

# Next Generation Higher National Unit Specification

## Ecology and Environment for Horticulture (SCQF level 7)

**Unit code:** J6F2 47  
**SCQF level:** 7 (16 SCQF credit points)  
**Valid from:** session 2024–25

### **Prototype unit specification for use in pilot delivery only (version 4.0) August 2024**

This unit specification provides detailed information about the unit to ensure consistent and transparent assessment year on year.

This unit specification is for teachers and lecturers and contains all the mandatory information required to deliver and assess the unit.

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## **Unit purpose**

This unit is suitable for learners studying Higher National Certificate (HNC) Horticulture or pursuing similar routes of study. The course content gives learners a broad introduction to the ecological and environmental issues they need to bear in mind for the design, creation and maintenance of commercial gardens or green spaces.

While learners would benefit from previous horticultural knowledge or experience, they do not need to have prior knowledge to study the unit. If learners are doing this as part of the HNC Horticulture group award, they can progress to Higher National Diploma (HND) Horticulture on completion of the HNC.

## Unit outcomes

Learners who complete this unit can:

- 1 explain the fundamental factors of ecology relevant to horticultural activities and industry
- 2 explain the fundamentals of environmental issues and sustainability relevant to horticultural activities and industry
- 3 apply the principles of ecology and environmental issues to actual and planned projects
- 4 develop general and subject-specific knowledge and understanding and skills of sustainability and the United Nations (UN) Sustainable Development Goals (SDGs)

## Evidence requirements

### Outcome 1

Learners can describe the fundamental factors of ecology relevant to horticultural activities and industry, including examples of:

- ◆ ecological principles
- ◆ symbiosis and mutualism
- ◆ diversity

Learners can generate assessment evidence for outcome 1 in a single project incorporating outcomes 2 and 3.

### Outcome 2

Learners investigate and describe the fundamentals of environmental and sustainability issues relevant to horticultural activities and industry. These should include:

- ◆ environmental sustainability principles
- ◆ at least three examples from:
  - limited resources and mitigations
  - sustainable growing systems
  - soil conservation
  - climate change

Learners can generate assessment evidence for outcome 2 in a single project incorporating outcomes 1 and 3.

### Outcome 3

Learners apply the principles of ecology and the fundamentals of environmental issues and sustainability researched in outcomes 1 and 2 to an actual or planned project.

Learners produce evidence that they have applied ecological and environmental learning to planning, or creating and maintaining, a garden or greenspace project. They can apply aspects of ecological and environmental learning across more than one project, and do not

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need to duplicate them. Evidence can be in the form of a diary, report, presentation or portfolio, or any other appropriate format.

#### **Outcome 4**

Learners must gather evidence that demonstrates that they can:

- ◆ identify and describe sustainability in the context of the United Nations (UN) Sustainable Development Goals (SDGs)
- ◆ explain how horticulture could be made more sustainable and help meet the aims of at least two selected SDGs

## Knowledge and skills

The following table shows the knowledge and skills covered by the unit outcomes:

Knowledge	Skills
<p><b>Outcome 1</b> Learners should understand:</p> <ul style="list-style-type: none"> <li>◆ major principles of ecology relevant to horticultural activities, including               <ul style="list-style-type: none"> <li>— ecological principles</li> <li>— symbiosis and mutualism</li> <li>— diversity</li> </ul> </li> </ul>	<p><b>Outcome 1</b> Learners can:</p> <ul style="list-style-type: none"> <li>◆ recognise and apply ecological principles to commercial horticulture, and greenspace development and maintenance</li> </ul>
<p><b>Outcome 2</b> Learners should understand:</p> <ul style="list-style-type: none"> <li>◆ principles of environmental issues and sustainability relevant to horticultural activities</li> <li>◆ at least three examples from:               <ul style="list-style-type: none"> <li>— limited resources and mitigations</li> <li>— sustainable growing systems</li> <li>— soil conservation</li> <li>— climate change</li> </ul> </li> </ul>	<p><b>Outcome 2</b> Learners can:</p> <ul style="list-style-type: none"> <li>◆ recognise and apply environmental and sustainability principles to commercial and greenspace maintenance and developments</li> </ul>
<p><b>Outcome 3</b> Learners should understand:</p> <ul style="list-style-type: none"> <li>◆ where learning about ecological and environmental issues is appropriate and applicable to horticultural activities</li> </ul>	<p><b>Outcome 3</b> Learners can:</p> <ul style="list-style-type: none"> <li>◆ recognise opportunities and impacts of commercial and greenspace maintenance and development</li> <li>◆ apply knowledge to actual and planned projects</li> </ul>
<p><b>Outcome 4</b> Learners should understand:</p> <ul style="list-style-type: none"> <li>◆ sustainability principles</li> <li>◆ the United Nations (UN) Sustainable Development Goals (SDGs), their aims, and their interconnectivity</li> <li>◆ why it is important to adapt horticultural processes or products to be more sustainable, in terms of UN SDGs</li> </ul>	<p><b>Outcome 4</b> Learners can:</p> <ul style="list-style-type: none"> <li>◆ identify how UN SDGs are relevant to horticulture</li> <li>◆ adapt a horticultural product or process to make it more sustainable, in line with UN SDGs</li> </ul>

## Meta-skills

Throughout the unit, learners develop meta-skills to enhance their employability in the horticulture sector.

### Self-management

This meta-skill includes:

- ◆ focusing
- ◆ integrity
- ◆ adapting
- ◆ initiative

Learners develop these meta-skills in self-directed study and further exploration of the topic, in particular when they apply research into ecological and environmental sustainability to their project in this unit.

### Social intelligence

This meta-skill includes:

- ◆ collaborating
- ◆ communication
- ◆ feeling
- ◆ leading

Learners develop these meta-skills when they work together to plan and carry out project work. They develop communication, feeling and leading skills as they make decisions about how to carry out projects and justifications based on ecological and environmental principles.

### Innovation

This meta-skill includes:

- ◆ curiosity
- ◆ creativity
- ◆ sense-making
- ◆ critical thinking

Learners develop these meta-skills through their reasoning processes, and by researching and applying their knowledge to their project work.

## **Literacies**

Learners develop core skills in the following literacies:

### **Communication**

Learners develop communication skills by working together to plan projects with consideration for ecological and environmental sustainability.

## **Delivery of unit**

The unit is primarily designed to allow learners to apply ecological and environmental knowledge and skills in the horticulture industry. We see learners describing and explaining ecology and sustainability as applied to project-based units. Where this is not possible — for example, where the unit is being taught as a stand-alone — then you should assess learners on their application of ecological and environmental knowledge to actual or planned projects.



## Additional guidance

The guidance in this section is not mandatory.

### Context and content for this unit

You can use a wide range of topics and themes to support the course of study. In this section we suggest some appropriate topics that you can explore to support current horticultural activities and industry. Topics are likely to overlap and support each other as the module progresses, and you can assess outcomes holistically and in combination.

### Explain the fundamental factors of ecology relevant to horticultural activities and industry (outcome 1)

Ecological principles:

- ◆ ecological units: biomes, niches, habitats, populations, communities, ecosystems
- ◆ evolution
  - processes of evolution: mutation, separation, survival of the fittest
  - direct and indirect effects on plants: range, suitability for environment, disease, and pest resistance
  - natural selection, artificial selection, bottlenecking, drift, hybrids
- ◆ interspecific competition: resource partitioning, community interactions, keystone and dominant species, invasive species
- ◆ food chains: trophic relationships and levels, energy transfer, predator-prey relationships, bioamplification
- ◆ succession: primary and secondary succession, natural and human disturbance, diversity, pioneer and climax species, pathways
- ◆ stratification: identification and interactions between layers of vegetation

Symbiosis and mutualism:

- ◆ competition between species, adaptations, mutual relationships ranging from symbiosis to predator-prey
- ◆ the role of bacteria: nutrient-fixing, nutrient recycling, decomposition, as pathogens
- ◆ the role of fungi: decomposition, nutrient recycling, parasites, and saprophytes
- ◆ microbial interactions: mycorrhizal roles and relationships, 'wood wide web' communication, nutrient and carbon redistribution, warning systems
- ◆ role of macro-organisms, where not covered elsewhere: worms, molluscs, mammals
- ◆ pest and disease management: pest and disease prevention, natural predators, rotation, companion planting, non-chemical methods

#### Diversity:

- ◆ loss of diversity: habitat loss, climate change, pollution, invasive species and disease, monocrops, wildlife corridors
- ◆ extinction: scale of the problem, relevant examples
- ◆ seed banks: reasons for, examples, methods, gene banks
- ◆ plant collections: botanic gardens and arboreta, national collections, species protection, education, gene banks, historic cultivars
- ◆ invasive species: methods of spread, impacts current and historical, relevant examples, biosecurity, legislation

Exploration of these areas may lead to opportunities for collaboration and communication, such as discussion boards or blogs.

### **Explain the fundamentals of environmental issues and sustainability relevant to horticultural activities and industry (outcome 2)**

This outcome looks at environmental principles of sustainability, such as pillars of sustainability, principles of sustainable development, threats and opportunities, and public attitudes and education.

#### Limited resources and mitigations:

- ◆ peat extraction: sources, uses, carbon dioxide (CO<sub>2</sub>) sequestration and release, alternatives and challenges, effects of climate change, legislation
- ◆ recycling and waste avoidance: reusing, repurposing, upcycling, composting, waste management, minimising landfill, biosecurity and hygiene, soil sterilisation, legislation
- ◆ nutrient cycling: carbon and nutrient cycling and loss, microbial interactions, green manures, crop rotation, artificial fertiliser use
- ◆ heating and light: heating systems, seasonality of cropping, artificial lighting systems, photoperiodism and photosynthesis

#### Sustainable growing systems:

- ◆ organics: aims, principles, planning, managing, legislation
- ◆ permaculture, biodynamics, or other examples of sustainable systems: aims, history, ethics, benefits, success, practicality
- ◆ green architecture: opportunities, planning, infrastructure, hydroponics
- ◆ the effects of growing systems on ecology, environment and soils: advantages and disadvantages, impacts of chemicals, disease resistance, yields, quality, transport, storage, marketing
- ◆ the benefits of growing systems on ecology, environment and soils: particulate reduction and carbon sequestration

Soil conservation:

- ◆ erosion: causes and mitigation
- ◆ drainage: water movement and retention in soil, drainage systems, irrigation
- ◆ climate change impacts
- ◆ machinery use
- ◆ crop rotation, nutrients, pests and disease, green manures
- ◆ contamination: sewage by-products, residual chemicals

Climate change and mitigation:

- ◆ net zero: aims, timeframes, conflicts
- ◆ weed, pest and disease spread — including threats from more southerly pathogens, biosecurity and plant passports, invasive species, control methods, threats to natives
- ◆ pollination: threats to pollinators, mitigation
- ◆ phenology: flowering uncoordinated with pollinators, natural predators uncoordinated with pests, photoperiod, and temperature
- ◆ extended or limited crop opportunities
- ◆ carbon capture and trading, offsetting, carbon credits, feedback mechanisms, carbon sequestration, carbon dioxide fertilisation
- ◆ fire, permafrost and albedo

### **Explain the fundamentals of environmental issues and sustainability relevant to horticultural activities and industry (outcome 3)**

Learners achieve outcome 3 by applying their learning from outcomes 1 and 2 to current or planned projects integrated into portfolios, reports or other appropriate submission formats. Alternatively, where accessibility is an issue, assessed themes are fundamental or theoretical in nature, or this unit is being studied in isolation, you can assess them in other ways, such as in a project carried out within the unit.

Learners must be able to identify and apply ecological and environmental issue themes integrated within a project submission. They should select and justify appropriate themes and, where appropriate, describe and explain any opportunities, threats and conflicts.

### **Develop general and subject-specific knowledge, understanding and skills of sustainability and the UN Sustainable Development Goals (SDGs) (outcome 4)**

This outcome introduces the UN SDGs and encourages learners to identify the SDGs relevant to a horticultural product or process of their choosing. This could relate to a project or activity they are carrying out during their course.

