

Unit 38: Protected Horticultural Crop Production

Delivery guidance

This unit will provide learners with the practical skills and knowledge required to cultivate, grow and maintain a range of commercial protected horticultural crops. Knowledge of plant types will include vegetables that require protection, bedding plants, cut flowers, foliage and stems and house plants. Learners will need to consider how site requirements have an impact on the growth and development of plants as well as the resource requirements, which will include buildings, equipment, tools and materials.

Learners will be required to investigate two named protected horticultural crops – one edible and one ornamental – in order to understand their production requirements and the factors that affect plant growth and establishment. Learners will compare the different production requirements and make links relating to organic guidelines where appropriate.

Access to a suitable protected cropping area with opportunities for hands-on practical experience is critical to this unit. Learners will be given a brief to individually carry out tasks in establishing, maintaining, harvesting, grading and storing protected horticultural crops, including the completion of appropriate records. Learners will carry out their tasks on their selected crops, learning how to manage and monitor their plants, which will include plant health and the importance of timing for production.

Connections with a range of local professionals, such as small, medium and large-scale local growers, can be used to support this unit by arranging external visits and guest speakers.

Approaching the unit

There needs to be flexibility in the method of delivery and the timing of this unit to suit the correct timings of the protected crops being established.

Learning aims may be combined so that the theory is taught alongside practical tasks, helping learners to put the unit into context. Other units could be linked where appropriate: for example, you could teach health and safety considerations in *Unit 2: Estate Skills* and *Unit: 3 Understanding Environmental Management* relating to the use of tools, equipment and machinery or link to *Unit 7: Work Experience in the Land-based Sectors* where learners will work directly with protected crops.

For learning aim A, learners will have to investigate the key requirements for the commercial production of protected horticultural crops. They should be shown the wide range of plant types that require protection including vegetables, bedding plants, cut flowers, foliage and stems and house plants. They will then be able to select and investigate one edible and one ornamental crop type that is suitable for their first assignment.

You could arrange visits to small, medium and large-scale growers so that learners can observe a range of different buildings and production areas first-hand, which will help them to understand the importance of selecting appropriate sites, growing systems and storage and packing facilities. Guest speakers can also enhance the visits by providing information on establishing and harvesting techniques. Site selection and growing systems for protected crops are a critical element of this Learning aim, as learners need to have an understanding of:

- growing media
- how the season effects growth and establishment
- access requirements to crops for planting and harvesting



- irrigation and ventilation requirements
- the location of markets for selling crops.

Learners are also required to understand the requirements involved in becoming a certified organic grower. A visit to a certified organic grower would be beneficial, along with inviting a guest speaker to discuss the subject of becoming a certified organic grower.

Learners will need access to the full range of resources required for protective crop production in order to gain an understanding of how to manage and monitor crop health, including pests, diseases, disorders, planning, timing and costs, ensuring that they always adhere to the key principles of legislation and regulations.

For learning aims B and C, learners will gain an understanding of plant production and be able to carry out site preparation, planting, establishment, monitoring and maintenance of their protected crop. It is possible that learners will need to be grouped for the practical tasks. You should consider both your class and production area sizes: however, it is essential to remember that learners have to produce their own evidence individually.

Tutor-led practical demonstrations will be used to show safe tool, equipment and machinery use and how site preparation, establishment, monitoring and harvesting tasks are completed safely and effectively. You should take into account learners' previous experience in this area, as more advanced learners could be asked to demonstrate some practical tasks where appropriate. Ensure that learners work independently on their tasks so you can monitor their skills development. Learners must also be able to demonstrate that they can meet the legislative requirements of safe working practices and use personal protective equipment (PPE) correctly. This must be demonstrated by staff and learners throughout the unit delivery.

Learners will be required to use accepted working practices to carry out the appropriate harvesting, grading and storing methods to meet legislative requirements and ensure the successful growth, health and maintenance of their chosen protected crops.



