

Unit 18: Understand Agricultural Forage Crop Production

Unit code:	T/600/9128
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 needed for agricultural forage crop 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

The cultivation of non-grass forage crops can make an important contribution to livestock feeding in a number of land-based situations. The use of forage crops can also benefit other enterprises as part of a rotation, fixing nitrogen and allowing spring cultivations. This unit reflects the wide range of forage crops produced across the UK, but allows learners to investigate those crops of local importance in detail. Grass will be studied relatively briefly as a comparison to other forage crops.

Learners will study the husbandry requirements of a range of forage crops and demonstrate their practical ability in maintaining healthy growing crops. The harvesting, storage and feeding of forage crops are considered, together with their nutritional value. Learners will investigate metabolic or digestive disorders in livestock associated with forage crops. The cost of production and wider agronomic and environmental issues are also studied.

Learners will consider the full range of forage crops, including their botanical and agronomic characteristics, and have an opportunity to focus on those forage crops which are of local relevance. They will look at the husbandry of forage crops and study their establishment, use and management. This will include researching the harvesting, storage and utilisation of fodder crops by a range of livestock species. Learners will look at production costs, yields and nutritive content as methods of evaluating the potential value of forage crops for a business.

● Learning outcomes

On completion of this unit learners should:

- 1 Know the role of a range of forage crops
- 2 Be able to plan the growth of forage crops
- 3 Understand the methods of harvesting and storing forage crops
- 4 Understand the benefits and production costs of forage crops.

Unit content

1 Know the role of a range of forage crops

Range of forage crops including botanical and agronomic characteristics: forage maize; roots eg stubble turnips, forage beet; brassicas eg kale, forage rape; arable silage; grazing rye; legumes eg forage peas, lucerne, clovers; suitability to a region eg versatility, growth pattern, soil types, climatic conditions; grass eg grazed, conserved; feed value; growth patterns

Use of forage crops: extending grazing season; extending winter feed stocks; suitability for particular climatic/soil conditions; use of forage crops to complement grass; catch cropping; buffer feed; specific feeding purposes

2 Be able to plan the growth of forage crops

Husbandry: soil type; soil pH; rotational considerations; cultivations; seedbed requirements; fertiliser requirements; leaching; environmental considerations; sowing date and rate; plant populations; row widths; weed, pest and disease identification and control; labour and machinery requirements; health and safety, current relevant legislation and codes of practice; climatic conditions; cultivar selection

3 Understand the methods of harvesting and storing forage crops

Harvest and utilisation: direct feeding eg grazing, zero grazing; harvesting and conservation (hay, silage, clamp storage, silage additives); feeding conserved forage (trough feeding, whole diet/mixtures); health and safety; Control of Substance Hazardous to Health (COSHH) Regulations

Classes of livestock: cattle eg dairy cows, single sucklers, young stock, beef cattle; sheep; others eg horses, goats

Timeliness: time management eg excluding air from silage clamps; awareness of the effects of metabolic diseases and digestive disorders eg bloat, hypomagnasaemia

4 Understand the benefits and production costs of forage crops

Nutritional values: fresh yield; nutritional analysis eg dry matter, digestibility, metabolisable energy, protein, pH

Production costs: fixed costs; variable costs; inputs; outputs; margin per hectare; machinery/storage requirements

Other considerations: environmental benefits; agronomic advantages eg break crops for weed, pest and disease control, pioneer crops on reclaimed land, area for slurry disposal, green cover to reduce nitrate leaching; health and safety

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 different forage crops at different growth stages	M1 compare selected forage crops with grass in given scenarios	D1 discuss environmental, physical, crop health and human safety factors in relation to the establishment, husbandry and utilisation of a given forage crop
P2 describe the botanic and agronomic characteristics of forage crops [IE, RL, SM]		
P3 outline the value of forage crops for different classes of livestock		
P4 contribute to the preparation of soil for forage crops [CT]	M2 report on the establishment of a selected non-grass forage crop	
P5 plan a fertiliser programme for forage crops [CT]		
P6 describe weed, pest and disease control procedures appropriate to production of a named crop [CT]		
P7 follow correct legislative and environmental guidelines		
P8 explain harvesting arrangements for forage crops [IE, CT, EP]	M3 evaluate selected methods of feeding forage crops	
P9 evaluate suitable storage methods for forage crops [IE, CT, EP]		
P10 analyse crop yields	M4 assess, in detail, the nutritional value of forage crops for different classes of livestock.	D2 analyse yields of selected forage crops comparing the production costs on a cost per unit basis with grass.
P11 assess the nutritional value of forage crops for different classes of livestock		
P12 compare production costs of different forage crops.		