## **Approaches to assessment**

### **Outcome 1**

The assessment for this unit, combining outcomes 1, 2 and 3, can be a horticulture project that allows learners to plan and apply what they have learned to real-life situations. They can present their project using slides, posters or handouts.

If required, you can use open-book testing with 'describe' and 'explain' questions to establish that learners have gained underpinning knowledge of the fundamental principles of ecology in relation to horticulture.

### **Outcome 2**

The assessment for this unit, combining outcomes 1, 2 and 3, can be a horticulture project that allows learners to plan and apply what they have learned to real-life situations. They can present their project using slides, posters or handouts.

If required, you can use open-book testing with 'describe' and 'explain' questions to establish that learners have gained underpinning knowledge of the fundamental principles of ecology in relation to horticulture.

### **Outcome 3**

You can assess learners on their ability to relate their knowledge and understanding to the commercial, development or maintenance unit projects and case studies. They need not relate any fundamental point to more than one project. This will prevent duplication of assessment and allow learners to select the project that is most appropriate to use as a case study.

Learners' successful completion of outcome 3 has no impact on project-based unit assessment outcomes. There is therefore no need for an overarching matrix between this and the project-based units. Learners can create an extract or proposal for each of their project-based units, outlining their objectives and including it with submissions to allow assessors to make appropriate judgements.

Assessment can begin following delivery of outcomes 1 and 2 to allow learners to plan their projects.

### **Outcome 4**

This outcome could be assessed independently or could be assessed, for example, with outcome 3, as learners are applying their knowledge of sustainability to their projects or case studies. The assessment could take the form of a short report, a presentation or a poster.

## **Equality and inclusion**

This unit is designed to be as fair and as accessible as possible with no unnecessary barriers to learning or assessment.

You should take into account the needs of individual learners when planning learning experiences, selecting assessment methods or considering alternative evidence.

Guidance on assessment arrangements for disabled learners and/or those with additional support needs is available on the assessment arrangements web page:

[www.sqa.org.uk/assessmentarrangements](http://www.sqa.org.uk/assessmentarrangements).

## Information for learners

### Ecology and Environment for Horticulture (SCQF level 7)

This information explains:

- ◆ what the unit is about
- ◆ what you should know or be able to do before you start
- ◆ what you need to do during the unit
- ◆ opportunities for further learning and employment

### Unit information

This unit is suitable for you if you are studying Higher National Certificate (HNC) Horticulture or similar routes. It gives you a broad introduction to ecological and environmental issues to help inform your decisions when designing commercial projects or maintaining and creating gardens or green spaces.

On completion of the unit, you can:

- ◆ explain the fundamental factors of ecology relevant to horticultural activities and industry
- ◆ explain the fundamentals of environmental issues and sustainability relevant to horticultural activities and industry
- ◆ apply the principles of ecology and environmental issues to actual or planned projects
- ◆ develop general and subject-specific knowledge, understanding and skills of sustainability and the United Nations (UN) Sustainable Development Goals (SDGs)

The assessment for the unit is likely to take the form of a horticulture project that allows you to plan and apply what you have learned to real-life situations.

While some previous horticultural knowledge or experience would be beneficial in studying the unit, it is not essential. If you study the unit as part of the HNC in Horticulture, then you may be able to progress to Higher National Diploma (HND) Horticulture or directly into employment on completion of the HNC.

# Administrative information

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**Superclass:** QA

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## History of changes

Version	Description of change	Date
2.0	Unit title amended to better reflect unit content, specifically: <ul style="list-style-type: none"><li>◆ Environmental Horticulture is now Ecology and Environment for Horticulture.</li><li>◆ Social Horticulture is now Social and Community Horticulture.</li></ul>	November 2022
3.0	Amended evidence requirements, and knowledge and skills for outcome 2 — removal of genetic modification.	August 2023
4.0	Added Learning for Sustainability outcome.	June 2024

Note: please check [SQA's website](#) to ensure you are using the most up-to-date version of this document.