Unit 46: Managing Soil Water

Delivery guidance

This unit covers the management of water in soil in the context of agricultural and horticultural production. It looks at the requirements of the soil and plant in relation to water, including irrigation and drainage, its use and the legal requirements. The unit looks specifically at the soil and its management concerning water use, storage and removal by the plant.

It may not be possible for all centres to have access to fields or glasshouses where they can observe soil water under different conditions, e.g. irrigation and drainage systems, so it is important to plan delivery to include visits and access to a range of resources. Promotion of skills development in a range of appropriate settings, including work-related experience, will enhance and support delivery of this unit. Further inclusion of input from local employers will also boost learners' understanding of managing soil water.

Learners will also benefit from access to a virtual learning environment (VLE) for sharing information; it could be that worksheets and web links are available to the learners in order to extend learning beyond the classroom.

Approaching the unit

Learning aim A explores the requirements of soil water and looks at the structure of the soil and soil water management in the land-based industries. It covers quite comprehensively the different types and composition of soil, as well as looking at the many characteristics that soil possesses. In the first part of the unit, learners will investigate the terminology used for the differing levels of soil water and look at sources of irrigation. The unit also looks at the relationship between managing soil water and plant access to water. Learners will also cover the properties of water, including how it causes changes to the soil appearance.

Learning aim B covers the maintenance of irrigation and drainage systems; this includes the inspection of different systems found in the land-based industries. Learners will develop knowledge on routine maintenance and annual maintenance, as well as the important tracking of faults with these systems, and this will be applied to the skills they develop to repair or replace nozzles. There is maintenance of drainage systems in this learning aim, looking at the range of drainage systems used. The unit then explores the maintenance of drainage systems installation, monitoring and maintenance, as well as looking for common faults during routine inspections.

Learning aim C concentrates on the legal requirements that apply to irrigation and draining in the land-based industries. It covers details of current legislation on both a local and national scale. There is also detail of the relevant codes of practice and guidance used in agriculture and horticulture. The learning aim also covers record keeping for water usage and drainage activities, as well as rules for abstracting water and carrying out drainage activities.

Assessment model

Learning aim	Key content areas	Recommended assessment approach
A Explore the requirements of soil water management for land-based industries	**A1** Soil water management **A2** Soil water relationships	A written report.
B Maintain irrigation and drainage systems for land-based industries	**B1** Maintenance of irrigation **B2** Maintenance of drainage systems	Project book and practical work supported by a written report.
C Understand the legal requirements applicable to irrigation and drainage for land-based industries	**C1** Relevant legislation and guidance	

Assessment guidance

Learning aim A

Learners need to look in detail at soil and discover what the requirements of soil are in terms of water management. This will include an investigation of different properties of soil, from structure and texture and understanding shown of how much water needs to be accessed by plants. They need to include information on the soil type and the capabilities of the soil to hold water according to its composition.

Learners must cover the topic of extremes of soil water management, from field capacity through to soil moisture deficit. The topic of how much water is held and how it moves through the soil, as well as the importance of this vital resource in agriculture and horticulture, needs to be evidenced.

Learning aim B

In this learning aim, learners need to provide an exploration of the use of both irrigation and drainage systems and look at maintenance of both systems. Learners need to demonstrate knowledge of, and practical skills linked to, the various components of irrigation systems and how these function. They need to provide information on the inspection and repair of an irrigation system, also covering repair and replacement of parts. Learners need to cover the routine and annual maintenance of irrigation systems.

Learners need to demonstrate maintenance of a drainage system including positioning and techniques for different drainage systems. They need to cover how drainage systems are comprised and installation in the soil.

Learning aim C

In this learning aim, learners need to demonstrate their understanding of the legal requirements that apply to both irrigation and drainage systems. They need to show knowledge of legislative requirements on both a local and national basis, as well as codes of practice applicable to irrigation and drainage. Learners need to provide information on practical record keeping for irrigation and drainage, along with abstraction.

Getting started

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

Unit 46: Managing Soil Water

Introduction

This unit will help to develop learners' understanding of how soil water can be managed in both agriculture and horticulture settings. It will give comprehensive cover of the relationship between soil and water and how this can be used effectively, with due regard for relevant legislation and guidance. There will be good benefit in employer engagement in the form of:

- guest speakers
- a visit to a farm which uses irrigation/drainage systems
- a visit to a horticulture glasshouse which uses irrigation/drainage systems
- case studies of different scenarios for irrigation and drainage
- work placement opportunities
- tutor support and mentoring.

Learning aim A – Explore the requirements of soil water management for land-based industries

As part of the introduction to the unit, the tutor could facilitate a class discussion to determine levels of previous knowledge on soil water management.