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

This unit should be delivered using as wide a range of techniques as possible. For example lectures, discussions, seminar presentations, supervised farm walks, field practicals, work placements, internet and/or library-based research.

Work placements should be monitored regularly in order to ensure the quality of the learning experience. It would be beneficial if learners and supervisors were made aware of the requirements of this unit before any work-related activities are undertaken, so that naturally occurring evidence can be collected. For example, learners may have the opportunity to use forage crop husbandry methods, and they should ask for observation records and/or witness statements to be provided as evidence. Suitable examples of observation records and witness statements can be found on the Edexcel website (www.edexcel.com).

Whichever delivery methods are used, it is essential that tutors stress the importance of animal welfare issues relating to the feeding of forage crops, sound environmental management and the need to manage the resource using approved methods.

Health and safety issues relating to working around livestock and machinery, and before learners visit any farm, must be stressed and reinforced regularly, and risk assessments must be undertaken before any practical activities. Adequate personal protective equipment (PPE) must be provided and used.

Tutors should consider integrating the delivery, private study and assessment for this unit with other relevant units and assessment instruments learners are taking as part of their programme of study.

Delivery of learning outcome 1 requires effective advanced planning to ensure sufficient examples of forage species are available for learners to observe a number of forage crops at various growth stages. Delivery is likely to be in the form of lectures, discussion, supervised practical sessions, site visits and independent learner research. When delivering learning outcome 1, tutors should consider grassland as a comparison to other forage crops. For learning outcome 2, the study of husbandry methods needs to be linked with practical activities, enabling learners to demonstrate their ability to establish and maintain healthy crops in a commercial setting.

For learning outcome 3, centres will need access to harvesting, feeding and storage resources for forage crops so learners can experience industry practice. Safety training is paramount where machines, silage additives and other hazardous materials are a necessary part of production. Delivery is likely to be in the form of lectures, discussion, supervised practical sessions, site visits and independent learner research. Learning outcomes 1, 2 and 3 can be supported by visits to suitable sites or trade demonstrations.

For learning outcome 4 examples of the nutritional analysis of a range of forage crops must be provided together with suitable costings. The latter can be from any suitable source, but ideally contain some local examples. Delivery is likely to be in the form of lectures, discussion, supervised practical sessions, site visits and independent learner research. As with learning outcome 1, it would be beneficial to study grassland as a comparison.

Visiting expert speakers could add to the relevance of the subject for learners. For example, agronomists or representatives from a seed company could talk about the cultivars available, their uses, and crop management practices.

Opportunities may occur for the integration through links to livestock, crop production or machinery units learners have previously studied. Group work could be useful when covering the unit content, allowing learners to research as wide a range of crops as possible. If group work is used for assessment as well as delivery, formal briefing paperwork and tutorial sessions will be required to clarify the learning process. The content for learning outcomes may be split between the peer group but co-related through joint presentations of findings.

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 and overview of unit.
Range of forage crops and identifying features.
Use of forage crops.
Assignment 1: Understanding Forage Crop Production (P1, P2, P3, P6, P8, P9, P11, M1, M3, M4)
Tutor introduction.
Husbandry requirements – environmental considerations, fertilisers, weeds, pests and diseases.
Nutritional value of forage crops.
Assignment 2: Practical Planning and Establishment of Forage Crops (P4, P5, P7)
Husbandry requirements – soils, rotations, cultivations, seedbeds, sowing information, etc. (Timing will be weather dependent).
Weed, pest and disease control.
Written assessment – Preparing a cropping plan.
Establishment of crops (Timing will be weather dependent).
Assignment 3: Report on Forage Crops Grown (M2, D1)
Harvesting and storage.
Production costs.
Assignment 4: Forage Crop Yields/Costs (P10, P12, D2)
Tutor introduction.
Unit review.

Assessment

Assessment methodology should reflect the opportunities provided by the range of delivery methods, with particular emphasis on opportunities to demonstrate practical application.

To achieve a pass grade, learners must meet the 12 pass criteria listed in the assessment and grading criteria grid.