Assessment model

Learning aim	Key content areas	Recommended assessment approach
A Investigate key requirements for the commercial production of protected horticultural crops	A1 Plant suitability for protected horticultural crop production systems A2 Site selection and growing systems for protected horticultural crops A3 Resource requirements A4 Factors affecting the management of plant growth and establishment	An illustrated report or presentation researching site considerations, facilities and techniques (including the use of organics) in the management of commercial protected crop production for two contrasting protected horticultural crops, one of which meets approved organic guidelines.
B Carry out the establishment and maintenance of protected horticultural crops	B1 Site preparation and establishment methods for protected horticultural crops B2 Maintaining protected horticultural crops	Evidence of carrying out tasks in establishing, maintaining, harvesting, grading and storage of protected horticultural crops to meet current standards and production targets. Completion of appropriate records.
C Use accepted working practices to carry out harvesting, grading and storage of protected horticultural crops	C1 Harvesting and grading of protected horticultural crops C2 Maintaining the shelf life of protected horticultural crops	

Assessment guidance

This is an optional, internally assessed unit comprised of two summative assignments that will examine learners' knowledge through written tasks and practical competency skills.

For learning aim A, learners are required to write an illustrated report or produce a presentation on the production requirements of one edible and one ornamental crop; one of which needs to meet the approved organic guidelines.

Learners should use clear diagrams, photographs, charts and supporting examples to illustrate their findings and document their research on site considerations, facilities and techniques in the management of commercial protected crop production for both of their selected crops.

Within their work, learners should make comparisons between their two selected crops and present their information in a clear and logical way, using technical terms and accurate botanical plant names throughout.

In the second assignment for learning aims B and C, learners will have to show evidence of carrying out practical tasks in establishing, maintaining, harvesting, grading and storing protected horticultural crops, including the completion of appropriate records. It is essential that learners are given a suitable production area to carry out the full scope of the unit and produce their own evidence, even when working within small groups.

Learners must gather a wide range of evidence to show that they have completed their practical tasks to the required standard. This should include a risk assessment, completed crop monitoring sheets and a series of annotated photographic evidence sheets



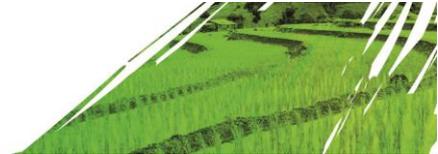
demonstrating the practical tasks being carried out in a time-efficient and appropriate manner. You will complete observation proformas that will include evidence of learners:

- selecting and using tools, equipment and materials safely and correctly
- preparing their site
- planting and establishing crops
- monitoring and maintaining crop health ready for harvest.

Learners must also demonstrate clear consideration of the environment, safe working practices and working to site conditions effectively.

Learners must discuss with you when they consider their crop to be ready for harvest with clear reasoning. This can be a voice recorded discussion or video evidence of the discussion taking place.

Learners will then gather evidence of their harvest via photographic evidence sheets, records or video evidence. This will show learners correctly and efficiently harvesting, loading, grading and monitoring their protected crops with consideration to storage hygiene and reasons for this. Learners should use the correct horticultural terminology and botanic names throughout.



Getting started

This provides you with a starting place for one way of delivering the unit, based on the recommended assessment approach in the specification.

Unit 38: Protected Horticultural Crop Production

Introduction

Introduce learners to protected horticultural crop production and the plant types that are grown in protected environments. There are excellent opportunities to develop strong links with local employers during this unit, especially during the introduction. Learners could visit a range of local small, medium and large-scale growers. Guest speakers or guided tours will enable learners to gain first-hand knowledge of the vast range of protected crops grown.

This will could also be a good opportunity for learners to see the wide range of protected cropping areas, tools, equipment and materials used. There are also excellent resources that can support the delivery of this unit, such as video clips that show large commercial growers of edible crops and ornamental plants.

Learning aim A – Investigate key requirements for the commercial production of protected horticultural crops

- You could begin learning aim A by delivering a presentation on the different plant types that are grown under protection, including vegetables, successional bedding plants, cut flowers, foliage and stems and house plants (see named examples in unit specification) including the resource requirements for each protected crop discussed. For example:
 - buildings and structure requirements
 - tools and equipment
 - temperature and lighting
 - equipment and materials
 - information for recording purposes.

