Unit 19: Undertaking Root Crop and Field Vegetable Production

Unit code: T/600/9582

QCF Level 3: BTEC National

Credit value: 10

Guided learning hours: 60

Aim and purpose

This unit aims to introduce learners to the skills and knowledge in root crop and field vegetable production and how these can be applied in practice. It is designed for learners in centre-based settings looking to progress into the sector or onto further/higher education.

Unit introduction

Root crop and field vegetable production is an important and specialised sector of the agriculture industry in certain parts of the UK, offering enterprises that can generate a high income per hectare for land-based businesses.

Much of the machinery, storage facilities and skills required for the crops studied in this unit are highly specialist in nature, making detailed knowledge essential. Career opportunities within the root crop and field vegetable sector are varied and are strengthened by consumers moving to source their fruit and vegetables locally.

This unit aims to give learners with the necessary practical skills, and also the skills needed to work as part of a competitive, business-minded and environmentally aware workforce.

Learning outcomes

On completion of this unit a learner should:

1 Know the husbandry requirements of root crops and field vegetables

2 Understand the harvesting, storage and marketing of root crops

3 Understand the harvesting, storage and marketing of field vegetables

4 Be able to carry out root crop and field vegetable production.

Unit content

1 Know the husbandry requirements of root crops and field vegetables

Husbandry requirements for soil and climate: soil types; soil pH and crop growth; soil structure and the environment; field drainage requirements; climate (eg frost, topography, aspect, sunshine, rainfall); artificial aids (eg irrigation, water availability and requirement of crop, plastic film, poly-tunnels, glasshouses)

Husbandry requirements for selected crops: place in rotation; seed and plant selection; relevant pre-planting treatment; seedbed preparation methods (eg beds, ridges); planting and drilling machinery; timing; row and plant spacing; soil index interpretation, manure and fertiliser requirements; Nitrate Vulnerable Zone (NVZ) requirements; disease control; health, safety and environmental requirements (eg Local Environment Risk Assessment Procedures (LERAPs), codes of practice, Control of Substances Hazardous to Health (COSHH) Regulations

2 Understand the harvesting, storage and marketing of root crops

Harvesting: timing and crop maturity; machinery and labour requirements; target crop yields; minimising crop damage; health and safety

Storage: types of store (eg temporary, permanent, clamp); climate control of store (eg frost, insulation, ventilation, moisture); disease and sprouting control; pest control

Marketing: market requirements; contracts; grading and sorting; transport

3 Understand the harvesting, storage and marketing of field vegetables

Harvesting: timing and crop maturity; machinery and labour requirements; target crop yields; minimising crop damage; health and safety

Storage: types of store (eg temporary, permanent, clamp); climate control of store (eg frost, insulation, ventilation, moisture); disease and sprouting control; pest control

Marketing: market requirements; contracts; grading and sorting; transport

4 Be able to carry out root crop and field vegetable production

Husbandry tasks: seedbed preparation; drilling/planting; fertiliser and manure application; irrigation; disease control; harvesting operations

Physical and financial performance: production targets; inputs and outputs; gross margins; unit costs of production; partial budgets

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 identify the soil and climate requirements for selected root crops and field vegetables	**M1** monitor the seedbed preparation for a specified root crop and field vegetable assessing the environmental impact	**D1** identify the strengths and weaknesses of a specified root or field vegetable crop production programme
P2 describe the husbandry requirements of selected root crops and field vegetables		
P3 explain the organisation of harvesting and storage of selected root crops to meet market requirements		
P4 compare the gross margins for two named root crops		
P5 explain the organisation of harvesting and storage of selected field vegetables to meet market requirements	**M2** monitor the harvesting and storage of a root or a field vegetable crop.	**D2** calculate the unit costs of production for a root or field vegetable crop.
P6 compare the gross margin for two named field vegetables		
P7 carry out specified husbandry tasks for selected root crops and field vegetables [IE, CT, RL, TW, EP]		
P8 calculate the physical and financial performance of selected root crops and field vegetables. [SM]		

PLTS: This summary references where applicable in the pass criteria, in the square brackets, the elements of the personal, learning and thinking skills. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key			
	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical and written assessments and visits to suitable collections. It could link to work experience placements.

