



MCAST

Malta College of Arts, Science & Technology

MQF Level 6

AG6-02-19

MCAST Bachelor of Science (Honours) in Horticulture

Course Specification

Course Description

This course gives students skills in the latest horticultural practices with the use of modern technology.

Students will have the opportunity to study and practise different aspects related to their main area of study, with the aim of seeking employment at management level in private enterprise, in research and development and/or regulatory services both locally and internationally.

This course is aimed at students who want to work in the horticulture sector in industries/sectors as varied as EU/national regulatory control sector, farmer training provision, farm advisory services, garden design and landscaping, crop and fruit production sector, educational and promotional horticulture services and pest management/regulatory sector. This programme offers the required knowledge and competences related to Sustainable Land Use, Integrated Pest Management, Plant Nutrition and Fertilisation, Agricultural Technology, Rural Development and Garden Design/Landscaping. During this course, students need to undertake a research project whereby a topic is chosen and subsequently investigated, researched, a methodology formulated and data collected, analysed and discussed. Students will also be expected to attend a standard first aid course provided by a recognised entity (fees to be covered by the student).

Programme Learning Outcomes

At the end of the programme the learner will be able to:

1. Understand and apply research methods to carry out an advanced project study based on scientific research related to specific units within the course's area of study
2. Understand and research different entrepreneurial skills required at management level and to plan for a successful business
3. Undertake practical tasks related to horticultural skills and services including plant nutrition/ fertilisation and agricultural technology
4. Study and apply principles of sustainability, integrated pest management and rural development.

Entry Requirements

MCAST Advanced Diploma in Horticulture

or

2 A-Level passes and 2 I-Level passes

Preferred I-Level: Biology or Chemistry

MCAST

Current Approved Programme Structure

Unit Title	ECVET/ECTS
Agriculture and the Environment	3
Apiculture	6
Agricultural Marketing and Agri-Tourism	6
Research Methodologies	6
Pesticides and Safe Pesticide Application	6
Post-Harvest Management	6
Professional Garden Design	6
Field Crop Planning and Production: Vegetables and Fruits (Umbelifiers, Alliums, Salads & Herbs)	6
Agriculture Policy	3
Food Flavour and Tasting	6
Bedding Flowers, Turf and Nursery Production	6
Field Crop Planning and Production: Cereals, Legumes and Brassicas	6
Crop Biology and Physiology	6
Greenhouse Production	6
Field Crop Planning and Production: Olives, Vines, Citrus and Stone Fruits	6
Plant Propagation	6
Soil and Organic Matter Management	6
Tree care and management	3
Business Management & Work Experience	6
Oenology and Viticulture	3
Wildlife Science and Conservation	6
Business Planning	6
Rural Development	6
Development of Land-Based Activities	6
Integrated Pest Management	6
Plant Nutrition	6
Agricultural Technologies	6
Dissertation	12
English	6
Critical Thinking	6
Entrepreneurship	6
Total ECVET/ECTS	180

ECVET are used for programmes at MQF Level 1-4 whilst ECTS is used for programmes at MQF Level 5-6

Agriculture and the Environment

Unit level (MQF): 5

Credits: 3

Unit Description

This is a knowledge based unit and will demonstrate the learner's abilities to evaluate and understand the benefits of organic principles from a variety of philosophies that can be utilised in crop production for the protection of the environment.

The learner will demonstrate an understanding of key organic concepts that can be applied to crop production and the permissible and non-permissible practices under organic certification schemes. The unit also enhances knowledge of general environmental practices, issues and problems. On completion of the unit learner's will be able to understand the need for good environmental practices as an investment for the future and the role that organic organizations may have in developing environmentally friendly management of the soil and production techniques.

Learners will gain knowledge of key organic organisations and the services they offer and be able to analyse and compare different systems and their feasibility in crop production. The learner's will also gain an understanding of certification processes and their implications on management systems.

Learners will gain underpinning knowledge of the differences between 'conventional growing systems' and organic systems and the impact they have on the environment. The learner's will also explore specific philosophies and system such as Permaculture and Biodynamic and the background to their development and what they have to offer as production systems.

Learning Outcomes

On completion of this unit the student will be able to

1. *Explain the principles of Organic Agriculture.*
2. *Evaluate organic practices and techniques.*
3. *Analyse the principles of Permaculture.*
4. *Analyse the principles of Biodynamic Agriculture.*

Apiculture

Unit level (MQF): 5

Credits: 6

Unit Description

The purpose of this unit is to enable learners to develop skills of analytical thinking and scientific enquiry. Learners will gain an understanding of apiculture and will be able to apply these skills when considering the applications of bee keeping in our lives. The approach of this Unit is to not only provide knowledge to the student but also teach the learner problem solving and investigation skills. The Apiculture Unit covers the main areas of understanding bees, their physiology and anatomy, pest and diseases that affect bees and why bees swarm. Learners who complete this unit will be able to draw on the knowledge and understanding of the key areas of apiculture and apply the skills of scientific enquiry to practical investigation.

The Apiculture Unit is a core unit of the Diploma in Higher Diploma in Horticulture and is also available as a free-standing Unit. The unit is relevant to learners aspiring to further advance their knowledge of bees and bee keeping. Learners are encouraged to research current apiculture issues and thus develop their scientific literacy. On completion of the Unit, learners will appreciate how the bee colony functions, the threats to their survival, swarming triggers and swarming prevention, the types of bee products and the functional anatomy of these insects.

