Unit 30: Understand Grassland Management

Unit code: R/600/9136

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 grassland management, 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.

This unit enables learners to develop the knowledge and skills needed to successfully manage grassland. It can be applied to all grazing livestock enterprises and grass kept for conservation purposes.

● Unit introduction

Grassland is the foundation of much of the UK's food supply chain. For most of the livestock population in the UK, grass constitutes the basis of their diet. Grass is consumed in a variety of forms, from grazing to the consumption of conserved grass such as hay or silage. Without healthy grassland systems, milk quality and yield would fall and there would be a drop in the production of meat from cows and sheep.

As well as being important for agriculture, grassland is a key component of the British landscape covering pastures on downland slopes and forming riverside hay meadows. Its traditional management over centuries has given rise to areas rich in wildlife. The importance of farming for the sustainable management of these areas has become apparent as government agencies attempt to meet priority targets within the UK Biodiversity Action Plan.

This unit introduces the key species of grasslands and their characteristics, as well as the requirements for the successful creation and establishment of grassland. This includes a practical element to give learners with the opportunity to gain valuable experience in grassland management. Learners will also investigate the different methods used to conserve grass and the processes involved.

On completion of this unit, learners will be able to assess the condition of grassland fields and recommend techniques to meet a variety of management objectives. These could include the management of a grassland sward to feed livestock as well as conserving butterfly species, or it could entail making recommendations to improve the silage yield.

Learning outcomes

On completion of this unit a learner should:

1   Understand grasses and grass growth
2   Understand the factors to consider when establishing and maintaining grass
3   Be able to manage grassland for grazing
4   Know how to conserve grass.

Unit content

1 Understand grasses and grass growth

Terminology: eg rough grassland, permanent grassland, pasture, meadow, ley, sward, turf

Growth: photosynthesis; carbohydrate production and storage; life cycles of grassland plants (annual, perennial, biennial); tillering, annual grass growth curve (daylight, temperature, rainfall); effects of physical factors eg slope, aspect, rainfall, soil type, pH on growth; different cuts (first, second, third) and timing for harvesting of silage, haylage and hay to maintain digestibility and nutrient value; effects of grazing and cutting on growth

Agronomic characteristics of key grass species: grass species and varieties eg Perennial ryegrass, Italian ryegrass, hybrid ryegrasses, timothy, cocksfoot, red fescue, meadow fescue; leguminous species eg clover (red and white), lucerne

Agronomic characteristics of key weed grass species: local weed grasses as appropriate eg annual couch-grass, crested dogstail, soft brome, yorkshire fog, rough stalked meadow grass, smooth stalked meadow grass

2 Understand the factors to consider when establishing and maintaining grass

Techniques: site preparation and seedbed requirements eg spraying, ploughing, harrowing; sowing techniques eg drilling, direct drilling, cross drilling, broadcasting, slot seeding, overseeding, undersowing in crops, seed mixtures for different purposes eg leguminous grass mixture, ryegrass mixture, sowing rates and depth; timings for cultivation and sowing; machinery and equipment

Nutrient requirements: macronutrients; micronutrients; pH description and effects on growth; soil indices; fertiliser types; liming materials; application rates; machinery and equipment for fertiliser applications; costs of fertiliser applications; relevant codes of practice

Control of weeds, pests and diseases: types of weeds and their control through herbicides and husbandry eg docks, thistles including spear thistle and creeping thistle, nettles, burdock, annual meadow grass, broadleaf annuals (eg Common chickweed), couch-grass, crested dogstail, soft brome, ragwort, gorse, blackthorn, bracken, broom, rush; types of pests and their control eg aphids, leather jackets, slugs, rabbits; types of diseases and their control eg crown rust, stripe rust, leaf rust, mildew, fusarium root rot, bacterial wilt, ryegrass mosaic virus, barley yellow dwarf virus, clover rot, pepper spot, black blotch, verticillium wilt; machinery and equipment for applying pesticides; certification; costs; relevant codes of practice

Sward deterioration: causes eg undergrazing, overgrazing, nutrient deficiencies, drainage issues, drought, compaction, poaching, erosion, poor timing of cutting operations; pH; weed problems, pest invasion eg fruit fly, leatherjacket

Legislation and environmental considerations: Nitrate Vulnerable Zones, Local Environmental Risk Assessments for Pesticides (LERAPs); relevant legislation eg Environment Act 1995, EU Water Framework Directive, UK Biodiversity Action Plan; management systems of grassland for nature conservation purposes and incentives eg Entry Level Stewardship, Higher Level Stewardship

3 Be able to manage grassland for grazing

Soil sampling: description of soil profile including soil types and structure; measurement of macronutrients (nitrogen, phosphate, potassium); pH

Routine maintenance: operations eg rolling, harrowing, topping, aerating, tined weeding, use of a subsoiler and press; timing; repairing damaged swards