This unit focuses on learners being involved in all operations associated with root crop and field vegetable production, and so tutors need to ensure learners have access to as wide a range of learning opportunities as possible. This will involve lectures, regular crop walks, (both in taught and learners' own time) farm practicals, work experience, guest speakers, visits, and outside specialists such as people involved in agronomy, marketing or crop storage. Assessments should be carried out in practical taught sessions, and through opportunities such as farm duties, work experience or similar.

For the unit to be effective, tutors will need to choose the timing of some of the assessments carefully because of the importance of seasonality. There will inevitably be areas where certain crops may not be grown in the locality, but which are of importance in other areas of the country. A good example of this would be sugar beet, which is grown in parts of the country where there is a processing factory nearby. There are none, for example, in the south west, but crops such as fodder beet or swedes are of similar importance and could be studied.

Learners will need access to farm recording data and previous cropping history.

Learning outcome 1 will need to be delivered at the start of the course programme, for example in the autumn. Learners may have been working with and involved in autumn cultivations and seedbed preparation. There may be an opportunity for tutors to arrange farm visits to enterprises that are harvesting crops in the autumn, such as carrots, cabbages or Brussels sprouts.

Learning outcome 2 will need to be delivered to coincide with root crop harvesting, which, in general, takes place in the autumn, for example sugar beet or potatoes. Tutors should also ensure that learners are clear about the aspects of root crop harvesting, and may need to clarify that harvesting takes place using machinery.

Learning outcome 3 will be similar to learning outcome 2 and tutors will need to plan how these two learning outcomes are best delivered, given local conditions and especially where field vegetables are in short supply.

Learning outcome 4 involves practical husbandry tasks as well as financial performance management. Tutors should plan the assessment of the various husbandry tasks carefully as they may take place during the autumn, winter and spring seasons. Learners' work experience could also be taken into consideration where appropriate.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives **an indication of the volume of learning it would take the average learner** to achieve the learning outcomes. It is **indicative and is one way of achieving the credit value.**

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment
Introduction to unit and unit overview.
Assignment 1: Cultivations and Drilling/Planting (P1,P2, M1, D1) Tutor to introduces assignment.
Practical sessions: crop walks to observe post-harvest field conditions before drilling / planting, soil assessment profiles, soil pH testing, machinery selection.
Theory session: soil types and structure, sustainable guidelines, field drainage, artificial husbandry methods.
Theory session: crop rotations, seedbeds and their preparation, machinery for planting, manure and fertiliser requirements for crops, disease control.
Assignment 2: Harvesting, Storing and Marketing Root Crops (P3,P7, M2) Tutor introduces assignment.
Theory session: harvesting machinery, market requirements, labour organisation.
Practical session: recognise crop maturity, prepare, use and maintain harvesting machinery, prepare crop storage, visit relevant crop storage systems.
Assignment 3: Harvesting, Storing and Marketing Field Vegetable Crops (P5, P7, M2) Tutor introduces assignment.
Theory session: harvesting machinery, recognise crop maturity, market requirements, labour organisation.
Practical session: recognise crop maturity, prepare, use and maintain harvesting machinery, prepare crop storage, visit relevant crop storage systems.
Assignment 4: Physical and Financial Performance of Root and Field Vegetable Crops (P4, P6, P8, D2) Tutor introduces assignment.
Theory session: physical performance targets, financial performance targets, gross margins, partial budgets, production costs.
Practical session: visit relevant enterprises.
Unit review.

Assessment

For P1, learners must identify the soil and climate requirements for specified crops. They must be able to differentiate between loams, sands and clays. They should also state the pH for the crops in question and understand how climate can influence crops at their various stages of growth.

For P2, learners must describe the husbandry requirements for selected root and field vegetable crops. Tutors should, where possible, be mindful of local variations. Husbandry requirements should include the soil, cultivation and seedbed needed, choice of crop variety to suit the relevant market, the type, amount and timing of fertiliser relevant to any soil index analysis, and specified disease control measures.

