

## Higher National Unit specification

### General information for centres

**Unit title:** Horticultural Production Mechanisation

**Unit code:** F21R 35

**Unit purpose:** This Unit is designed to enable the candidates to effectively manage the production environment through a knowledge of the important environmental parameters for horticultural crop and plant production and the performance characteristics of alternative means of control used in commercial practice. The Unit also develops skills in production planning through the development of mechanised systems to meet production objectives, and encourages candidates to critically compare and contrast alternative solutions.

On completion of the Unit the candidate should be able to:

- 1 Explain the principles of environmental control for growing and storage environments.
- 2 Plan the application of mechanisation for a horticultural production enterprise.

**Credit points and level:** 1 HN credit at SCQF level 8: (8 SCQF credit points at SCQF level 8\*)

*\*SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

**Recommended prior knowledge and skills:** Entry to this Unit is at the discretion of the delivering centre, however, it is recommended that candidates possess basic mathematical skills equivalent to Standard Grade and have studied a land-based industries mechanisation Unit such as Selection and Management of Machinery for Land Based Industries.

**Core Skills:** There are opportunities to develop the Core Skills of Numeracy and Problem Solving at Higher level in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

**Context for delivery:** If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

**Assessment:** This Unit is assessed using two instruments of assessment. Outcome 1 is assessed by means of a report. Outcome 2 is assessed by means of an assignment which may be presented either as an oral or a written report. In both cases it is recommended that the assessments are project based and relate to real or simulated production systems.

## **Higher National Unit specification: statement of standards**

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The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

### **Outcome 1**

Explain the principles of environmental control for growing and storage environments

#### **Knowledge and/or Skills**

- ◆ Environmental parameters
- ◆ Environmental requirements for plant growth and storage
- ◆ Means of environmental control
- ◆ Principles of control systems

#### **Evidence Requirements**

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ identify the significant environmental parameters to be controlled for specific cropping, growth or storage situations
- ◆ determine appropriate values for each environmental parameter requiring control
- ◆ select the equipment and mechanisms that will be required in order to provide those conditions in accordance with commercial practice
- ◆ explain the principles of operation of a suitable control system to maintain the required conditions
- ◆ identify relevant energy management and Health and Safety considerations

#### **Assessment Guidelines**

Outcome 1 could be assessed by a report. This should consist of written material of approximately 1,000 words with suitable diagrammatic supplements that illustrates the candidate's ability to optimise the environment for a growing crop or to manipulate storage environments to extend shelf life. The assessment should be related to the crop interest of the individual student and should be conducted under open-book conditions.

## **Higher National Unit specification: statement of standards (cont)**

**Unit title:** Horticultural Production Mechanisation

### **Outcome 2**

Plan the application of mechanisation for a horticultural production enterprise

#### **Knowledge and/or Skills**

- ◆ Growing media preparation technology
- ◆ Plug and pot plant equipment and systems
- ◆ Materials handling
- ◆ Mechanised systems for irrigation and nutrient supply
- ◆ Work analysis techniques

#### **Evidence Requirements**

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ describe machines appropriate to the production of a specified glasshouse crop
- ◆ integrate machines into a coherent production system to meet production objectives
- ◆ analyse an aspect of a production system and propose improvements
- ◆ identify the key health and safety considerations of horticultural production machinery

#### **Assessment Guidelines**

Outcome 2 could be assessed by an assignment presented either in a written format or as an oral presentation. As a structured written report it should extend to about 1,000 words plus supporting information undertaken under open-book conditions. As an oral presentation it should be of the same extent as a written report and presented to other class members and encompass visual material.

## Administrative Information

**Unit code:** F21R 35

**Unit title:** Horticultural Production Mechanisation

**Superclass category:** SD

**Original date of publication:** August 2007

**Version:** 01

### History of changes:

Version	Description of change	Date

**Source:** SQA

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## **Higher National Unit specification: support notes**

### **Unit title: Horticultural Production Mechanisation**

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

### **Guidance on the content and context for this Unit**

This Unit is clearly focussed on two of the key aspects of production horticulture: creating the right growing conditions and planning the effective use of machines in the production of horticultural crops. The Unit is most appropriate for those pursuing a career in production horticulture, where the principal focus is on the production of plants for a specified market. Market demands are generally for consistent, high quality produce, at least cost and this is most frequently satisfied where the treatment of all plants is optimised and identical. Hence the context of this Unit is heavily targeted on the controlled conditions of a protected environment of a glasshouse, polytunnel and similar structures.