Learning Outcomes

On completion of this unit the student will be able to

1. *Explain bee basics to show how bees work.*
2. *Describe bee anatomy and physiology for understanding how bees function.*
3. *Discuss bee pests and diseases in order to protect bee colonies.*
4. *Analyse bee swarming and prevention for managing bee colonies.*

Agricultural Marketing & Agri-tourism

Unit level (MQF): 5

Credits: 6

Unit Description

This unit introduces learners to key concepts and functions of 'Marketing' as they apply to the tourism sector and in specific Agri-tourism. This unit is divided into two key areas - Agricultural Marketing and Agri-tourism: The first focuses on the concept of Marketing and elements of the Marketing (principals) and provides the learner with a knowledge base in relation to marketing and its application to business and agri-business. The second key area focuses on Agri-tourism and provides the learner with an understanding of tourism concepts, Agr-tourism with specific focus on Malta.

The unit is made up two key areas:

1) Agricultural Marketing:

- Concepts of Marketing (definition, theories and customer aspect).
- Marketing principles (Elements of marketing principles, agricultural marketing principles Ps, Macro and Micro environments)
- Agricultural Marketing relating to food and niche products

2) Agri-tourism:

- Identify and explore Agricultural tourism (what is agri-tourism, various types of agri-tourism businesses, why is agri-tourism becoming important and popular, sustainability concepts linked to agri-tourism).
- Explore Agricultural-tourism in Malta (agricultural tourism businesses in Malta; the Maltase tourist plan (agri-tourism); why is agri-tourism important to the Maltase economy (including how agri-tourism can be integrated with Malta's historical and cultural aspects) ; explore types of agri-tourism businesses in Malta.

This unit will provide learners with knowledge and understanding of key factors affecting marketing environments and investigate the role of marketing in relation to agri-tourism.

Learning Outcomes

On completion of this unit the student will be able to

- 1. Describe the key elements of marketing.*

2. *Investigate marketing principles in relation to Agri-business marketing.*
3. *Assess the significance of agri-tourism to the different stakeholders.*
4. *Evaluate the potential of organizing agri-tourism activities on the farm.*

MCAST

Research Methodologies

Unit level (MQF): 5

Credits: 6

Unit Description

This unit prepares students for their independent research project linked to Fisheries or Aquaculture. In both cases, students are guided in the process of carrying out a research enquiry from initial concept to final report. The unit will demonstrate methodological approaches to collecting and analysing data and will address ethics in research.

Another key aspect of this unit is the development of a working relationship between the student and their supervisor(s) and this will be addressed through the recommended timeline and activities.

Finally, the unit will guide students in how to write critically and objectively in producing their final project and how to correctly cite and reference the work of others in their own original work.

Learning Outcomes

On completion of this unit the student will be able to:

1. *Develop a research enquiry from initial objectives and a review of others work, through the proposed research.*
2. *Complete the research through to the final report.*
3. *Evaluate findings and results of research project.*
4. *Present the proposal and findings of the project.*

Pesticides & Safe Pesticide Application

Unit level (MQF): 5

Credits: 6

Unit Description

This module provides the opportunity to study the chemicals used for crop protection purposes in horticultural crop production and their safe and effective use in horticulture.

The module will develop an understanding of the principles, techniques and equipment used to optimize and exploit the biological activity of pesticides in horticultural crop protection.

The groups of central relevance are those that are utilised for the control of pest populations such as insects, weeds, fungi, nematodes, and bacteria, by direct toxic action.

Note that the definition of pesticides used throughout this module includes not only those exerting poisonous effects on the biochemistry of the target organism but also those used to disrupt other life processes such as behavior and chemicals or treatments that control the effects of injurious biota through physical means.

Crop management chemicals are therefore studied in detail across a wide range of chemistries and uses.

The module will develop an understanding of the interaction between pesticides and organisms and the principles and techniques used in the assessment of the biological properties and activity of pesticides.

Toxicology is introduced to describe the general action of toxic chemicals on populations, and the theory of bioassay and probit analysis is presented. Studies include the use of bioassays to identify pesticide tolerant populations, the joint action of pesticides in synergism, antagonism, and potentiation. The biochemical, biophysical, and application basis of pesticide target/non-target selectivity will be studied.

Modes of action of the principal groups of chemicals used in horticultural production are included.

Pesticide formulation is reviewed and the principles of formulation chemistry are studied in relation to the production, storage, use, and biological performance of active ingredients and commercial products.

The module will develop knowledge of the various types of equipment used for the application of crop protection chemicals together with an appreciation of the practical techniques involved in the compliance with legislation to achieve the safe and effective use of pesticides through application equipment.

A wide range of application technologies are studied, and the comparative advantages and disadvantages of relevant application systems are appraised.

Pesticide safety is discussed in relation to both human and environmental aspects.

Techniques and methods used to quantify risk and hazard are studied in relation to legislative requirements for the safe and effective use of pesticides.

Safe use is studied at applicator level, and the requirements for achieving this are reviewed in the context of good horticultural practice.

The use of pesticides is approached with the theme of integrated pest management (IPM), and the requirement for product management to sustain the effective lifetime of new horticultural pesticide products.

At the end of this unit, learners will be in a position to sit for Malta's pesticide applicator license.