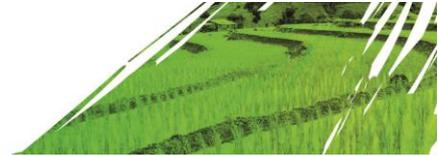
Learners could also be introduced to the examples above in practice during a facilities tour that happens after the presentation. Learners could list what resources are available in their own growing facilities, covering both seeds and cuttings.

- You could facilitate an interactive whiteboard task where learners categorise the protected crops discussed. They must consider the age, size and intended market for all crop types introduced.
- Learners should be given an assignment task sheet and must develop some questions that cover site selection and growing systems for protected crops to commercial growers to ask during an arranged visit. These questions will support their choice of edible and ornamental crop for their report or presentation and should display an awareness of site considerations for protected crops (soil and soil-less growing media, seasonal characteristics, aspect, access requirements, availability of services, structures, irrigation requirements, relevant legislation, location of end users).
- You could arrange a series of visits to commercial growers to look at a range of protected crops (covering both edible and ornamental crops if possible) being grown on small, medium and large-scale sites. Ensure that learners are able to see site considerations and all stages of protected crop production from preparation to sale. You should also speak to employers in advance to discuss the learning aims of this unit in preparation for when learners ask questions.
- As a formative assessment activity, learners should individually produce a fact sheet on gaining certification of organic status. This should also include the benefits and limitations of certified status for growers, as well as the time and cost required to convert and availability of inputs.

- You could deliver a presentation on monitoring and maintaining plant growth, which should include the following criteria:
 - growing space available
 - seed density
 - spacing for correct time of year
 - stage of development
 - size of plant
 - thinning
 - pruning
 - trimming
 - providing support.
- Facilitate a practical session where learners must correctly identify the health problems of protected crops, including pests, diseases, viruses and disorders and their feed requirements. Where possible, show learners some real examples (although pictures and video clips can be used where necessary).
- You could deliver a presentation on how, when and why it is so important to monitor protected crops. This should include factors that affect timeline planning, such as natural growth times of crops, work schedules, contingency planning and production timings. Learners could then produce charts detailing all the factors taught so far to use in their own planning.
- Learners are to produce monitoring sheets to use when completing the designated monitoring activities on their selected protected crop for learning aim B.
- A research activity could be set for learners to find out about key legislation and codes of practice in relation to growing protected crops. They should produce a list of these with brief explanations of their importance.
- For the summative assessment activity, learners should write an illustrated report or produce a presentation on the production requirements of one edible and one ornamental crop, one of which needs to meet approved organic guidelines. Learners should follow an assignment brief developed by you.

Learning aim B – Carry out the establishment and maintenance of protected horticultural crops

- Learners should be given a protected cropping area to prepare, establish, maintain and monitor a named protected crop. Learners may have to work in small groups but it is critical that they produce their own practical evidence independently.
- Facilitate a tutor-led session on assessing risks that relate to practical tasks, including the relevant tools, equipment, materials, people and area they are working in. You could demonstrate to learners the practical preparation of the protected cropping area, along with the sowing and planting tasks that are suitable to the crops being established.
- As a formative assessment activity, learners could be given a blank risk assessment template and they must fill it out for their practical tasks including personal protective equipment (PPE) requirements.
- Arrange a series of practical sessions where learners carry out the preparation of their own protected growing area (including any criteria listed in the unit specification for LAB1 that is relevant to their crop). Learners will demonstrate how to:
 - ensure continuous safe working practices
 - select and safely use the correct tools and equipment
 - perform the necessary pre-use checks and post-use maintenance tasks
 - minimise environmental damage while working



- leave the work area clean and tidy after tasks
- dispose of any organic and inorganic waste correctly.
- You should complete written observation records for each task and ensure that photographs and/or video evidence is obtained throughout each practical session. Over several weeks, learners will use their own monitoring sheets to record crop development (e.g. propagation record, growing-on log and crop records) and then carry out the relevant tasks as necessary. This could include:
 - pruning, tidying, support and training
 - providing additional protection
 - irrigation, application of fertiliser and pinching out
 - feeding and watering
 - environmental controls (e.g. thermal, blackout and aspirated screens)
 - weed removal
 - health checks (e.g. pests, diseases and disorders, good hygiene practices).
- Facilitate tutor-led discussions after each practical session (or as appropriate) to check learners' progress and offer support in relation to monitoring and recording crops.

