Unit 16: Manage Plant Propagation Activities

Unit code: T/600/9842

QCF Level 3: BTEC National

Credit value: 10

Guided learning hours: 60

Aim and purpose

This unit aims to provide learners with an understanding of how to manage plant propagation activities and how these can be applied in practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

Unit introduction

Commercial plant propagation has an important role in horticulture. It is essential that plant propagators understand the requirements of the plants in order to propagate them successfully. Plant production can be from seeds or vegetative methods and the choice of which of these is used depends on a number of factors.

This unit will develop learners' skills in using propagation techniques. They will consider what structures, materials and equipment are used in a commercial plant propagation facility. Learners, through taking part in practical sessions, will be able to develop propagation schedules for a range of plant types and know the different stages in the propagation cycle.

Learners will carry out plant propagation using seeds, cuttings, division, grafting and budding. The importance of source material, environmental conditions, pest and disease control and health and safety considerations will be identified. Choice of tools and appropriate PPE will be evaluated.

Learners will manage the needs of the plants after the weaning stage, looking at the role of nutrition and water in the development of healthy plants. The principles of commercial seed production will be explored and the implications for sustainability of the different methods of propagation compared.

Learning outcomes

On completion of this unit a learner should:

1 Know how to develop propagation schedules

2 Be able to manage vegetative propagation

3 Be able to manage seed propagation

4 Know how to manage the aftercare of propagated plants

5 Understand seed treatments and supply.

Unit content

1 Know how to develop propagation schedules

Propagation facilities and structures: glasshouses; polythene tunnels; low polythene tunnels; frames; facilities for outdoor propagation benching; under-bench heating; heating systems; mist units; fog units; shading systems; micro- propagation facilities

Propagation materials and equipment: appropriate tools and equipment, propagation media; trays and containers; methods and equipment used in pest and disease control

Production planning: production lead times; sales demand; availability of stock plant material or seed; labour requirements; ordering supplies; budgeting and costing

2 Be able to manage vegetative propagation

Sources of propagation material: methods of producing propagation material; selection and maintenance of stock plants; optimum timing for propagation

Principles of vegetative propagation: advantages and disadvantages of vegetative propagation; techniques in current practice; division; cuttings (root, softwood, semi-ripe, hardwood stem, leaf and leaf bud); grafting budding; layering; micro-propagation; use of rooting hormones; pest and disease control; maintenance of propagation records ; personal protective equipment (PPE); health and safety; implications of poor hygiene; risk assessment; Plant Health Regulations (plant passports); disposal of waste material

3 Be able to manage seed propagation

Principles of seed propagation: advantages and disadvantages of seed propagation; hybrid (F1, F2) or non-hybrid (open pollinated) seed; timing of seed sowing; seed sowing techniques; seed germination; pricking out; transplanting and potting on; pest and disease control; substrates; growing aids; field production techniques; importance of environmental conditions for optimum germination; maintenance of propagation records and appropriate labelling; PPE; health and safety; risk assessment; disposal of waste material

4 Know how to manage the aftercare of propagated plants

Aftercare: appropriate environment for post-propagation aftercare; spacing and weaning young plants to a normal environment; growing media for plants; potting on; timing; provision of water and feed; training or trimming to promote appropriate growth formation; sub-culturing; PPE; health and safety; risk assessment; disposal of waste material

5 Understand seed treatments and supply

Sources of seed: sources of genetically pure seed eg plant breeding companies; genetically modified material; seed production techniques; seed viability; seed collection, cleaning and storage; import regulations

Seed treatments: pre-sowing treatments; encapsulating; pesticide coatings; priming; scarification (physical and chemical); stratification

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 describe the environmental conditions necessary for propagation by seed and vegetative means		
P2 describe propagation facilities suited to seed and vegetative propagation		
P3 develop schedules for seed and vegetative propagation	**M1** review the factors that contribute to successful plant propagation by seed and vegetative methods	**D1** evaluate selected structures and facilities for plant propagation
P4 collect and prepare vegetative propagation material		
P5 propagate plants by division, cuttings, grafting and budding	**M2** produce a propagation schedule for one seed raised and one vegetatively propagated plant species	**D2** discuss what factors can affect the choice of propagation method for a plant
P6 prepare growing media suitable for vegetative propagation		
P7 establish propagation material in the propagation environment		
P8 carry out collection and extraction of seeds		
P9 treat seeds to overcome dormancy		
P10 prepare growing media suitable for seed sowing		
P11 sow seed outdoors and under protection		
P12 monitor the propagation environment		

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P13 describe the weaning of plants from the post-propagation stage to establishment	**M3** assess how the choice of propagation material can affect the quality of plants produced	**D3** evaluate selected facilities and systems for post-propagation aftercare
P14 evaluate sources of seed and provenance	**M4** discuss the importance of good hygiene for a commercial propagation company.	**D4** illustrate, using appropriate examples, the differences between hybrid and non-hybrid seed production methods.
P15 compare the storage conditions required for different types of seeds		
P16 review seed treatments to overcome dormancy ◊ priming ◊ cleaning		

PLTS: This summary references where applicable in the pass criteria, in the square brackets, the elements of the personal, learning and thinking skills. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key			
	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical assessments, written assessment, visits to suitable collections and will link to work experience placements.