Learning Outcomes

On completion of this unit the student will be able to

- 1. Appreciate and understand the biological, chemical and physical properties of the range of chemicals used for crop protection purposes in horticulture.*
- 2. Describe the biological mode of action of pesticides and the terminology and methods used to estimate toxicity to humans and the environment.*
- 3. Appreciate the role of legislation to reduce health and environmental risks posed by pesticides.*
- 4. Demonstrate familiarity with the principles and practice of the safe and effective use of pesticides.*

Post-Harvest Management

Unit level (MQF): 5

Credits: 6

Unit Description

The unit will set the context for understanding in the context of post-harvest management of produce in terms of storage, especially controlled storage, post-harvest processing and distribution to customers. Marketing standards can be regulatory or market driven and organisations need to be aware of the standards required by legislation and the procurement standards of their direct customers and/or retail customers who may be several steps detached from their operation. Marketing standards include not only standards for the produce but also for the primary, secondary and tertiary packaging that forms part of the final product or provides protection during transit. Hazard analysis critical control point (HACCP) is the management tool that ensures that quality management systems focus on product safety as well as quality issues.

Key pre-requisite programmes (PRP) such as traceability systems, temperature control and monitoring, foreign body control, pest control and premises and personal hygiene procedures all limit the risk of contamination or a loss of product quality. Postharvest activities including controlled and ambient storage of product, techniques for ripening or retarding maturity and measures for post control such as post-harvest crop protection product applications will be considered.

By the end of the unit, students would be in a position to obtain the 'Food Handling license B' (as issued by Malta's Food Safety Commission) which is a license suited for people directly involved in the preparation and production of food.

Learning Outcomes

On completion of this unit the student will be able to:

1. *Demonstrate the principles of HACCP and the Quality Management System.*
2. *Demonstrate the applicability of regulatory and market standards to a given horticultural example.*
3. *Define how post-harvest operations can control product quality, shelf-life and safety.*
4. *Assess procedures, systems and mechanisms to grade and trace food items.*

Professional Garden Design

Unit level (MQF): 5

Credits: 6

Unit Description

This unit will provide a detailed understanding and professional application of garden design processes and practices to design small and medium sized gardens

This is achieved through learners undertaking real site based design projects and applying professionally design activities from contemporary practice. Learners will also be required to evaluate design theories and processes and appraise their own understanding and development within this discipline. Self and Peer evaluation will be an important learning tool through formative design critiques, tutorials and project reviews. These research, evaluation and design activities will allow learners to develop a detailed comprehension of the stages of the garden design process.

This unit will give learners the knowledge and skills required to understand, contextualise and apply a design process to produce effective, creative and practical garden designs.

This will include historical contextual studies; applied design theories and processes, producing garden designs for small and medium gardens, both hypothetical show gardens and real site gardens; detail design packages for appropriate technical, creative and financial solutions; producing appropriate visualisations, plans and drawings to present their designs; and how designers quantify and cost-budget their garden designs.

It is anticipated that this unit will occur in the second year of the HND because of the advanced evaluative nature of the subject at this academic level.

However, there should be open access to the unit with no requirement for prior knowledge or experience in the subject areas.

Learning Outcomes

On completion of this unit the student will be able to

- 1. Recognise the historical and contemporary contexts and influences in garden design.*
- 2. Demonstrate the use of design theories within the stages of a professional design process.*

3. *Design, evaluate and present small and medium garden designs.*
4. *Identify the technical, creative and financial requirements of detail design packages.*

MCAST

Field Crop Planning and Production -Vegetables and Fruits (Umbelifiers, Alliums, Salads and Herbs)

Unit level (MQF): 5

Credits: 6

Unit Description

The commercial production of vegetables, salad crops and herbs to meet the local market, ensures that reliance on importation of fresh produce to the island of Malta is reduced. Due to the Mediterranean climate with maritime influence which create a more equitable environment for crop growth, then an extended season allows continuation of production through much of the year.

There is currently increased interest in expanding the fresh and processed market of herbs either for culinary use or essential oil extraction.

This unit offers career opportunities and employment to students in both the growing industry as well as post-harvest, marketing and manufacturing of value added products.

The unit aims to bring together the underlying principles of crop production with the practical applications as seen through local enterprises and other resources which will enrich the learners understanding.

The focus of the unit should primarily encompass the following commercially important crops; umbellifers (to include carrots, celery, fennel), alliums (to include bulbous and green onions, garlic), salads (lettuce and baby leaf) and herbs (annual and perennial).

The principles of field grown crops will be discussed with relevance given to the above named crops. The choice of variety to meet seasonal needs and continuity of production, methods for plant raising, significance of plant spacing to meet market specifications will be covered. This will be followed by input of husbandry techniques such as water application, nutrient requirements and prevention of weeds pests and diseases.

Identifying the need for correct handling methods and in the case of leafy crops, hygiene procedures at the point of harvest is important to ensure the successful short and long term of produce. Removal of field heat and post-harvest treatments relevant to specific crops will be analysed.

Plants classified as herbs extends to a potentially significant range of annual and perennial plants. Identifying those that are of particular merit and commercial significance for use as culinary and /or essential oil extraction will be assessed. Harvesting and processing of the herbs will be researched by students and their findings presented to the group.

Learning Outcomes

On completion of this unit the student will be able to

1. *Discuss the field preparations required to establish Umbellifers, Alliums and salad crops*
2. *Identify the requirements for establishing and maintaining a crop of Umbellifers, Alliums, salad crops and herbs.*
2. *Compare the growth stages and determinants for a range of crops.*
3. *Investigate the post-harvesting procedures for different crops.*

Agriculture Policy

Unit level (MQF): 5

Credits: 3

Unit Description

This unit provides an overview of the policy context for agriculture, including national, European and international policies, to summarise the interface of the various policy frameworks. Students are first introduced to the notion of pricing of agricultural products and the determinants of these prices.