Developing the right growing conditions involves heating (both direct and indirect, with all the ancillary components of boilers, pipework and/or ducting), humidity control, lighting (supplementary and daylength control), supplementing carbon dioxide and integrating these with the building structure, layout, and a ventilation system. These systems must be highly efficient, as they are one of the major costs of production horticulture. Outcome 1 considers all these aspects to provide the candidate with a clear understanding of how different systems operate, how the systems differ in their efficiency, and hence their most suitable application. Consideration of the merits of different control technologies is essential to predict the likely response of crops, hence comparing on/off thermostatic control to the alternatives is included. The candidate should get a clear view of the most financially advantageous option for a given situation. In the course of this Outcome it will become clear that horticulture is a very energy intensive industry and hence energy efficiency implications should be stressed.

It should be noted that this Unit focuses on conventional heating and related systems based on fossil fuels. Whilst technologies such as CHP and other on-site generation facilities may be mentioned they are not specifically explored in this Unit

Outcome 2 is concerned essentially with machinery to remove drudgery and improve consistency of plant product. Hence preparing growing media through proportioning, mixing, and then blocking, sowing seed, transplanting and handling plug trays, pots, trolleys and using materials handling equipment to maximise space utilisation in the growing area are all important areas explored in this Outcome. Options for the provision of water and nutrients is explored and this should include outlines of NFT techniques. The selection of a machine for a particular position in the production sequence entails considering the quality of the work and throughput compared to hand methods and in turn this is developed into work analysis to enable candidates to review mechanised systems and seek improvements. The range of machines available to the grower is staggeringly large hence it is essential to be selective in the scope of the study and concentrate on the machines likely to be encountered by the candidates according to their interests. Despite this it is important to include the types specified in the Knowledge and/or Skills section.

## **Higher National Unit specification: support notes (cont)**

**Unit title:** Horticultural Production Mechanisation

### **Guidance on the delivery and assessment of this Unit**

The Unit is best studied as part of a Group Award in the horticultural sciences. Its focus is on two major facets of horticultural production: the growing environment and the machines used to reduce labour requirements for establishing, transplanting, potting and growing on crops. It is therefore most appropriate later in the programme of a Group Award when the candidate has a good appreciation of the environments and cultural requirements of crops. Its inclusion as part of a Group Award will mean that the candidate can apply the content to a crop (or crops) being studied in other Units. This is particularly apt for the assessment of the Outcomes and may present opportunities for consolidating assessment reports and reducing the assessment burden. Alternatively more experienced candidates should already have the plant experience and can study the module independently. These candidates could be encouraged to explore the environment and mechanisation of crops to complement their experience.

Given that machines evolve very quickly and are closely associated with computer technology it is highly advantageous to make use of visits to and/or visiting speakers from both progressive horticultural growers and machinery manufacturers. Despite this it is likely that access to many machine type will not be possible and it will therefore be necessary to make significant use of photographic and diagrammatic material in the delivery phase

#### ***Opportunities for developing Core Skills***

There may be opportunities to develop the Core Skills of Numeracy and Problem Solving at Higher level in this Unit; however, there is no automatic certification of Core Skills or Core Skills components.

### **Open learning**

It is possible for this Unit to be offered by means of distance learning. In terms of the assessments, candidates should be provided with data and information that can be used as a scenario for which to develop environmental control and production machinery systems. Candidates will also require access to a horticultural protected crop production facility that may be studied with a view to developing improvements.

### **Candidates with disabilities and/or additional support needs**

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* ([www.sqa.org.uk](http://www.sqa.org.uk)).

## **General information for candidates**

### **Unit title: Horticultural Production Mechanisation**

Production Horticulture is principally concerned with growing plants of consistent and high quality for specific markets. This is mostly undertaken in closely controlled environments using highly specialised machinery to minimise variation between plants. This module explores in detail these two aspects and will enable you to focus on the important factors that govern plant growth and hence profitability.

The first Outcome explores the environmental factors that it is important to control, the various methods that are used, and how the systems are controlled to produce the desired plant growth conditions. This will enable you to understand the terminology and the interrelationships between the plant and its environment that govern growth and hence will give you an insight into the likely success of different production strategies.

The second Outcome is concerned with a study of the machinery that is used in production horticulture, and how to ensure that it is used in the most effective ways to maximise returns. Most plants are either produced as plugs or in pots and the machinery that can be employed for both these aspects is covered. The purpose of this Outcome is to ensure an awareness of the range of machinery options that are available to the grower, their mode of operation and to provide the skills to bring machines together in systems to produce crops in an effective manner. The Outcome also includes how to critically review an existing system with a view to making improvements. This is an essential skill to keep systems up-to-date and efficient.

Given the high energy cost of production horticulture, and the complexity of the machinery both energy efficiency and health and safety are considered in context and stressed throughout the delivery and assessment of the Unit.