Tutors delivering this unit have opportunities to use as wide a range of techniques as possible. Lectures, discussions, seminar presentations, practical demonstrations, research using the internet and/or library resources and the use of personal and/or industrial experience (for example growers or plant breeders) would all be suitable. Delivery should stimulate, motivate and educate learners.

Work placements should be monitored regularly in order to ensure the quality of the learning experience. It would be beneficial if learners and supervisors were made aware of the requirements of this unit before any work-related activities are undertaken, so that naturally occurring evidence can be collected at the time. For example, learners may have the opportunity to carry out plant propagation techniques and they should ask for observation records and/or witness statements to be provided as evidence of this.

Visiting expert speakers could add to the relevance of the subject for learners. For example, commercial growers or horticulturalists could talk about their work, the crops they grow and the production methods they use.

Whichever delivery methods are used, it is essential that tutors stress the importance of sound environmental management and the need to manage resource using legal methods.

Health and safety issues relating to working with plant propagation materials and equipment must be emphasised and reinforced regularly. Risk assessments must be undertaken before practical activities. Adequate PPE must be provided and used following the production of suitable risk assessments.

Tutors should consider integrating the delivery, private study and assessment for this unit with other relevant units and assessment instruments learners are taking as part of their programme of study.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives **an indication of the volume of learning it would take the average learner** to **achieve** the learning outcomes. It is **indicative and is one way of achieving the credit value.**

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment
Introduction and overview to the unit and relevance to the industry.
Assignment 1:Propagation Schedules (P1, P2, P3, M1, D1) Tutor introduces the assignment brief.
Introduce methods and techniques; types of structures and facilities.
Learners to develop skills and techniques for propagation.
Discuss the importance of health and safety, plant health regulations.

Topic and suggested assignments/activities and/assessment
Assignment 2:Practical Propagation (P4, P5, P6, P7, P8, P9, P10, P11, M2, D2) Tutor introduces the assignment brief.
Principles of propagation: theory session: introduce different propagation methods and skills.
Practical demonstration of methodology.
Discuss importance of correct choice of propagation material.
Learners to demonstrate basic skills using different propagation methods.
Learners to record and review the performance of the methods used.
Assignment 3:Weaning and Aftercare (P12, P13, M3, M4, D3) Tutor introduces the assignment brief.
Discuss the merits of the methods used.
Learners to review the performance of plant material they propagated.
Practical session: material to be pricked out or potted up.
Assignment 4: Seed Production (P14, P15, P16, D4) Tutor introduces the assignment brief.
Theory session: commercial seed production methods and plant breeding techniques.
Learners to research and evaluate seed treatment methods.
Practical session: breaking dormancy by different methods and record results.
Unit review.

Assessment

For P1 and P2, learners must describe environmental conditions and facilities suitable for plant propagation by different methods. Tutors should identify the methods through discussion with learners. Evidence could take the form of a pictorial presentation with notes or a PowerPoint presentation.

For P3, learners should identify the stages in the propagation cycle and produce a schedule showing these for both a seed and a vegetatively propagated plant species. Tutors should identify the species chosen through discussion with learners. Evidence could be in the same format as for P1 and P2.

For P4, P5 and P6, learners should prepare a growing medium that they will use for the propagation material following on from work in P1. After preparation of this medium learners must consider what propagation method they will use and carry out the appropriate techniques to produce suitable plant material for propagating. Evidence could be through tutor observations during practical activities and production of a propagation diary.

For P7 and P12, learners will need to set up the appropriate environmental conditions for their chosen propagation method and monitor the plants for signs of development or pest and disease problems. They will be required to identify strategies for dealing with problems that occur. Learners will continue to keep records in their diaries. Evidence could be in the same format as for P4, P5 and P6.

For P8, P9, P10 and P11, learners should prepare a growing medium that they will use for the seed sowing following on from work in P1. After preparation of this medium learners must consider what seed treatment method they will use to overcome dormancy and carry out the appropriate techniques to produce suitable seed for sowing. Evidence could be through tutor observations during practical activities and continuing use of a propagation diary.

For P13, learners should record observations in their diaries and decide when the plants are ready for potting up. After potting up learners should review the propagation schedule they produced and recommend any changes they feel are necessary. Evidence could be through tutor observations and production of a report on the work carried out, identifying any changes that could be made.

For P14, P15 and P16, learners must research current systems of seed production and review the types of seed treatment available. Learners should show how these contribute to improving the quality of crops produced. Evidence could take the form of a pictorial presentation with notes or a PowerPoint presentation.

For M1, learners must explain the environmental factors that contribute to plant propagation. Evidence could be through questions and answers during practical sessions which are appropriately evidenced using observation records. Alternatively, evidence could be in the form of a presentation that links to P1 and/or D1.