With a broad overview of the international picture, the role and development of key organisations associated with global agriculture and trade will be depicted. Using case studies, the impact of these on worldwide agriculture, and the roles of organisations such as the Food and Agriculture Organisation (FAO), the World Trade Organisation (WTO), and the European Free Trade Association (EFTA) will be explored. The unit will also provide an introduction to global agricultural trade, for students to further understand the role of market intervention and the role of the WTO for negotiations and agreement.

An agricultural policy is a vital tool in the development and vision of the agricultural sector of any country. The building up and implementation of this strategy together with an analysis of the various issues contained in such policies will be undertaken with special emphasis on Malta's situation and the issues facing the Maltese agricultural sector.

Learning Outcomes

On completion of this unit the student will be able to

1. *Assess the drivers of agricultural product prices.*
2. *Analyse the role of key organizations involved in global agricultural policy and trade.*
3. *Describe the process followed for the drafting and implementation of an agricultural.*
4. *Evaluate different issues targeted in an agricultural policy.*

Food Flavour and Tasting

Unit level (MQF): 5

Credits: 6

Unit Description

Different types of foods contain thousands of chemical compounds that are responsible to the flavour of the food consumed. There established methods to determine the nutritional compositions of foods, but to reach sensory approval by consumers is far more complicated due to the number of variables in the process such as colour, texture, and shape, flavour of consumed foods. It is also important not to forget the cultural background, dietary habits of consumers and on top of that foodstuff undergoes various chemical and biochemical reactions during storage, transport, and processing. All of these could result in poor or improved sensory experience by the consumer which adds to the complexity.

This is unit will allow the learners to understand what components in food is responsible in giving its characteristic tastes. Therefore, the main aim would be to give a broad overview of the relation between colour, food flavor and sensory insight.

The learners taste and aroma/smell senses will be put to test through practical sessions in which they will learn about the sensory evaluation process and the different taste panel methods such as difference, ranking tests and category scaling.

Learning Outcomes

On completion of this unit the student will be able to

1. *Describe how flavour is generated.*
2. *Explain the dynamics of flavor perception.*
3. *Discuss the process used for the classification of food items.*

Bedding Flowers, Turf and Nursery Production

Unit level (MQF): 5

Credits: 6

Unit Description

Malta's tourism industry and the need to provide high quality and colourful displays in public spaces as well as private accommodation ensures the continued need for production and installation of decorative plants and turf.

The knowledge gained from the study within this unit will be of benefit to those students interested in the ornamental and landscape sectors of the horticulture industry whether employed within the supply or the installation business. This sector is largely made up of small to medium sized businesses where employees have a wide skills base to reflect the genetic diversity of the crops produced.

The unit aims to provide a broad underpinning knowledge of the production of a range of decorative plants to include annuals and perennials. Plant varieties selection suitable to the local climatic conditions will be studied and the scheduling of plant production to meet target sales period will be covered and assessed. The principles as well as practice of plant production are evaluated and prepare learners to adapt to future changes and market demands.

Though classroom based, every opportunity will be taken to include involvement of local enterprises where possible. The assignments are designed to encourage the students to undertake research and to compile technical details for presentation.

Learning Outcomes

On completion of this unit the student will be able to

1. *Discuss the principles of bedding plant production to supply local markets.*
2. *Examine the production techniques and the uses of shrubs and perennials within the landscape sector.*
3. *Evaluate the range of day to day operations for crop cultivation on a nursery.*
4. *Identify the requirements for successful turf production.*

Field Crop Planning and Production- Cereals, Legumes and Brassicas

Unit level (MQF): 5

Credits: 6

Unit Description

Understanding of the major cropping groups is important skill required to becoming a successful grower in these globally traded products. Due to the unpredictable nature of weather it is important to understand how the weather can influence growing cereals, legumes and brassicas. Students will develop a good understanding of crop growth and development so they can appreciate the opportunities and challenges of growing these crops.

In this unit learners will develop knowledge related to crop rotations, crop suitability and the impact of crop management on the environment. Learners will study processes of considering and developing suitable cropping systems. Soil types, crop establishment, understanding growth stages, weed, pest and disease control will be considered for the different crop groups. Fieldwork skills will be developed to allow identification of weeds, pests and diseases and the skills of crop monitoring.

Interactions between different cropping families and how the crops work together will be investigated and how these factors can influence yield and quality. Introduce the concepts of dry matter partitioning, sources and sinks, and harvest index will be introduced. Students will then be cover with reference to cereal cropping the principles and practices of; soil tillage; crop sowing and establishment; irrigation; crop nutrition; crop protection and harvesting. These cropping principles will then be tested against the agronomy requirements of individual crops as case studies covering field beans, oilseed rape and wheat.

Learners will also explore basic crop protection strategies and the role of crop nutrition for growing good quality and high yielding cereals, legumes and brassicas. The impact of these different crops on the environment and their risks will be studied. Consideration will be given to potential different production techniques including organic, low input and high input strategies.

