required to investigate a topic/problem, plan and execute the research work as well as present and discuss the results. The student will have to submit a dissertation at the end of the final year. Students should demonstrate good practice in using skills and knowledge acquired and follow guidelines as laid down.

AGRI 3027Y(5) - ANIMAL PRODUCTION AND HEALTH

Principles of managing animals in typical production systems for biological and economic sustainability: poultry, pigs; rabbits; deer; goats and sheep; beef and dairy cows and novel species. Best management practices for their efficient and profitable production: nutrition, reproduction and fertility, housing and equipment, waste management technologies.

Food chain management from primary production to consumer use. Trends and current issues related to production and consumption of animal products: meeting the needs of a global market and public concerns.

Prevention and control of farm animal disease. Management of disease risks. Principles of vaccination. Classification and mode of action of the major classes of drugs. Use and control of drugs. Disease control using non chemical methods. Animal health management schemes for various farm animals.

Animal welfare concepts and definition (eg; the five freedoms). Specific requirements for the welfare of named ruminants and non-ruminants. Methods for assessing animal welfare status.

AGRI 3061Y(5) - EMERGING TECHNOLOGIES IN CROP PRODUCTION

Plant characteristics for mechanised crop production. Minimal tillage cropping. Seed priming and enhancement. Direct sowing. Plug production. Mechanical transplanting. Plastic mulching. Good Agricultural Practices (GAP). Tissue culture technologies for commercial micro propagation.

Greenhouse design, structures and construction. Cladding materials. Natural light optimisation. Supplementary lighting. Temperature management. Climate control systems. Irrigation and water quality. Carbon dioxide enrichment. Growth control.

Hydroponics: concepts and systems. Growing media. Open and closed cultivation systems. Substrate hydroponics. Nutrient film technique. Ebb and flow technique. Aeroponics. Plant nutrition and control. Crop fertilisation systems. Plant culture. Greenhouse crop protection. Technologies and Extension linkage.

AGRI 3083Y(5) – SOIL CONSERVATION AND MANAGEMENT

Principles of land suitability evaluation, qualitative land evaluation methods, development and application of quantified land evaluation methods to maintain and/or improve soil quality. Soil and plant nutrients, nutrient flows in soils and plants, nutrient budget and balance, organic and inorganic fertilizers management, crop residues management, green manure crops, crop rotation, deficiency symptoms of plants, plant nutrients and their availability to plant uptake, role of soil organic matter on nutrient availability, calculation of optimum NPK fertilizer rates at a given soil nutrient budget (using specific software), interactions between N, P and K during uptake and growth; optimum N:P:K fertilization ratios from economic and an environmental point of view. Bioremediation. Soil biogeochemistry.

Wetlands and their management. Soil pollution: fertiliser and pesticide in the environment. Soil erosion by wind and water, including coastal erosion, and their control practices. Solid and Liquid Waste Management in soil: handling, treatment and disposal. Landfill technology and Septic tank. Impact of Solid waste in soil.

Land Resources of Mauritius and Rodrigues. Ramsar Convention. Land management practices. Land resource planning. Field equipment and impact of mechanisation on land. Land Information Systems. Land Information Management Systems. The institutional set-up. Economics of land development.

AGRI 3084Y(5) – WATER CONSERVATION AND MANAGEMENT, HYDROLOGICAL MODELLING AND CLIMATE CHANGE

Water quantity management: irrigation canals, rivers, lakes. Design of water control structures: dams and reservoir. Water harvesting. Water pollution and Water quality management. Impacts of land use activities on water quality. Integrated watershed management systems for environmental protection. Economics of water development. Preliminary Environment Report and Environmental impact assessment. Environment Protection Act. Legislation and Institutional set-up.

Use of deterministic and stochastic models to analyze components of the hydrologic cycle on agricultural and forested watersheds: Rainfall-runoff modelling, flood frequency analysis, reservoir routing, erosion and sediment transport. Effects of land-use changes, farm and recreational water management systems on the hydrologic regime. Use of CROPWAT and SWAT model.

Impact of climate change to the different components in the water cycle: high temperature, different rainfall patterns to evapotranspiration and surface runoff.

15 August 2011