

MSc Crop Science (Postharvest Technology) - A502 (Under Review)

1. Objectives

The programme aims to promote the professional development of graduates in the field of crop science, with emphasis on postharvest technology. On completion of the programme, learners will be able to apply the principles, techniques and practices in the field of postharvest science and technology to crop-based enterprises. Learners will also develop the capability to work as independent researchers and technical managers in crop-related organisations.

On completion of this programme, learners will be able to:

- identify technological problems encountered in current crop production systems and advise on the adoption of the relevant techniques and practices to resolve these problems;
- develop an ability to integrate knowledge acquired across functional areas and disciplines in crop science, including postharvest sciences;
- familiarise themselves with the chemical, biological, and physical principles that relate to 'crops and their environment'.
- develop their skills to apply the principles related to crops, soils, and environment to solve emerging crop production and quality problems;
- apply scientific principles to post harvest handling of horticultural produce;
- describe the nature and causes of postharvest diseases, disorders and pest incidence;
- develop skills in the diagnosis of postharvest diseases, disorders and pests, and implement control measures to rectify them;
- devise means to add value to horticultural produce through appropriate postharvest techniques;
- demonstrate skills in written and oral communication and critical analysis of scientific reports and data.
- apply the steps involved in a research process to any research project in the discipline area;
- prepare their continuing professional development plan towards lifelong learning.

2. General Entry Requirements

Successful completion of an undergraduate degree with

- at least a Second Class or 50%, whichever is applicable or
- a GPA not less than 2.5 out of 4 or equivalent, from a recognised higher education institution

OR alternative qualifications acceptable to the University of Mauritius

3. Programme Requirements

A Degree in Agricultural Sciences or any related fields.

4. General and Programme Requirements – Special Cases

The following may be deemed to have satisfied the General and Programme requirements for admission:

- (i) Applicants who do not satisfy any of the requirements as per Regulations 2 and 3 above but submit satisfactory evidence of having passed examinations, which are deemed by the Senate to be equivalent to any of those listed.
- (ii) Applicants, who do not satisfy any of the requirements as per Regulations 2 and 3 above but who in the opinion of Senate, submit satisfactory evidence of the capacity and attainments requisite to enable them to pursue the programme proposed.

5. Programme Duration

	Normal [Year(s)]	Maximum [Years]
Master's Degree (FT):	1	2
Master's Degree (PT):	2	4
Postgraduate Diploma (FT):	1	2
Postgraduate Diploma (PT):	2	4

6. Credits per Year: Minimum 12 credits subject to Regulation 5.

7. Minimum Credits Required for the Award of

Master's Degree: 36

Postgraduate Diploma: 24

Breakdown as follows:

	Core	Specialisation		Electives
	Taught Modules	Taught Modules	Project	Taught Module
Master's Degree:	16 credits	8 credits	9 credits	3 credits

8. Assessment

Each module will carry 100 marks and will be assessed as follows (unless otherwise specified):

Assessment will be based on written examination of 3-hour duration for all modules, carrying a weighting of 70%, and continuous assessment carrying 30% of total marks. Continuous assessment will be based on case studies; site visits, practical classes, student-led seminars, and literature-based research and/or assignments, and should include at least 1 class test.

For a student to pass a module, a minimum of 30% should be attained in both the Continuous Assessment and Written Examination, with an overall total of a minimum of 40% in that module.

There will be a compulsory class test for the module taught over a semester at the end of the semester of the given academic year. Written examinations for all the modules, whether taught over one semester or one academic year, will be carried out at the end of the year.

Each module will carry credits in the range of 3 to 5. Project will carry 9 credits.

Assessment of the 'Scientific Communication' module will be based on continuous assessment of students throughout the module and/or submission of a portfolio. For satisfactory completion of the module, a minimum of 40% should be attained.

Submission Deadlines for Dissertation:

- First Draft: End of July in the Final year.
- Final Copy: Last working day of August in the Final year.