Learning Outcomes

On completion of this unit the student will be able to

1. *Discuss the field preparations required to establish cereals, legumes and brassicas.*

2. *Identify the requirements for establishing and maintaining a crop of cereals, legumes and brassicas.*
3. *Compare the growth stages and determinants for a range of crops.*
4. *Investigate the post-harvesting procedures for different crops.*

MCAST

Crop Biology and Physiology

Unit level (MQF): 5

Credits: 6

Unit Description

This module develops the knowledge and understanding achieved at level 4 in plant biology and genetics. Emphasis is placed on production related aspects of plant biology, biochemistry and physiology; the internal governing processes that control plant and crop growth and development to produce an acceptable yield quantity and quality in horticultural enterprise.

The module also concentrates on plant and crop responses to the inputs that are within the scope of production management techniques and methods. Advances in research in crop physiology are integrated into this module, and the potential application of novel production technologies is examined.

Studies are based on the crop as a unit of production rather than individual plants but the contribution of plant physiology to the understanding of physiological aspects is included.

The module is based on the life cycle of crops, and undertakes a reviewing content wherever possible of phenologically based crop life stages.

Light is studied as a component of the environment that drives growth. Both natural and artificial light is studied in their properties and characteristics. Crop utilisation of light as both a source of energy for growth and an environmental signal for developmental processes are studied in relation to crop lighting system technology.

Photosynthesis is presented as a process that can be examined from the level of the chloroplast to the entire crop. Conditions that limit the photosynthetic activity and efficiency of crops resulting in the limitation of production are presented and means to alleviate this are studied. Similarly, the relationship between photosynthesis and respiration are examined and related to production processes. Source and sink activity and dependency will be studied.

The partitioning and utilisation of photoassimilates in the growth process is described, and the biochemistry of yield formation is studied.

The final part of the module deals with further interactions between the crop and the environment such as the physiology of water stress, competition and nutrient uptake, and the modelling of these processes in computer software.

On completion of this module students will be able to define, understand, assess and interpret the various processes that drive or control crop growth and development at the level of plant communities in a field or protected space, and their interaction with the environment.

Learning Outcomes

On completion of this unit the student will be able to

1. *Describe plants' needs for light and vernalization.*
2. *Perform assessments of photosynthetic characteristics of crops.*
3. *Evaluate crop water and nutrient use.*
4. *Explain how crop models can be utilized to predict better crop production scenarios.*

Greenhouse Production

Unit level (MQF): 5

Credits: 6

Unit Description

The greenhouse industry is a very international one with continuing development in technology of alternative structures and cladding materials being a world-wide phenomenon. This unit seeks to open eyes to development in other parts of the world that may hold some application to their own local economy and business development and seeks to develop the research, analytical and interpretative capability of students wishing to enter in to this industry.

Understanding the current thinking with regard to structure design and materials is essential if future developments are to be viable. Each design offers its own properties in terms of light interception and internal distribution, heat retention / reflection and humidity control. The properties of cladding material themselves offer immense opportunities to customize facilities that reflect the needs of the cropping being undertaken. Learners will review these with the tutor and be encouraged to seek further information online that can be used in discussion groups. The one constraint that students need to be able to analyze before any proposed development is location and the effect of local weather / climate on structures from optimizing light levels to protection from potential damaging winds for example

For any cropping situation, whilst there is a need to offer maximum flexibility to enable changes in cropping usage that may occur for economic reasons, there is a need to be able to assess what infrastructure requirements are needed and can these be permanent or temporary and to decide which can fit in to on-going improvements and potential crop loading. Learners will evaluate a range of these and identify what is appropriate for a range of cropping situations

Understanding the environment created and ability to both measure and interpret data for making decisions on a continual basis either through manual operation of controls, semi-automatic through to fully integrated computer control programmes is essential for optimum crop performance and hence financial return. It is essential that learners familiarize themselves and develop competence with low key solutions and equipment that they can master that will enable them to understand some of the more complex control equipment.

Students will develop an understanding of crop cultivation and husbandry practices that include: understanding the limitations and advantages of growing in border soil through to deciding from an increasing range of soilless media culture systems

Learners by way of carrying out an assignment on the production of a named crop will prepare them in identifying the key components in any cropping situation and offer a degree of transference to new and changing cropping situations.

This unit is an essential introduction to the world of protected cropping and it is likely that most learners who enter in to production horticulture will find themselves being involved with some aspect of this unit that assist growers with providing continuity of supply to their markets. Due to the capital intensity of this sector of horticulture, it also spawns numerous employment opportunities in the supply sector from a range of agronomic and analytical services, young plant suppliers to supplying a range of sundry materials and equipment that are needed to run these enterprises.

This is such a vast unit that it can only prepare learners for this complex industry but the study of underpinning knowledge combined with the opportunity to see and research how much of this is employed particularly when related to local enterprises will prepare learners to technician level with the ability to speedily pick up the remaining skills required in a full blown commercial scenario

Learning Outcomes

On completion of this unit the student will be able to

- 1. Identify the range of greenhouse structures and cladding materials*
- 2. Assess requirements for internal materials and equipment to meet crop needs.*
- 3. Manage the greenhouse environment through interpretation of data from monitoring systems.*
- 4. Analyse the production requirements for a range of crops of local economic significance to provide continuity of supply to meet market needs.*

Field Crop Planning & Production- Olives, Vines, Citrus & Stone Fruits

Unit level (MQF): 5

Credits: 6

Unit Description

This is a management skills based unit and will demonstrate a learners abilities to analyse and evaluate a range of cultural practices for successful production and a basic understanding of site selection, breeding and developmental processes, species selection and post-harvest biology. The learner will also gain an understanding of the management of growth, fruit quality and the importance of quality control measures.