Planning for improvements: recommendations for improving grassland condition eg types and amounts of fertilisers, drainage improvements, weed control, pest control, species choice; aeration, pH change; alternative grazing procedures to allow sward improvements eg rotational grazing; minimising poaching; partial reseeding techniques eg direct drilling, light discing, light spike rotavation, slurry-seed applications; methods for defoliating an old sward to ensure success of seeding; equipment; timing

Grassland improvement activities: control of herbaceous weeds eg mechanical, chemical, hand; grassland restoration eg clearance of gorse or blackthorn; drainage improvements eg ditch clearance, drain installation or repair; application of fertilisers; health and safety considerations including the use of personal protective equipment (PPE)

4 Know how to conserve grass

Systems: silage, haylage, hay; uses; environmental, health and safety considerations eg farmer's lung, risk assessments, Control of Substances Hazardous to Health (COSHH)

Mechanical methods and treatments: mower/conditioner, tedder, balers, grass spreading and windrowing, wrapping, forage harvester, transportation, clamp filling; wildlife considerations

Processes: chemistry eg concentration of sugars, pH adjustment; additives; wilting; dehydration eg barn dried, grass nuts; prevention of silage deterioration during feed out;

Storage: hay barns, silage clamps, building/clamp capacity; wrapped bales; spontaneous combustion; cleanliness; collection, storage and use of silage effluent

Analysis: sampling methods (hay, silage, haylage); clinical assessment of silage eg colour, texture, taste, smell, litmus paper/pH meter; clinical assessment of DM in grass/legume crops and silages; quality standards, interpretation of routine laboratory analysis eg ammonia (% Total N), D-value, Metabolisable Energy (ME), ash, protein, nitrogen fractions, lactic acid, acetic acid, butyric acid, ethanol

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 explain the terminology used in grass production and management		
P2 relate growth patterns to the management of grass for grazing and conservation		
P3 discuss the agronomic characteristics of key grass species/varieties [RL]		
P4 discuss the agronomic characteristics of common weed grass species. [RL]	M1 compare production from a ryegrass only sward with a sward containing legumes for given criteria	
P5 compare the alternative methods used to prepare a site for and establish a grass crop		
P6 assess nutrient requirements for grassland and prepare a nutrient programme to meet production and sward needs [IE, TW]		
P7 describe how common weeds, pests and diseases of grass can be controlled		
P8 discuss the factors that contribute to sward deterioration [RL]		
P9 carry out soil sampling and analysis [TW, EP]		
P10 monitor grass during the grazing season		

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:
P11 carry out grassland improvement activities [TW, EP]	**M2** compare grassland management options in relation to legislation and environmental considerations for a selected site	**D1** evaluate the financial margins associated with a selected grassland improvement programme
P12 describe common systems for grass conservation		
P13 describe the alternative mechanical methods/ treatments for conserving grass		
P14 describe the processes involved in harvesting and storing conserved grass.	**M3** assess the suitability of conserved grass samples for livestock feed.	**D2** recommend improvements in the harvesting and storage of a selected grass crop.

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 has been designed to give learners a thorough understanding of grasslands and the techniques used to conserve grass. Learners should be given plenty of opportunities to study grasslands and observe different storage systems as a supplement to knowledge gained during classroom sessions.

As part of the delivery, internet sources that provide extensive background knowledge and interactive learning activities could be used. This will help learners to develop their independent researching skills. Classroom sessions can also be interactive, for example, labelling activities based on the weed category of different plants can lead to lively discussions.

Much of the unit is practical. If the centre is not based on a farm, learners would benefit from visits to local farms to see different grassland fields and their management. In addition, learners would benefit from observing different harvesting methods in operation and handling conserved grass of various ages and methods of storage. Local farms will also be able to provide opportunities for learners to investigate grassland condition and sites for grassland improvement tasks. As it is likely that a local farm will be managed under an agri-environment scheme, a guided walk by the farm manager to demonstrate how the payments have been used on the farm (and their benefits) would be of value to learners. In addition to farm visits, learners could also benefit from a visit to a nature reserve to see how grassland is managed for a broader range of objectives.

Inevitably, there is an element of seasonality with this unit, as grasses are best identified in the field during the later months of the academic year. However, centres may have their own herbarium collection (or access to one) that could provide specimens for identification and further study. Learners would benefit from using dissection microscopes in a laboratory to explore identification features, as a way of developing their independent enquiry skills. Much of the ground preparation and establishment of grasslands occurs in the early spring while harvesting activities take place during the summer months towards the end of the academic year. The unit does not need to be followed in any particular order but can be scheduled to fit in with seasonal requirements.

