



National Unit specification: general information

Unit title: Soils and Fertility (SCQF level 6)

Unit code: H2N2 12

Superclass: RF

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Summary

This Unit allows learners to develop knowledge and skills in identifying different soil types and their characteristics. Learners will learn about the influence of soil type, structure and the key plant nutrients of Nitrogen, Potassium and Phosphate, on cropping potential.

This is a mandatory Unit within the National Certificate in Agriculture (SCQF level 6) but is also available as a free-standing Unit.

This Unit is suitable for learners who have no previous knowledge in this area.

Outcomes

- 1 Identify soil types and describe their characteristics.
- 2 Identify soil structural conditions and explain how they impact on crop production.
- 3 Explain the importance of pH and Nitrogen (N), Potassium (P) and Phosphorus (K) in plant growth and nutrition.
- 4 Calculate the value of different sources of nutrients in managing soils for crop production.

Recommended entry

Entry is at the discretion of the centre.

Credit points and level

1 National Unit credit at SCQF level 6: (6 SCQF credit points at SCQF level 6*)

**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.*

General information (cont)

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Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the support notes of this Unit specification.

There is no automatic certification of Core Skills or Core Skill components in this Unit.

National Unit specification: statement of standards

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Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

Outcome 1

Identify soil types and describe their characteristics.

Performance Criteria

- (a) Identify the main components of soils.
- (b) Identify various soil types using hand texturing techniques.
- (c) Describe the characteristics of various soils.

Outcome 2

Identify soil structural conditions and explain how they impact on crop production.

Performance Criteria

- (a) Identify the basic horizons in a soil profile.
- (b) Explain the effect of soil structural conditions on crop growth.
- (c) Explain how soil structural conditions can be modified or maintained to maximise crop production.

Outcome 3

Explain the importance of pH and Nitrogen (N), Potassium (P) and Phosphorus (K) in plant growth and nutrition.

Performance Criteria

- (a) Carry out a pH analysis of a soil.
- (b) Describe the suitability of a soil for the production of different crops based on pH value.
- (c) Explain the effect of pH on the availability of plant nutrients and crop growth.
- (d) Explain the individual contributions of N, P and K to plant growth.
- (e) Describe how soil pH and N, P and K status can be adjusted to maximise plant growth and nutrition.

National Unit specification: statement of standards (cont)

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Outcome 4

Calculate the value of different sources of nutrients in managing soils for crop production.

Performance Criteria

- (a) Calculate the nutrient value of a range of organic materials that are applied to soil.
- (b) Calculate the nutrient value of a range of inorganic materials that are applied to soil.
- (c) Calculate the amount of available nutrients applied to a soil from both organic and inorganic fertilisers.

Evidence Requirements for this Unit

Written and/or oral evidence is required to demonstrate that learners have achieved all of the Outcomes and Performance Criteria. Evidence must be obtained under supervised conditions at appropriate points throughout the Unit. Evidence can be generated holistically or Outcome by Outcome.

For Outcome 1, learners must provide evidence of the following:

- ◆ Identification of the four main components of soils
- ◆ Identification of a minimum of four different soil types using hand texturing techniques and a key
- ◆ Description of four characteristics of each soil type

For Outcome 2, learners must provide evidence of the following:

- ◆ Identification of top-soil, sub-soil, parent and rock material in a soil profile
- ◆ Description of two structural conditions of soils and explanation of their effect on crop growth
- ◆ Explanation of one appropriate remedial action and/or preventative measure in relation to each soil condition described above

For Outcome 3, learners must provide evidence of the following:

- ◆ Description of the suitability of an acidic soil and neutral soil for the production of four named crops
- ◆ Explanation of the effect of the pH levels on the availability of two nutrients
- ◆ Explanation of the importance of N, P and K in crop establishment and production
- ◆ Description of one method of adjusting soil pH and one method of adjusting N P K levels to maximise plant growth and nutrition

National Unit specification: statement of standards (cont)

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For Outcome 4, learners must provide evidence of the following:

- ◆ Calculation of the nutrient value of two organic soils additives
- ◆ Calculation of the nutrient value of two inorganic soil additives
- ◆ Calculation of the total N, P and K quantities applied to a soil from given applications of organic and inorganic nutrients

National Unit specification: support notes

Unit title: Soils and Fertility (SCQF level 6)

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 is a mandatory Unit within the National Certificate in Agriculture (SCQF level 6) but is also available as a free-standing Unit.

Learners are required to investigate soil types, profiles, characteristics and develop knowledge and understanding of how soil characteristics affect plant growth and development. Learners will also learn about the role and value of basic plant nutritional requirements required to sustain crop growth and production. This Unit should prepare learners for progression to Higher National Units in agriculture, Scottish Vocational Qualifications or other related land-based qualifications.