The learner will demonstrate an understanding of a range of field crop fruits including vines, olives, citrus and stone fruits as well as minor fruits including loquat, almond, mulberry and Pomegranates and specific requirements needed to produce successful crops. The unit is relevant to learners to further enhance their knowledge of alternative and potential crop plants and markets. On completion of the unit learners will understand management of the soil and cultivation of a range of suitable species and cultivars suitable to the climate and resources.

The learners will also gain knowledge of a wide range of information sources from the internet, case studies, forums, and international professional bodies as well as governmental sources.

Visits to local producers of the crops and if possible breeding research establishments are essential to aid learning and expand understanding of the principles of cultivation, local markets, economic importance, and possible career opportunities and employment within the production industry or with ancillary suppliers.

Learning Outcomes

On completion of this unit the student will be able to

- 1. Plan the establishment of a fruit tree orchard.*
- 2. Evaluate factors affecting different aspects of tree growth and production.*
- 3. Explain the requirements for good management of fruit tree orchards.*
- 4. Outline the processing methods for the production of olive oil and wine.*

Plant Propagation

Unit level (MQF): 5

Credits: 6

Unit Description

The knowledge gained and the skills developed during the delivery of this unit will prepare learners for a key role in any horticultural enterprise. The broad spectrum of propagation methods outlined and studied reflect the very diverse and international approach to the propagation of plants generally, all plants have to start either from seed or vegetative means.

The needs and scale of the larger economically important crops has allowed government and private enterprises to developed blue-prints for the successful raising of young plants. However due to the significantly wider botanical diversity of plants used for ornamental or indeed minor vegetable and fruit crops, necessitates that learners develop an independent approach. Encouraging experimentation is essential to develop crop species formulae to ensure successful raising of crops that meet the needs of what may sometimes be a niche or local market.

References may be available that provide pointers but the ability to determine the most successful methods following careful trialling and recording of results is still the best reference for much of the industry.

A significant and increasing proportion plant raising for economically important crops is often contracted to specialist nurseries, this relies on economy of scale for distribution that can also mean shipping worldwide often using air freight. However, the scale of smaller growing enterprises and their more remote location can exclude them from these sources. The solution being to either propagate under licence for protected varieties or undertake their own young plant enterprise to feed the production side of the business. This therefore offers the opportunity for a small number of highly specialised key individuals who can locally provide those needs either as independent businesses or under the umbrella of a main production enterprise. Propagation does not end at just being able to “put roots on things” but needs an understanding of how to manipulate growth of young plants during those early phases to ensure speedy and successful growth of the right quality to enter the production stage.

The practical element of this unit ensures that the underlying principles are being used in the methodology being applied to a specific propagation method. This experience should prepare them by developing their self-confidence to tackle other methods at a future time if the need arises.

The written assignments further help develop an awareness of the need to start with disease free clean mother material and be able to compare and contrast a range of propagation environments, how they may support the young plant during the root initiation and development stages.

By examining seed propagation to which considerable technology in seed treatments and equipment (some of it highly automated) for accurate sowing in a range of environments completes the most common methods employed

The principles of micro-propagation are provided to learners but the likelihood that learners will ever get to work in such a facility or even be involved in the setting up of such an enterprise are very low. The high euphoria that developed some twenty years ago with this technique has given way to a small and often international group of businesses who can afford the high capital and running costs.

Learning Outcomes

On completion of this unit the student will be able to

- 1. Identify the requirements and equipment for establishing propagation facilities.*
- 2. Explain the principles and practice of sexual propagation to be able to grow a range of plants from seed.*
- 3. Explain the principles of asexual propagation in order to select and prepare material for vegetative propagation.*
- 4. Undertake a range of methods of vegetative plant propagation.*

Soil and Organic Matter Management

Unit level (MQF): 5

Credits: 6

Unit Description

This is a theory and skills-based unit which prepares learners to be able to manage the nutrients and organic matter within the soil, so that crops can be grown more sustainably, without damaging or degrading the soil.

It covers the appropriate sampling and analyses of soils, and students will be able to take samples of soil from various farm or garden locations, analyse them in the laboratory for the main nutrients (N, P, K) as well as lime and trace elements such as magnesium, and then interpret the results to determine crop requirements for artificial or natural fertiliser applications. The soil analysis sessions will also include texture determination through quantitative measurement and hand texturing techniques.

Students will also be introduced to the concepts of optimum soil structure for crop growth and will examine soil profiles and a range of seedbed conditions.

The unit will cover in outline the use of corrective measures to improve topsoil and subsoil structure, as well as temporary drainage methods.

Wider, more comprehensive soil management plans will be covered in the unit. These will include measures to protect against soil erosion, avoid loss of organic matter, avoid loss of nutrients through leaching and volatilization, maintain soil structure, protect any environmental or archaeological features, avoid salinization, and avoid soil contamination.

The unit will finish by explaining the composting process and the use of the end product as a fertilizer and soil conditioner.

Learning Outcomes

On completion of this unit the student will be able to

1. *Analyse soil samples and interpret the resulting report.*
2. *Describe the soil's physical properties and their effects on nutrient and water dynamics.*
3. *Formulate a soil management plan for the improvement and maintenance of soil fertility.*
4. *Set up a successful on-farm composting process.*

MCAST

Tree Care and Management

Unit level (MQF): 5

Credits: 3

Unit Description

Trees are an important and the most permanent part of any landscape and planting schemes as they provide an aesthetically pleasing green environment that also brings wide ranging benefits for wildlife and people. The active management of established plantings through recognised modern arboriculture practices requires skills which may be enhanced through the study of this unit.