For M2, learners must collate information obtained in P1, P2 and P3 to produce a propagation schedule detailing the steps required for the propagation of the selected plant species. Evidence could take the form of a pictorial presentation with notes or a PowerPoint presentation.

For M3, learners must describe sources of propagation materials for seed and vegetatively propagated plant groups and evaluate their effect on the quality of plants produced. Tutors should identify the plant groups or agree them through discussion with learners. Evidence could be in the same format as that suggested for P1 and P2.

For M4, learners should summarise the importance of good hygiene in the plant propagation facility and outline the steps taken to ensure good hygiene is maintained. Evidence could be provided through discussion with the tutor and/or the production of a written report.

For D1, learners must evaluate selected structures and facilities for plant propagation. Tutors should establish the structures and facilities to be identified or agree them through discussion with learners. Evidence could take the form of a pictorial presentation with notes, an annotated poster or a report that could link to D3.

For D2, learners must discuss the factors that influence the choice of propagation method for a plant. Evidence could be in a similar format as that suggested for D1.

For D3, learners must assess selected facilities and systems for post-propagation aftercare. Tutors should identify the facilities and systems or agree them through discussion with learners. Evidence could be as part of a report linked to D1.

For D4, learners must compare hybrid and open pollinated methods of seed production and identify the factors that influence the choice of production method. Evidence could take the form of a pictorial presentation with notes or a PowerPoint presentation.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, P3, M1, D1	Propagation Schedules	Research the relevant facilities and techniques used in plant propagation and, from this information, produce a propagation schedule for both seed and vegetative propagation.	Written evidence.
P4, P5, P6, P8, P9, P10, P11, M2, D2	Practical Propagation	Using the propagation schedule carry out the practical work to propagate plants using appropriate techniques and record details in a propagation diary.	Production of a diary. Practical observation and assessment.
P12, P13, M3, M4,D3	Weaning and Aftercare	Monitor propagated plants regularly and record progress in the diary.	Pictorial presentation and written report.
P14, P15, P16, D4	Seed Production	Carry out research on commercial methods of seed production. Review the different types of seed treatment available and produce a summary of their main uses.	Pictorial presentation.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Land-based sector suite. This unit has particular links with:

Level 2	Level 3
Understand the Basic Principles of Plant Science	PH9 Plan and maintain the production of plants by vegetive methods
Understand the Basic Principles of Soil Science	Establish and Manage Exterior Plant Displays
Undertake Nursery Stock Production	Establish and Manage Interior Plant Displays
Participate in Protected Horticultural Plant Production	Understand the Principles of Advanced Horticultural Science
	Construct and Maintain Decorative Landscape Features
	Undertake Horticultural Production Techniques-Outdoors
	Undertake Horticultural Production Techniques-Protected
	Manage Advanced Nursery Stock Production

Essential resources

Learners will need access to the appropriate environment or facilities and equipment required to carry out the activities, as well as to resources related to research, for example the internet and library facilities.

Employer engagement and vocational contexts

This unit focuses on practical aspects of plant propagation and will give learners background knowledge relating to a variety of propagation skills and techniques. Centres are encouraged to create and develop links with local nurseries and garden centres. This could be via visits from nurserymen or horticulturalists or visits to commercial growers. When learning about the skills and techniques involved in propagating plants, learners could be encouraged to gain work experience with a local nursery.

Indicative reading for learners

Textbooks

Thompson P – *Creative Propagation, 2nd Edition* (Timber Press, 2005) ISBN 978-088192681 1

Toogood A – *RHS Propagating Plants* (Dorling Kindersley, 2006) ISBN 978-1405315258

Journals

The Grower

Horticulture Week

Websites

www.ipps.org.uk	International Plant Propagators Society
www.ishs.org	International Society for Horticultural Science
www.rhs.org.uk	Royal Horticultural Society

Delivery of personal, learning and thinking skills (PLTS)

The following table identifies the PLTS opportunities that have been included within the assessment criteria of this unit:

Skill	When learners are ...
Independent enquirers	researching background information on techniques and applying them to their practical work
Reflective learners	using results from practicals to review and amend, if necessary, their propagation schedule
Self-managers	using results from practicals to review and amend, if necessary, their propagation schedule.

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	researching propagation techniques using a variety of sources of information
Creative thinkers	applying techniques used on one plant type to a different one
Reflective learners	analysing the performance of the propagation method and suggesting improvements
Self-managers	monitoring and caring for the propagation material.

Functional Skills — Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	researching the internet for the appropriate propagation techniques for selected plants
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	
Manage information storage to enable efficient retrieval	
Follow and understand the need for safety and security practices	
Troubleshoot	
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: • text and tables • images • numbers • records	
Bring together information to suit content and purpose	
Present information in ways that are fit for purpose and audience	
Evaluate the selection and use of ICT tools and facilities used to present information	
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	

Skill	When learners are ...
Mathematics	**When learners are**
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	evaluating the success of a particular method by calculating the percentage of plants surviving
Identify the situation or problem and the mathematical methods needed to tackle it	
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	presenting their report on the facilities and techniques used in plant propagation.
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	