In relation to Outcome 1, the basic components of soils outlined should include air, water, particle size and organic matter. Textural types should include clays, sands, loams and silts as appropriate. Soil characteristics should include water holding capacity, aeration, fertility, organic matter, ease of working, susceptibility to structural damage, crumb structure, aggregate size. Descriptions of suitability should be in reference to rooting depth, availability of nutrients and water, drainage, water-logging, pH, organic matter and compaction.

In relation to Outcome 2, discussion should take place around aggregate size, compaction, water-logging, crumb structure in relation to root structure, crop establishment and growth. Field solutions such as drainage and sub-soiling along with nutrient solutions, including the application of lime and organic matter, should be acknowledged.

In relation to Outcome 3, a field/laboratory test for soil pH should be undertaken and implications for crop growth in soils of varying acid/alkali levels discussed. The pH scale and use of lime should be fully explained and examples of cropping suitability highlighted. The fundamental nutritive importance of Nitrogen, Potassium and Phosphorous in plant establishment, growth and reproduction should be explained. The interaction between soil pH and N P K and the overall availability of nutrients in the soil should be explored.

In relation to Outcome 4, the definition of inorganic and organic nutrient sources as well as examples of the range within each source should be explained, to include artificial fertiliser, farm yard manure and slurry. The N P K nutritional values in terms of Units/kg, etc should be explained and calculated in the context of availability from the source.

National Unit specification: support notes (cont)

Unit title: Soils and Fertility (SCQF level 6)

This Unit is broadly aligned to the following National Occupational Standards (NOS) from Lantra:

- AgC5 Prepare for planting and plant extensive crops
- AgC6 Monitor and maintain the healthy growth of extensive crops
- AgC9 Prepare, monitor and cultivate sites for planting

Guidance on learning and teaching approaches for this Unit

The Unit should be delivered in as practical a context as possible with delivery taking place in the field to investigate soil types and structures and in a classroom/lab setting, eg. to carry out pH analysis. The emphasis should always be on the practical application of knowledge and understanding.

Learners would benefit from a balanced approach to learning by undertaking field visits to farms growing a range of crops and participating in classroom activities to develop crop nutrition knowledge and understanding. Working in small groups, a soil profile could be dug and explored in the field with individuals undertaking soil pH analysis in the laboratory.

By adopting the above learning and teaching approaches and/or through the Outcomes and corresponding Evidence Requirements, the Unit should provide learners with an opportunity to develop the following essential skills for life, learning and work:

- ◆ Employability — through developing practical skills to industry standards and working on time limited tasks
- ◆ Sustainability — through considering the use of resources, soil additives, etc.
- ◆ Technical skills — through analysing soil samples and testing for pH
- ◆ Organisational skills — in terms of personal management through punctuality, record keeping, organising portfolio work, etc
- ◆ Interpersonal skills — through contact with employers and in class teams

Opportunities for developing Core Skills

In this Unit, learners will develop knowledge and skills in identifying different soil types and their characteristics and learn about the influence soil type, structure and plant nutrients have on cropping potential. Learners will:

- ◆ Identify soil types and structures
- ◆ Make decisions about the suitability of soils for particular crop production purposes
- ◆ Explain the importance of key plant nutrients and soil conditions
- ◆ Analyse the pH of a soil and nutrient value of soil additives
- ◆ Make recommendations about suitable courses of action to increase soil productivity
- ◆ Make calculations relating to plant nutrients

This means that as learners are doing this Unit, they may develop aspects of the Core Skills of *Communication*, *Numeracy* and *Problem Solving*.

National Unit specification: support notes (cont)

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In addition, aspects of the following Core Skills could be developed where particular learning and teaching approaches are adopted:

- ◆ *Working with Others* — through group work, eg to collect data in relation to soil types and profiles
- ◆ *ICT* — through recording data electronically or investigating plant nutrient sources

Guidance on approaches to assessment for this Unit

The following approaches to assessment are suggested.

- Outcome 1: A combination of an individual practical exercise using a range of demonstration soils and a written question paper.
- Outcome 2: A written assignment based on a soil practical field study.
- Outcome 3: A written assignment or structured question assessment, combined with a practical assessment of soil pH.
- Outcome 4: An assignment for a farm scenario or crop situation.

Both the practical and written/oral elements of the Unit lend themselves to holistic assessment approaches. In relation to the practical element, learners could maintain a folio of evidence to record their findings.

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003)*, *SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

Disabled learners and/or those with additional support needs

The additional support needs of individual learners should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements

History of changes to Unit

Version	Description of change	Date

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