For P1 and P2, learners must identify a minimum of four forage crops in different growth stages and comment on their suitability to the region. Tutors should identify the crops or agree them through discussion with learners. Where possible, to ensure assessment is fair, the size and complexity of the tasks should be the same for all learners. Evidence should include the seed (or equivalent) at the establishment stage, when the crop reaches harvest condition, and at least two intermediate stages. Tutors should ensure that this identification is achieved primarily by observing the growing crops, although high quality audio-visual materials, preserved specimens or similar could be used where appropriate. For P3, learners must outline the value of forage crops for different classes of livestock. Evidence could take the form of an identification test or assignment.

Alternatively, P1, P2 and P3 could be assessed directly by the tutor during practical activities. If this format is used, then suitable evidence from guided activities would comprise detailed observation records completed by learners and the tutor. If assessed during a placement, witness statements should be provided by a suitable representative and verified by the tutor.

To achieve P4, P5, P6 and P7 learners are required to carry out the husbandry requirements for a given forage crop, and to demonstrate a practical ability to establish and maintain healthy crop growth. Learners must follow legislative and environmental guidelines. Tutors should identify the crops or agree them through discussion with learners. Where possible, to ensure assessment is fair, the size and complexity of the tasks should be the same for all learners. To ensure as wide a range of crops as possible are covered, it might be most effective to introduce an element of group work into the assessment.

For P8, learners must cover the methods of harvesting forage crops for given classes of livestock, and for P9 the storing and utilisation of forage crops. Tutors should identify the classes of livestock or agree them through discussion with learners. Where possible, to ensure assessment is fair, the size and complexity of the tasks should be the same for all learners. As a minimum, learners should provide evidence covering two crops. Tutors should ensure that all learners cover one crop that requires conservation or storage, together with another crop that is grazed or fed freshly harvested.

P10, P11 and P12 could be assessed through a report on the benefits and costs of crop production. For P10 and P12, learners must cover a minimum of two different forage crops. For P11, they must cover a minimum of two different livestock classes.

To achieve a merit grade, learners must meet all of the pass grade criteria and the four merit grade criteria.

For M1, learners must compare selected alternative forage crops to grass in a given land-based situation. As a minimum, learners should provide evidence covering four forage crops in comparison with a named grass species. Tutors should identify the crops and situation or agree them through discussion with learners. Where possible, to ensure assessment is fair, the size and complexity of the tasks should be the same for all learners.

M1 could be achieved through a written assignment or the record of a verbal assessment to establish whether learners can explain why certain forage crops are suitable or unsuitable for a given situation. Tutors could use either a farm known to learners or a simulation. In either case, the physical conditions stated in the unit content should be described.

For M2, learners must report on the establishment of a selected non-grass forage crop. This could be achieved through a written assessment or the record of a verbal assessment in the field. Tutors should identify the crops and situation or agree them through discussion with learners.

For M3, learners must evaluate selected methods of feeding forage crops.

Evidence could be in the form of an identification test or assignment. Alternatively, this criterion could be assessed directly by the tutor during practical activities. If this format is used, then suitable evidence from guided activities would comprise detailed observation records completed by learners and the tutor. If assessed during a placement, witness statements should be provided by a suitable representative, and verified by the tutor.

For M4, learners must assess the nutritional value of forage crops for different classes of livestock comprehensively. Feed analyses need to be available in conjunction with visual appraisal of the crops. As a minimum, learners should provide evidence covering two forage crops and two different classes of livestock. Tutors should ensure that all learners cover one crop that requires conservation or storage, together with another crop that is grazed or fed freshly harvested.

To achieve a distinction grade, learners must meet all the pass and merit grade criteria and the two distinction grade criteria.

For D1, learners must discuss factors relating to the establishment, husbandry and utilisation of a given forage crop. Tutors should identify the crop and situation or agree them through discussion with learners. Where possible, to ensure fairness of assessment, the size and complexity of the tasks should be the same for all learners. To reflect industry practice, this criterion could be assessed before the establishment of the crop used to assess P3, P4 and M2, if appropriate.

To achieve D2 learners are required to analyse crop yields and discuss reasons for poor performance. They are also required to explain production costs for given forage crops on a cost per nutrient basis. Tutors should identify the crops or agree them through discussion with learners. Where possible, to ensure assessment is fair, the size and complexity of the tasks should be the same for all learners. It is expected that, as a minimum, learners will provide evidence covering at least three different forage crops including grass. Evidence may be a project or presentation.