For P3, learners must explain how selected root crops are harvested and stored. They must be able to justify their choice of machinery, the timing of harvest according to crop maturity and market requirements, the preparation of storage facilities for their crop and what climate controls would be needed.

For P4, learners should lay out a typical gross margin for two root crops which must contain all the relevant criteria for both inputs and outputs. Learners must also be able to evidence how they arrived at their figures.

For P5, learners must explain how selected field vegetable crops are harvested and stored. They must be able to justify their choice of machinery, the timing of the harvest according to crop maturity and market requirements, the preparation of storage facilities for their crop and what climate controls would be needed.

For P6, learners should lay out a typical gross margin for two field vegetable crops. which must contain all the relevant criteria for both inputs and outputs. Learners must also be able to evidence how they arrived at their figures.

For P7, learners are to carry out specified practical tasks in relation to both root and field vegetables. The tasks should cover a range of activities relevant to the specified crops and could be assessed as part of timetabled activities and work experience.

For P8, learners are to produce relevant physical and financial performance data for specified crops. This must include crop yield, reference to specific crop requirements such as sugar percentage and tare weight for sugar beet, seed fertiliser and sprays, transport costs, and levies paid to marketing boards.

For M1, learners must select one root and one field vegetable crop and monitor how the seedbed was produced. This must start from the moment the previous crop was harvested, and should include all relevant machinery used in the operations. Learners must also link the machinery used for the seedbeds with environmental impact and requirements for cross-compliance.

For M2, learners must monitor the harvesting and storage of either a root or a field vegetable crop. Harvesting will include all machinery and equipment, the timing relevant to crop maturity, how the workforce was organised, the crop store and the crop in storage.

For D1, learners must identify the strengths and weaknesses of either a root or field vegetable crop production programme. This must include the main husbandry factors involved in growing the crop, and aspects such as the place of the crop in the farm's rotation, the efficiency of machinery use and availability of labour, the type of crop and its market, the use of technology and its potential role, and care of the environment.

For D2, learners are to examine the whole production costs broken down into relevant units such as costs per kg of a specified crop.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, M1, D2	Husbandry Requirements of Root and Field Vegetable Crops	For specified root and field vegetable crops you are to identify and monitor the growing of the crop from seedbed up to the moment of harvesting. You should be able to identify strengths and weaknesses of the production programme.	Practical observation. Written evidence. Independent research monitoring and analysis.
P3, P7, M2	Harvest, Store and Market Root Crops	You are part of a team dedicated to the successful harvesting and storage of a specified root crop. Describe how the process takes place and the market requirements that determine the crop programme.	Practical observation. Written evidence. Independent research and monitoring.

P5, P7, M2	Harvest, Store and Market Field Vegetable Crops	You are part of a team dedicated to the successful harvesting and storage of a specified field vegetable crop. Describe how the process takes place and the market requirements that determine the crop programme.	Practical observation. Written evidence. Independent research and monitoring.
P4, P6, P8, D2	Assess the Physical and Financial Performance of an Enterprise	For the crops chosen, produce gross margins that reflect accurate inputs and outputs, and from these calculate the unit costs of production for one chosen crop.	Written evidence. Independent research and analysis.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC land-based sector suite. This unit has particular links with:

Level 2	Level 3
Introduction to Crop Establishment	Element AgC11.1 Prepare planting equipment Element AgC11.2 Plant and establish extensive crops Element AgC12.2 Prepare harvested crops
Assist with Agricultural Crop Production	Undertake Agricultural Crop Production

Essential resources

Learners will need access to fields where the relevant range of crops are grown, possibly both in a centre farm situation and also on local farms. They will need to be aware of a farm's policy with regard to the environment, such as use of conservation strips/buffer margins, and where a farm has entered the Entry Level Scheme. Learners must also be able to carry out the relevant field operations in a safe manner, using tractors and machinery. Certain harvesting machinery and equipment is highly specialist and can be the cause of accidents. Tutors must therefore ensure complete health and safety awareness and compliance at all times where learners are involved.

Farm visits/guest speakers are to be encouraged to local farms and associated enterprises or cooperatives so learners can see and experience the full scope of the production process. Learners should have access to a farm's records, physical and financial, at relevant times during the programme.