A1

- Take learners on a field walk to collect samples of soil. These can then be brought back to the science laboratory to determine soil type via a spit and rub test (this can be done with pre-collected samples).
- Learners could independently undertake research into different soil types and environments where these are commonly found.
- Learners could work in pairs to experiment, investigate soils in the laboratory, and use a sieve tower to determine the percentage of different soils within the sample.
- Learners could work independently to produce a diagram showing different soil structures and their relationship with soil water. They could then work in small groups to conduct a filtration test on the soil to see how water moves through different soil types, to determine bulk density and porosity.
- Learners could work in small groups, in the field or a horticulture setting, to observe soil conditions and look for field capacity, wilting point and soil moisture deficit. The results can then be collated and shared with the group.
- Invite a representative from a local irrigation company to deliver a presentation on sources of irrigation. Learners should take notes to use as preparation for their assignment.

A2

- Learners could independently conduct research on soil water relationships and produce a short report for both agriculture and horticulture management.
- Have learners work in small groups to conduct experiments to measure soil samples to determine soil water content. They should record their results in a table and share with others in the group.
- Ask learners to produce a factsheet on terminology connected to soil water content and the common measurements used for this.
- Learners could work independently to produce a report on when water is accessible to plants. Depending on resources, it may be possible to use organisational fields or gardens to observe plants to see if they have access to water.
- Have learners work in small groups to produce a poster looking at soil water potential and its characteristics.

Learning aim B – Maintain irrigation and drainage systems for land-based industries

B1

- Ask learners to work individually to produce a labelled diagram of an irrigation system, naming all the individual parts.
- Using the organisational resources, learners could visit a setting where an irrigation system is being used to inspect the different systems.
- Bring in samples of component parts of an irrigation system, e.g. nozzle, pumps and pipes, so that learners can familiarise themselves with these.
- Manipulate some faults within an irrigation system and allow learners time to inspect the system, having to identify faults.
- Learners could then repair or replace the faulty component. This could be evidenced through a witness statement and be used towards assessment evidence.
- Arrange a visit to a suitable irrigation system in operation and conduct routine and annual maintenance.
- Have learners work in pairs to produce a factsheet on the benefits of irrigation.

B2

- Ask learners to work individually to create a diagram of the different drainage systems and label these with information.
- Learners could work in pairs to create a presentation on the different drainage systems, when these are used and the features of each system. These can then be presented to you.
- Arrange for learners to visit a drainage company and observe them installing drains. They could take picture evidence and use this to create a flowchart of how drainage systems are created.
- Learners could work in pairs to create a series of questions on the parts and materials used in drainage, and use these to conduct a quiz with the rest of the group.
- Take learners on a visit to an agricultural or horticultural setting that uses drainage to carry out some routine maintenance, fault-finding and repairs.

- Have learners produce a checklist of instructions for carrying out annual maintenance of drainage systems.

Learning aim C – Understand the legal requirements applicable to irrigation and drainage for land-based industries

C1

- Ask learners to complete some independent internet research on what legislation covers irrigation and drainage. They could make notes on how this affects the agriculture and horticulture industries on a local and national basis.
- Learners could work in pairs to read and interpret the codes of practice and guidance for agricultural and horticultural operations, and produce a list of main points.
- Have learners individually complete records for water abstraction, drainage and use of grey water – give them scenarios to use for this.
- Learners work in small groups to complete research into what rules are in place for water abstraction and drainage activities.

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

This unit links to:

- Unit 1: Plant and Soil Science.

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

Ashman, M and Puri, G – *Essential Soil Science* (Blackwell Science, 2008) ISBN 9780632048854.

Davies, B, Eagle, D and Finney, B – *Soil* (Resource Management Series) (Farming Press, 2002) ISBN 9780852365595.

Green, NPO, Stout, GW and Taylor, DJ – *Biological Science 1 and 2,* 3rd Edition (Cambridge University Press, 1997) ISBN 9780521561785.

Roberts, M, Reiss, M and Monger, G – *Advanced Biology* (Nelson Thornes, 2000) ISBN 9780174387329.

Soffe, R – *The Agricultural Notebook,* 20th Edition (Blackwell Science, 2003) ISBN 9780632058297.

White, R – *Principles and Practice of Soil Science* (Blackwell Science, 2005) ISBN 9780632064557.

Journals

Arable Farming – a journal devoted to arable farming

Crops – comprehensive coverage of crop growth

Crop Science – a leading science journal covering crop science

Farmers Guardian – a weekly newspaper with a section for cropping

Farmers Weekly – a weekly journal looking at all aspects of farming

Websites

Biotechnology and Biological Sciences Research Council

Department for Environment, Food and Rural Affairs in the UK

Potash Development Association

Rothamsted Research

British Society of Soil Science

Science and Plants for Schools

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