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, P3, P6, P8, P9, P11, M1, M3, M4	Understanding Forage Crop Production	Produce an overview of the value of forage crops for different classes of livestock. This should include characteristics of different crops, and comment on the required husbandry including harvesting and storage.	Illustrated written report.
P4, P5, P7	Practical Planning and Establishment of Forage Crops	Assessments to include crop identification, a variety of field operations and assessment of the nutritional value of forage crops for different classes of livestock.	Practical assessments. Witness/observer statements.
M2, D1	Report on Forage Crops Grown	Information on factors influencing the establishment, growth and harvest of one chosen forage crop.	Report that could be used as a basis for a presentation.
P10, P12, D2	Forage Crop Yields/ Costs	Using either standard data or data from an actual analysis, comment on yields of selected forage crops and compare the production costs on a cost per nutrient basis with grass.	Data analysis. Written analytical report.

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 AgC9.2 Cultivate sites for planting crops Element AgC10.1 Monitor and maintain the healthy growth of extensive crops Element AgC10.2 Minimise risks to crops from pests, diseases and disorders Element AgC11.1 Prepare planting equipment Element AgC11.2 Plant and establish extensive crops Element AgC12.1 Maintain and control harvesting operations Element AgC12.2 Prepare harvested crops
Assist with Agricultural Crop Production	Understand Principles of Plant Science
	Understand Principles of Soil Science
	Undertake Agricultural Crop Production

Essential resources

Learners should make full use of the range of physical resources available to them, especially their centre or work placement, the library and resource centre, industry links and other resources such as demonstrations, shows and farm visits.

Learners must have the opportunity to observe forage crops being grown, so that these crops can be identified at various growth stages. If only basic facilities are available at the centre, transport must be provided for study tours to allow learners to observe the latest commercial facilities. Learners would benefit from visiting shows or demonstrations where the latest, commercially available forage crop harvesting, handling and storage technology is demonstrated.

Tutors delivering the unit should possess a suitable agricultural or animal production qualification and must have the opportunity to undertake appropriate technical updating and to develop links with local employers.

Employer engagement and vocational contexts

This unit focuses on the background knowledge and practical skills required to establish and maintain healthy forage crops, to provide suitable feedstuffs for livestock.

Access to work placements and/or site visits should be an integral part of the delivery of the unit. Employers and industry practitioners are therefore able to input into learner development. This input can be enhanced further if learners and placement supervisors are aware of the unit requirements before work-related activities are undertaken, so that naturally occurring evidence can be acknowledged.

Visiting expert speakers from industry will add relevance to the subject for learners.

Indicative reading for learners

Textbooks

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

Finch H, Samuel A, Lockhart J and Wiseman A – *Lockhart and Wiseman's Introduction to Crop Husbandry: Including Grasslands* (Butterworth-Heinemann, 1993) ISBN 0080420028

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

Waltham R and Raymond F – *Forage Conservation and Feeding, 5th Edition* (The Crowood Press, 2002) ISBN 0852363508

Wilkinson J – *Silage* (Chalcombe Publications, 2005) ISBN 0948617500

Journals

Dairy Farmer

Farmers Guardian

Farmers Weekly

Websites

www.niab.com

National Institute of Agricultural Botany

www.ruralni.gov.uk

Department of Agriculture and Rural Development

www.sac.ac.uk

Scottish Agricultural College

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	researching for written assessments
Creative thinkers	carrying out practical tasks
Reflective learners	setting goals to ensure written assessments are completed on time
Self-managers	carrying out practical tasks
Effective participators	looking to suggest alternative ways of carrying out practical tasks.

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 ...
Creative thinkers	problem solving in a practical situation.

● Functional Skills — Level 2

Skill	When learners are ...
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	using the internet to research information when preparing written assessments
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	producing written assessment material, including: <ul style="list-style-type: none"> • text • tables • records
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	producing calculations related to weed, pest and disease control procedures comparing production costs assessing nutritional values of forage
Identify the situation or problem and the mathematical methods needed to tackle it	producing calculations related to weed, pest and disease control procedures comparing production costs assessing nutritional values of forage
Select and apply a range of skills to find solutions	producing calculations related to weed, pest and disease control procedures comparing production costs assessing nutritional values of forage
Draw conclusions and provide mathematical justifications	producing calculations related to weed, pest and disease control procedures comparing production costs assessing nutritional values of forage
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	taking part in discussions relating to practical assessments
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	carrying out research for written assessments
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	producing written presentations for assessment.