The training of trees to meet aesthetic requirements requires a knowledge of tree selection and individual tree response to pruning techniques, whilst also recognising the perceived expectations by stakeholders. The production of trees themselves is usually undertaken by specialist nurseries with the economies of scale to offer a wide range of species throughout the European market. The unit aims to develop an understanding of the principles and practices used in the production of trees on the nursery and recognise the specifications that are applied to meet a range of market requirements. Propagation methods can further impact on long term care in the landscape.

Learners need to explore a range of planting techniques by examining the theory of successful establishment with the opportunity to discuss the successes and failures in a landscape setting.

Whilst the unit is not designed to prepare for an official tree officer role, the need to be able to identify the factors that affect tree health and safety concerns through continual monitoring is identified.

Learning Outcomes

On completion of this unit the student will be able to

1. *Define the roles of different parts of a tree.*
2. *Describe the principles of tree selection and production methods.*
3. *Recognise the requirements for tree establishment and management within the landscape.*
4. *Undertake diagnosis of plant problems.*

Business Management & Work Experience

Unit level (MQF): 5

Credits: 6

Unit Description

This unit aims to provide learners with the skills and knowledge of business management, and further through work experience equip them with workplace practice environment. The unit is divided into two key parts - the first will address Business Management and Agribusiness finance aspects and the second will provide learners with the opportunity to develop first-hand experience in a workplace environment where they will have the opportunity to be engaged with all aspects of business activities.

Business Management & Finance

- Small Business performance investigation
- Budgeting and Financial Statements
- Loans

Work Experience

- Evaluate and monitor progress (self and business organisation)

Overall the unit equips the learner with a number of skills and attributes, these include business profiling, business assessment skills, management of employees; understanding the importance of capital budgeting as well as providing business recommendations; understanding financial statements and exploring the process of taking and re-paying a loan

The unit further provides the learner with the opportunity to gain work place experience in an organisation, allowing them to gain on the jobs skills and an opportunity to evaluate their performance in a workplace environment.

Learning Outcomes

On completion of this unit the student will be able to

1. *Investigate and assess business performance.*
2. *Demonstrate skills to address various agri-business' financial attributes.*
3. *Explain how an agri-business can benefit from and manage a loan.*
4. *Evaluate workplace activities and own work experience performance.*

Oenology & Viticulture

Unit level (MQF): 5

Credits: 3

Unit Description

This unit seeks to give the students a detailed understanding of the process of vine cultivation and wine production. This is done through 4 Learning Outcomes. The unit commences with a general introduction of the importance of wine in Maltese, Mediterranean and cultures around the world. The vine's biology is then discussed in detail together with its phenological cycle. The second Learning Outcome delves into the management of vineyards and covers topics including the setting up of the vineyard, pruning, irrigation, fertilization and pest control. This lends itself to the rest of the unit which goes through the process of wine production from harvesting to packaging, wine hygiene, quality control and the sensorial evaluation of wines.

Learning Outcomes

On completion of this unit, the student will be able to:

1. *Describe the life-cycle of a vine.*
2. *Understand how vineyards are managed.*
3. *Explain the wine processing procedure.*
4. *Compare between different characteristics of various wines.*

Wildlife Sciences and Conservation

Unit Level (MQF): 6

Credits: 6

Unit Description

This unit delves into the science of wildlife management and conservation. With a growing concern on biodiversity loss, numerous entities are prioritizing conservation to restore and maintain populations of species. This unit prepares students for work related to habitat management and biodiversity conservation. It starts with an overview of evolutionary mechanisms that played a significant role in giving rise to the myriad of species we currently have in our midst. The unit then seeks to shed light on the importance of biodiversity and on the challenges that are contributing to its decline. Subsequently, a more technical analysis of biodiversity will be undertaken with the dynamics of species populations and the factors affecting their distribution discussed at length. The unit closes with an overview of measures that are commonly used to conserve species followed by the different methods that are usually used to conduct an ecological survey.

Learning Outcomes

On completion of this unit the student will be able to:

1. *Discuss evolutionary processes that gave rise to different plant and animal species.*
2. *Understand how wildlife can be valued as a resource and the factors threatening it.*
3. *Explain strategies that can be utilized to conserve wildlife and their respective habitats.*
4. *Conduct a study of habitats and wildlife population.*

Business Planning

Unit Level (MQF): 6

Credits: 6

Unit Description

Business planning is not just for financing purposes. This course will provide students with a broader view of business planning as a tool that helps business people in making their decisions.

This course should also help students to begin to think outside the box. Almost anyone can purchase a business plan software program and fill in the blanks. Attendees of the course should be able to create their own blanks by finding their way and sharing their passion for business.

With a blend of management, marketing and finance, this course takes students through the entire process of conceiving and planning a business venture. They will learn-by-doing through development of their own business plan project. The business plan has to be developed through completion of assignments.