9. Important Note

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

10. List of Modules

Code	Module Name	Hr/Yr L+P	Credits
AGRI xxxx (1)	Experimentation and Computing Techniques	30+45	3
AGRI xxxx (1)	Advanced Plant Protection and Breeding	30+45	3
AGRI xxxx (1)	Soil Fertility, Plant Water Relations & Irrigation	30+45	3
AGRI xxxx (1)	Applied Crop Physiology & Principles of Crop	45+45	4
AGRI 3100 (1)	Production Scientific Communication	20+0	0
AGRI xxxx (1)	Postharvest Biology & Technology	60+45	5
AGRI xxxx (1)	Postharvest Handling Systems & Processing	30+45	3
AGRI xxxx (1)	Economics & Management Applied to Crop Production Systems and Postharvest Technology (PHT)	30+30	3
AGRI 6000 (1)	Project	-	9
ELECTIVES (Choose one from)			
AGRI xxxx (1)	Sustainable Crop Production	45+0	3
AGRI xxxx (1)	Biotechnology for Postharvest Quality	30+30	3

11. Programme Plan – MSc Crop Science (Specialisation: Postharvest Technology)

Full-Time:

YEAR 1			
Code	Module Name	Hr/Yr L+P	Credits
AGRI xxxx (1)	Experimentation and Computing Techniques	30+45	3
AGRI xxxx (1)	Advanced Plant Protection and Breeding	30+45	3
AGRI xxxx (1)	Soil Fertility, Plant Water Relations & Irrigation	30+45	3
AGRI xxxx (1)	Applied Crop Physiology & Principles of Crop	45+45	4
AGRI 3100 (1)	Production Scientific Communication	20+0	0
AGRI xxxx (1)	Postharvest Biology & Technology	60+45	5
AGRI xxxx (1)	Postharvest Handling Systems & Processing	30+45	3
AGRI xxxx (1)	Economics & Management Applied to Crop Production		
	Systems and Postharvest Technology (PHT)	30+30	3
AGRI 6000 (1)	Project	-	9

ELECTIVES (Choose one from)

Code	Module Name	Hr/Yr L+P	Credits
AGRI xxxx (1)	Sustainable Crop Production	45+0	3
AGRI xxxx (1)	Biotechnology for Postharvest Quality	30+30	3

Total no. of credits : **36**

Part-Time:

YEAR 1			
Code	Module	Hr/Yr L+P	Credits
AGRI xxxx (1)	Experimentation and Computing Techniques	30+45	3
AGRI xxxx (1)	Advanced Plant Protection and Breeding	30+45	3
AGRI xxxx (1)	Soil Fertility, Plant Water Relations & Irrigation	30+45	3
AGRI xxxx (1)	Applied Crop Physiology & Principles of Crop	45+45	4
AGRI 3100 (1)	Production Scientific Communication	20+0	0
YEAR 2			
Code	Module	Hr/Yr L+P	Credits
AGRI xxxx (1)	Postharvest Biology & Technology	60+45	5
AGRI xxxx (1)	Postharvest Handling Systems & Processing	30+45	3
AGRI xxxx (1)	Economics & Management Applied to Crop Production		
	Systems and PHT	30+30	3
AGRI 6000 (1)	Project	-	9

ELECTIVES (Choose one from)

Code	Module	Hr/Yr L+P	Credits
AGRI xxxx (1)	Sustainable Crop Production	45+0	3
AGRI xxxx (1)	Biotechnology for Postharvest Quality	30+30	3

Total no. of credits : **36**

12. Outline Syllabus

CORE MODULES

AGRI XXXX (1) - EXPERIMENTATION AND COMPUTING TECHNIQUES

Elements of research methodology. The research process. Review of basic statistical methods. Regression models and analysis. Design and analysis of experiments. Sampling techniques. Questionnaire development, design and administration. Data entry and analysis using MINITAB and SPSS. Introduction to multivariate analysis. Communicating with statistics: Interpretation and reporting results of statistical analysis. Fundamentals of crop modelling.