Learning aim C – Use accepted working practices to carry out harvesting, grading and storage of protected horticultural crops

- You could deliver a presentation on harvesting and grading of crops to meet different standards and requirements of different countries, so that learners understand the:
 - maturation characteristics (i.e. sizes and stages of development)
 - packaging and labelling requirements
 - harvesting containers
 - waste management
 - environmental impact
 - health and safety issues, including safe working practices and the consequences if not followed (e.g. injury to self or others).
- Arrange a visit to a local employer's business (e.g. a flower grower or food producer) to look at harvesting and storage of protected crops. You should speak to the employer in advance to discuss the unit requirements for learning aim C in relation to harvesting and grading and maintaining shelf life of their crop.
- Once it has been agreed that the crop is ready for harvest, you could arrange a series of practical sessions where learners will carry out the correct harvesting and grading operations, meeting quality standards, making clear links to their previous nursery visits. Learners should always demonstrate continuous safe working practices, such as the correct selection and use of tools and equipment that includes pre-use checks and post-use maintenance. They must also ensure to minimise environmental damage while working, disposing of any organic and inorganic waste correctly and leaving their work area clean and tidy after tasks. You should complete written observation records for each task and ensure that photographs and/or video evidence are obtained throughout each practical session.
- Throughout the practical sessions, learners will need to demonstrate robust ways of maintaining the shelf-life of their harvested crop, including selecting correct storage and cooling methods where appropriate, pest and disease control and decay prevention. They should clearly explain the importance of store hygiene and accurately justify the reasons for their own methods.
- Facilitate tutor-led discussions after each practical session (or as appropriate) to check learners' progress and offer support in relation to keeping accurate records and using suitable horticultural terminology.

Details of links to other BTEC units and qualifications, and to other relevant units/qualifications

This unit links to:

- Unit 2: Estate Skills
- Unit 3: Understanding Environmental Management
- Unit 7: Work Experience in the Land-based Sectors
- Unit 27: Identification, Planting and Care of Plants
- Unit 28: Routine Plant Management
- Unit 29: Plant Propagation Activities
- Unit 31: Nursery Stock Production
- Unit 33: Pests and Disease in Plants.

Resources

In addition to the resources listed below, publishers are likely to produce Pearson-endorsed textbooks that support this unit of the BTEC Internationals in Agriculture/Horticulture/Land-based subjects. Check the Pearson website (<http://qualifications.pearson.com/endorsed-resources>) for more information as titles achieve endorsement.

Textbooks

Adams C R and Early M P, *Principles of Horticulture* (5th edition), Routledge, 2008 ISBN 9780750686945 – an excellent introduction to horticultural study; covers commercial aspects of protected cropping

Russell J, *The Polytunnel Book: Fruit and Vegetables All Year Round*, Frances Lincoln Ltd, 2013 ISBN 0711231702 – gives information on the variety of plants that you can grow under polythene

Journals

The Commercial Greenhouse Grower – www.greenhousegrower.co.uk – includes the latest information from the protected cropping sector

Videos

Search online for a range of appropriate protected crop videos to support the teaching of this unit, especially some of the latest technology used in production, harvesting and storage of food crops in both the UK and Netherlands. Videos should be searched using key words and chosen by you to ensure they are relevant to the learner's area of growing or link to external visits.

Websites

www.gardenersworld.com – outlining new developments within the gardening sector.

www.ishs.org – The International Society of Horticultural Science – a useful website for the science and research side of horticulture.

An internet-based search for local commercial growers will also support the teaching of this unit.

Pearson is not responsible for the content of any external internet sites. It is essential for tutors to preview each website before using it in class so as to ensure that the URL is still accurate, relevant and appropriate. We suggest that tutors bookmark useful websites and consider enabling students to access them through the school/college intranet.