Centres will have well-established health and safety procedures, but extra care must be taken when visiting working farms. Livestock can be highly unpredictable with even the most docile animal becoming aggressive if it perceives a threat to itself or its offspring. In addition to hazards from livestock, the machinery associated with grassland management can be very dangerous. Farmyards and fields should only be visited with the permission of the farm manager or associated staff and learners will need to be thoroughly briefed on health and safety requirements. Learners should be given suitable personal protective equipment (PPE) when carrying out practical grassland management activities.

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
Assignment 1: Grassland Species and Agronomic Characteristics (P1, P2, P3, P4, M1)
Tutor introduces the assignment.
Explanation of grass production terminology.
Discussion of the growth of grass.
Describing agronomic characteristics of grass and weed species. Includes time allocated for independent research.
Assignment 2: Establishment and Maintenance of Grasslands (P5, P6, P7, P8)
Tutor introduces the assignment.
Methods for establishing grass crops.
Discussing nutrient requirements for grassland.
Preparing a nutrient programme for a grassland site. Includes time for independent enquiry.
Review of methods for controlling grassland weeds, pests and diseases.
Discussing factors leading to the deterioration of a sward.
Assignment 3: Grassland Improvement (P9, P10, P11, P12, M2, D1)
Tutor introduces the assignment.
Carrying out fieldwork: soil sampling and analysis of a grassland site.
Producing a maintenance plan and an improvement plan for a grassland site.
Carrying out practical activities: grassland improvement tasks.
Discussing environmental and legislative considerations.
Assessing cost-benefit options for grassland improvement techniques.
Assignment 4: Grass Harvest and Storage (P13, P14, M3, D2)
Tutor introduces the assignment.
Discussion of grass conservation systems.
Review of methods and treatments for conserving grass.
Description of the processes involved in the harvest and storage of grass.
Carrying out field assessments of grass samples from a variety of storage methods and harvest systems.
Unit review.

Assessment

For P1, learners need to explain the terminology used in grass production and management. The list of terms in the unit content is not exhaustive and tutors may want to amend the list to include, for example, regional variations of terms. Learners could use a pictorial presentation such as an annotated poster or give an oral presentation using appropriate software.

For P2, learners are expected to investigate the growth patterns of grass and relate them to the management of grassland for grazing and conservation. Evidence for this could be in the form of a short report or leaflet.

For P3 and P4, learners need to discuss the agronomic characteristics of key grass species and grass weeds. The species studied should be selected by the students. A minimum of four species/varieties of grass and at least one legume should be chosen and a minimum of two grass weed species should be selected. Suitable evidence would be an illustrated leaflet or short report.

For P5, learners are expected to compare the different methods used for the site preparation and

establishment of a grass crop. Tutors should specify the different categories for comparison, which could be based around economic, environmental or other objectives. This could be presented as a table in a report or as an annotated poster.

For P6, learners need to assess the nutrient requirements for grassland and prepare a nutrient programme to meet production and sward needs. It is important that the tutor sets out the scenario clearly with specific production objectives so that the learner knows what is expected. Suitable evidence for this would be a short report, as for P5.

For P7, learners should describe how to control common weeds, pests and diseases. A minimum of six weeds, three pests and two diseases should be selected for this assessment. Suitable evidence could be in the form of an illustrated leaflet or an extension of the report for P5 and P6.

For P8, learners will need to discuss the factors that lead to sward deterioration. This could be presented as an annotated poster.

For P9, learners must collect a soil sample and analyse the results. Suitable evidence for this would be completed worksheets, a practical observation record or a short report.

For P10, learners will need to monitor a given area of grass during the grazing system. This could be the same field studied as part of P9. Evidence could be in the form of a short report.

For P11, learners are required to carry out grassland improvement activities. The type of activities should be chosen by the tutor. A minimum of two different activities should be carried by learners. Suitable evidence for this could be a work log or a practical observation record.

For P12, learners are expected to describe common systems of grass conversion. This could be presented as an annotated poster, an illustrated report or a leaflet.

For P13 and P14, learners need to describe the alternative mechanical methods and treatments for conserving grass and the processes involved in harvesting and storing conserved grass. Evidence could be as an extension of the illustrated report for P12.

For M1, learners are expected to compare a leguminous grass mixture with a ryegrass mix. Learners should be given the categories for comparison, such as different growth patterns and uses of the different crops. Suitable evidence could be a short report or an annotated poster.

For M2, learners should build on the work carried out for P11, comparing their recommended grassland management and improvement options in relation to legislation and environmental considerations. Evidence for this could be in the form of an annotated poster or as part of their written report for their improvement plan.

For M3, learners are expected to assess the suitability of conserved grass samples for livestock feed. There should be at least two samples, chosen by the tutor, of differing quality from at least two types of conserved grass (hay, haylage or silage). Learners must assess the suitability and justify their assessments. Suitable evidence could be a practical observation record or a short written report.