AGRI XXXX (1) - ADVANCED PLANT PROTECTION AND BREEDING

Physical, chemical, biological, genetic, biotechnological methods of pest, disease & weed control. Botanical pesticides and biopesticides. Semiochemicals. Pest-host plant relationships. Metabolomics in relation to pest damage and pest management. Pest-resistant transgenic crops (GMOs). Integrated Pest Management. Economics of pest control. Pest surveillance and forecasting. Sanitary & phytosanitary issues; the SPS Agreement of the WTO pest-free areas; Pest risk assessment, surveillance and mitigation; Quarantine for plant health and biological control agents; 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. Molecular methods for disease diagnosis. Integrated Disease Management.

Traditional and modern plant breeding techniques; Biometrical genetics; Quantitative trait loci; Genetic variation and molecular biology underlying key traits; maintenance, selection and use of germplasm resources; biochemical and molecular techniques used in breeding program; transgenic plants crop improvement.

AGRI XXXX (1) -SOIL FERTILITY, PLANT WATER RELATIONS & IRRIGATION

General concepts of soil fertility: factors affecting soil fertility; techniques of evaluating soil fertility; plant tissue analyses; Approaches to managing and maintaining soil fertility: composting, organic manures, soil amendments, types of fertilizers, fertiliser formulation, methods of fertiliser application and management; biological management of soil fertility and rhizosphere effect. Nutrient budgeting.

Concepts of water potential and movement in soil – plant – atmosphere continuum; crop evapotranspiration and its measurements; water budgets; effects and measurement of water in soil and plants, research techniques in studies on soil plant water relations and their applications. Irrigation planning and design; management of irrigation water; control and management of salts in irrigation; agronomic and socio-

economic factors in irrigation management; evaluating irrigation systems in greenhouses and open-field agriculture; use of industrial and urban effluent for irrigation; and fertigation technology.

AGRI XXXX (1) - APPLIED CROP PHYSIOLOGY & PRINCIPLES OF CROP PRODUCTION

Economic significance and importance of weather; Introduction to agro-meteorology: The earth's atmosphere; Atmospheric energy; Atmospheric moisture and precipitation; Atmospheric motion. Global climatic change and variability and its effect on agriculture. Weather patterns over Mauritius.

Seed physiology: dormancy and germination. Environmental influences on crop growth and development. Plant water relations. Water and plant mineral uptake. Plant growth regulators in crop production. Physiology of reproductive growth and development: photoperiodism and vernalisation. Plant growth analysis. Source-sink relationship. Photosynthate partitioning in relation to yield. Modification of yield potential by chemical and cultural means. Adaptation of crop plants to stress factors.

Plant nutrition. Essential plant nutrients: forms, functions, deficiency symptoms and their correction. Nutrient requirements and fertiliser recommendations for specific crops/cropping systems. Crop-environment interactions. Crop geometry and competition. New advances in cropping systems. Crop propagation, including micropropagation. Principles of agronomy. Principles of olericulture. Pomology: principles and techniques. Orcharding techniques and practices. Pruning and training techniques. Field sanitation and hygiene. Good agricultural practices. Traceability.

AGRI XXXX (1) - ECONOMICS & MANAGEMENT APPLIED TO CROP PRODUCTION SYSTEMS AND PHT

Economic principles applied to crop production systems at the macroeconomic level; production efficiency at the farm level; measuring economic performance of farms. Project management and impact assessment; current issues and challenges (social, ecological, energy and food security) facing industrial agriculture. Community supported agriculture. Systems approach in crop sciences.

Agricultural marketing fundamentals; sustainable niche marketing; supply chain management. International trade and related issues. Management fundamentals applied to sustainable agriculture and PHT; application of agricultural extension principles and technology transfer models. Setting up agribusinesses; Business plans; Entrepreneurship.

AGRI 3100 - SCIENTIFIC COMMUNICATION

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.