Employer engagement and vocational contexts

The unit focuses on learner participation in all stages of crop production. This will involve the centre's farm and also local farms. A useful reciprocal agreement might take place where a farm is used in a case study, and the farmer invited to listen to and comment on learners' views regarding the farm's enterprise performance. There may also be opportunities for learners to undertake training in the use of specialist machinery through national proficiency related standards.

Indicative reading for learners

Textbooks

Bell B – *Farm Machinery* (Old Pond Publishing, 2005) ISBN 1 903366 68 2

Culpin C and Bloxham P – *Culpin's Farm Machinery* (Blackwell Science, 2006) ISBN 0632051825

Davies D, Finney B and Eagle D – *Resource Management: soil* (Farming Press, 2001) ISBN 0 85236 559 4

Eash N, Green C –*Soil Science Simplified* (Blackwell Publishing, 2008) ISBN 13 978 08138 1823-8

Finch H, Samuel A and Lane G – *Lockhart & Wiseman's Crop Husbandry: Including Grassland* (Woodhead publishing, 2002) ISBN 1 85573 5490

Fordham R, Biggs AG – *Principles of Vegetable Crop Production* (Wiley Blackwell, 2000) ISBN 10-063203631 1

Nix J – *Farm Management Pocketbook, 40th Edition* (The Andersons Centre, 2010) ISBN 0954120159

Soffe R – *The Agricultural Notebook, 20th Edition* (Blackwell Science, 2003) ISBN 0632058293

Wilson P, King M – *Arable plants – A Field Guide* (Wildguides, 2003) ISBN 1 903657 02 4

Other publications

DEFRA – *Fertiliser Recommendations for Agricultural and Horticultural Crops RB209, 8th Edition* (The Stationery Office Books, 2008)

Recommended List of Field Vegetables (NIAB farmers' leaflet, latest edition)

Recommended List of Potatoes (NIAB farmers' leaflet, latest edition)

Recommended List of Sugar Beet (NIAB farmers' leaflet, latest edition)

The Leaf Handbook for Integrated Farm Management (Linking Environment & Farming, 2000)

UK Pesticide Guide (CABI, 2009) ISBN 978 1 845934 16 3

Journals

British Sugar Review

Crops

Farm Building Progress

Farm Business

Farm Contractor

Farmers Guardian

Farmers Weekly

Websites

www.bayercropscience.co.uk	Bayer Crop Science
www.bsonline.co.uk	British Sugar
www.defra.gov.uk	Department of Environment, Food and Rural Affairs
www.efma.org	European Fertiliser Manufacturers' Association
www.environment-agency.gov.uk	Environment Agency
www.hgca.com	Home Grown Cereals Authority
www.newfarmcrops.co.uk	New Farm Crops
www.niab.com	National Institute of Agricultural Botany
www.potato.org.uk	British Potato Council

Delivery of personal, learning and thinking skills (PLTS)

The following table identifies the PLTS opportunities that have been included within the assessment criteria of this unit:

Skill	When learners are ...
Independent enquirers	monitoring crops themselves
Creative thinkers	monitoring and planning aspects of crop production
Reflective learners	monitoring and planning aspects of crop production
Team workers	engaged in practical activities, work experience and team planning an assignment to present to a farmer
Self-managers	involved in farm duties and are responsible for their own learning, punctuality and teamwork
Effective participators	engaged in practical activities, work experience and team planning to present their results to a farmer.

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Reflective learners	visiting local farms and relevant enterprises
Team workers	actively involved in farm work
Effective participators	actively involved in farm work.

Functional Skills — Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	engaged in interpreting and calculating soil index results, spraying recommendations or GPS software
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	
Manage information storage to enable efficient retrieval	
Follow and understand the need for safety and security practices	
Troubleshoot	
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: • text and tables • images • numbers • records	
Bring together information to suit content and purpose	
Present information in ways that are fit for purpose and audience	
Evaluate the selection and use of ICT tools and facilities used to present information	
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	interpreting financial information and producing their own calculations for management purposes
Identify the situation or problem and the mathematical methods needed to tackle it	
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	presenting information relating to a farm enterprise's physical and financial performance to farm managers or tutors.
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	