Learning Outcomes

On completion of this unit the student will be able to:

- 1. Collect and analyse data that will help with taking decisions in a particular business.*
- 2. Understand the importance of strategy in business management.*
- 3. Develop the operational plan of a business venture.*
- 4. Make decisions of a financial nature based on available information.*

Rural Development

Unit Level (MQF): 6

Credits: 6

Unit Description

During this course the student will be learning the main concepts of rural development and how it is contributing to the local and EU in general. Besides that other aspects which are linked to rural development will also be discussed such as the contribution of agriculture, the challenges and opportunities of rural livelihoods, natural resources and policies and legislation. Case studies will be an important learning tool so that students can link better the concept of the subject in practice.

Learning Outcomes

On completion of this unit the student will be able to:

1. *Describe the origins and evolution of rural development over time.*
2. *Describe EU and local agricultural and rural development policies and their contribution towards rural development.*
3. *Discuss the contribution of rural economic activities towards rural development.*
4. *Explain the contribution of rural areas towards the quality of public goods and the use of natural resources.*
5. *Debate the challenges and opportunities of rural areas.*

Development of Land Based Activities

Unit Level (MQF): 6

Credits: 6

Unit Description

This unit is essential for learners to understand the process that must be taken if they decide on setting up a business related to the rearing and management of animals. This unit mainly deals with the following enterprises: animal farms, pet shops, animal sanctuaries and horse stables. It starts by providing learners with a thorough understanding of the administrative procedures that must be followed for an animal-related business to be set up. It spans the whole process- from acquisition of land or premises to taxes and animal registration. The second module deals with the financial aspects of setting up business with a detailed overview of taking loans, having a business plan and applying for start-up funds. The unit then delves into the development of a site and provides a detailed explanation of the range of legislations and procedures that must be followed to design a farm, animal sanctuary or stable. The last module goes into more detail on the development, design and management of pet shops.

Learning Outcomes

On completion of this unit the student will be able to:

1. *Manage administrative procedures needed to set up and run an animal-related enterprise.*
2. *Manage financial procedures needed to set up and run an animal-related enterprise.*
3. *Choose the best design for an animal-related enterprise in line with relevant legislation.*
4. *Design and management of a pet shop.*

Integrated Pest Management

Unit Level (MQF): 6

Credits: 6

Unit Description

Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.

This course will introduce the basic principles and mechanisms involved in integrated management

Providing a wide array of examples of pests, including insects, weeds, plant pathogens, nematodes, and vertebrates. Specifically, the course will explore how knowledge of the agro-ecosystem, population dynamics, and provide in-depth clarification of biological, chemical, cultural, and mechanical/physical approaches to pest management. The latter will then be used to create integrated pest management systems. Throughout the course, case studies will be used to generate discussion and aid in the students' ability to formulate an integrated management program.

Learning Outcomes

On completion of this unit the student will be able to:

1. *Develop Integrated Pest Control programs by identifying suitable chemical, biological, physical and cultural intervention methods to given pest and disease scenarios.*
2. *Critique the sound management of biotic and abiotic factors in the context of IPM of various plant species.*
3. *Evaluate how crop backgrounds and other crop information can be used in an IPM strategy.*
4. *Discuss the use of IPM for a range of cropping and non-cropping industries.*

Plant Nutrition

Unit Level (MQF): 6

Credits: 6

Unit Description

This unit will give learners the necessary tools to understand the plant nutrient requirements and the fertilization that must complement a crop's cultivation to make sure it is absorbing all the necessary nutrients but without compromising the integrity of the water table. Learners will then be able to apply these principles in their private businesses as growers and in other institutions helping farmers draft their fertilizer programs.

This unit will first provide a thorough evaluation of the roles of each macro- and micro-nutrient followed by modules in which the considerations for nutrient management will be analyzed. The factors that must be considered before deciding which and how much nutrients to apply will give the learner a more complete overview of the science of fertilization. The learners will also be introduced to nutrient management software which is becoming more commonly used by agronomists.

Learning Outcomes

On completion of this unit the student will be able to:

1. *Evaluate how a deficiency in a range of macro- and micro- nutrients can affect the physiology of a plant.*
2. *Discuss the methods used to assess nutrients in the soil and plant.*
3. *Discuss how nutrient placing, application of fertilizers, various ion interactions and other crop and soil characteristics affect nutrient availability.*
4. *Prepare a fertilizer program.*

Agricultural Technologies

Unit Level (MQF): 6

Credits: 6

Unit Description

The rate of change, the new technologies available and today's technological era places agriculture in a situation where investment in such technologies is a must. These changes are driven by demand for food, less cultivable area available due to competition for land use, and scarcity of resources such as water.

This unit will introduce students to some of the new inventions that are making their way into the agricultural sector and that are becoming more popular with Maltese farmers. This will give the students a better understanding of the options that are available to make their work at the farm easier and to do away with inefficient methods, opting instead for scientific solutions.

Overall purposes of the module is to present the students with a holistic scenario of what technology is available on the market and what can be adapted to our typical agriculture, changing its difficulties and constraints into potential plusses.

The unit will be divided into four parts- each highlighting a different area where novel technologies have been introduced.

- Plant breeding,
- Agricultural machines & equipment
- Sensors & control systems
- Soilless techniques will be looked into each with its own applications for the Maltese agricultural realities.

Tours to local investors in Agriculture technologies such as Micro-propagation centre, Hydroponic farm and Propagation Units under controlled environments will also be held.

Learning Outcomes

On completion of this unit the student will be able to:

1. *Appraise a wide range of agricultural technologies by using engineering principles.*
2. *Distinguish between different soilless production systems.*
3. *Evaluate different plant breeding techniques and the use of micro-propagation.*
4. *Evaluate sensors and control systems available in agriculture.*