SPECIALISATION MODULES

AGRI XXXX (1) - POSTHARVEST BIOLOGY & TECHNOLOGY

Growth and development. Morphology, structure and composition of harvested produce. Respiration. Transpiration. Ripening and senescence. Climacteric and non-climacteric produce. Ethylene and other plant growth regulators in postharvest. Biochemical and physiological changes at postharvest level. Physiological disorders.

Postharvest pathology: host-parasite interactions; environmental factors and control. Postharvest diseases and their management. Decay control: postharvest fungicide treatments and bio-controls. Pests of stored crop commodities. Identification, taxonomy, biology, ecology and economic importance of postharvest

pests. Control and management of postharvest insect pests. Quarantine treatments for insect control. Postharvest IPM.

Postharvest safety and quality. Good agricultural practices. Pre-harvest conditions and postharvest quality. Maturity indices and quality standards. Postharvest losses. Postharvest loss assessment. Postharvest loss-reduction technologies. Waxes and edible coatings. Principles of postharvest chlorination. Environmental manipulation. Cooling and pre-cooling methods. Engineering fundamentals during cooling. Chilling and freezing injuries and their control. Cool chain management for perishables. Curing root, tuber and bulb crops. Field harvesting and preparation for market. Commercial fruit ripening. Transportation of horticultural produce.

Packaging of horticultural produce. Types of packaging. Modified atmosphere packaging. Environment-friendly packaging. Small packinghouses and their designs. Packinghouse operations. Instrumentation in postharvest science and technology. Packinghouse equipment and machinery. Storage of horticultural crops. Controlled atmosphere storage.

AGRI XXXX (1) - POSTHARVEST HANDLING SYSTEMS & PROCESSING

Postharvest handling systems for horticultural produce: subtropical and tropical fruits; vegetables; fresh-cut produce; cut-flowers & potted ornamentals.

Fruit and vegetable preservation by heating, chilling, freezing, dehydration, chemicals and ionising radiation. Processing potential of horticultural crops. Unit operations in crop processing. Dehydration technology for fruits and vegetables. Canning. Bottling. Pickling. Deep-frying technology. Vegetable and fruit juice production. Jam, jelly and marmalades. Crystallisation and candying. Minimal processing/fresh-cut technologies. Processing equipment and machinery.

AGRI 6000 (1) - DISSERTATION

The dissertation provides an opportunity for the students to undertake and contribute to a piece of original research work, in an area related to postharvest science and technology. The students are required to design an experiment (or investigation, survey or other means) to test a hypothesis or proposition, to plan and execute the research work, to evaluate the outcomes and draw valid conclusions.

The research work is carried out individually, under guided supervision. To support the dissertation work, the Faculty has prepared a document on: *Dissertation Guidelines for MSc Degree*.

ELECTIVES

AGRI XXXX (1) - SUSTAINABLE CROP PRODUCTION

Greenhouse design, structures and construction. Cladding materials. Spectral filters. Irrigation and water quality. Crop fertilisation systems. Greenhouses and their operation. Hydroponics: concepts and systems. Plant nutrition and control. Open and closed cultivation systems. Hydroponics media. Nutrient film technique; and Plant culture in hydroponics.

Farming systems for sustainable crop production. Integrated crop management. Principles and components of GLOBAL GAP and its applications. Sustainable crop protection measures. Soil health management. Nutrient dynamics. Integrated nutrient management and nutrient use efficiency. Introduction to organic cropping. Standards for organic crop production and certification issues.

AGRI XXXX (1) - BIOTECHNOLOGY FOR POSTHARVEST QUALITY

Basic concepts of postharvest quality. Quality assessment. Introduction to quality assurance.

An overview of the techniques of plant biotechnology, manipulating plant genomes, methods of plant cell transformation. Pest and disease resistance in commercial crops. Biochemical and physiological changes during produce senescence. Current biotechnological approaches to extend shelf life of fresh produce. Gene expression during senescence, as the basis of current biotechnological strategies to extend shelf life of green vegetables. Biochemistry of ethylene biosynthesis. Gene expression during ripening. Commercially successful genetic transformation strategies to maintain produce quality.