For D1, learners need to evaluate the financial margins associated with a selected grassland improvement programme. It is expected that the programme would be the one that learners produced as part of P11. Evidence for this could be part of their written report for the improvement plan.

For D2, learners are required to recommend improvements in the harvesting and storage of a selected grass crop. The crop should be selected by the tutor and the assessment could be based on one of the samples used for M3. Evidence for this could be part of a written report produced for M3.

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, P4, M1	Grassland Species and Agronomic Characteristics	You are assisting the Young Farmers with their stand at the local agricultural show. You have been asked to prepare some information explaining the importance of grasses and how they grow.	Annotated poster. Illustrated leaflet.
P5, P6, P7, P8	Establishment and Maintenance of Grasslands	You have been asked by a group of smallholders for some information on grassland establishment. Prepare some background information that will assist them with maintaining their grassland areas.	Oral presentation. Illustrated report.
P9, P10, P11, P12, M2, D1	Grassland Improvement	As an agronomic consultant, you have been called in by a farmer seeking advice on improving his grassland. Having carried out an assessment of the condition of the sward, including a soil analysis, produce a plan on the correct routine management and suggestions for improving the sward condition.	Practical observation record. Written report.
P13, P14, M3, D2	Grass Harvest and Storage	There is an open day on your farm and you are expecting several visitors from the local town who may not know much about farming. Produce some information that will explain the different methods and processes that are involved in conserving grass, which can be placed in an information pack or at relevant sites around the farm.	Annotated poster. Leaflet. Illustrated 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 Grass and Forage Crop Production	Element LP46.1 Monitor and maintain soil nutrition Element LP46.2 Manage grassland and forage crops to support livestock grazing
Introduction to Grass and Forage Crop Production	Understand Principles of Plant Science
	Understand Principles of Soil Science

Essential resources

Learners will need access to a variety of grassland sites for the identification of grassland species and further study. Herbarium samples can be used for identification. Lab facilities with dissection microscopes and dissecting kits should be available to aid with the identification of herbarium and field samples. Learners should

visit several different facilities to observe the harvest and conservation of grass. For practical work activities, learners will need to be provided with a sufficient number of high quality and well-maintained tools. If they are not required to provide their own, learners will need to be issued with personal protective equipment (PPE) for practical tasks.

Employer engagement and vocational contexts

This unit gives learners numerous opportunities to engage with local land managers for example farmers, land agents, estate managers and site managers of nature reserves. Centres are also encouraged to establish links with local businesses that deal with the mechanical equipment and processes for harvesting and conserving grass.

Indicative reading for learners

Textbooks

Barnes, RF – *Forages, An Introduction to Grassland Agriculture* (WileyBlackwell, 2003) ISBN 0813804213

Barnes, RF, Nelson, CJ, Moore, KJ and Collins, M – *Forages: The Science of Grassland Agriculture* (Wiley Blackwell, 2007) ISBN 0813802326

Crofts, A and Jefferson, R G. – *The Lowland Grassland Management Handbook* (English Nature, 1994) ISBN 1857161386

Davies, A, Baker RD, Grant, S and Laidlaw, AS – *Sward Measurement Handbook* (British Grassland Society, 1993) ISBN 0905944224

Finch, HJS and Samuel, AM – *Lockhart and Wiseman's Crop Husbandry including Grassland* (Woodhead Publishing, 2002) ISBN1855735490

Frame, J – *Forage Legumes for Temperate Grasslands* (Science Publishers, 2005) ISBN 1578083583

Frame, J – *Improved Grassland Management* (Farming Press, 2000) ISBN 0852365438

Gibson, DJ – *Grasses and Grassland Ecology* (Oxford University Press, 2009) ISBN 0198529198

Humphreys, L R – *Evolving Science of Grassland Improvement* (Cambridge University Press, 2007) ISBN 0521038731

Mundy, P – *Weed and Scrub Control on Organic Grasslands* (Soil Association, 2006) ISBN 190466511X

Newton, J – *Organic Grassland* (Chalcombe Publications, 1993) ISBN 0948617284

NIAB – *NIAB Agronomists Handbook 2009/10* (National Institute of Agricultural Botany, 2009) ISBN 1479-4749

Pearson, C J and Ison, R L – *Agronomy of Grassland Systems* (Cambridge University Press, 1997) ISBN 0521560101

Price, EAC – *Lowland Grassland and Heathland Habitats* (Routledge, 2003) ISBN 041518763X

Vickery, J A and Tallowin, J T – *Changes in Lowland Grassland Management: Implications for Invertebrates and Birds* (British Trust for Ornithology, 1999) ISBN 1902576144

Whitehead, DC – *Nutrient Elements in Grassland: Soil, Plant and Animal Relationships* (CABI Publishing, 2000) ISBN 0851994377

Whitehead, R – *The UK Pesticide Guide 2008* (CABI Publishing, 2008) ISBN 9781845934163

Journals

British Farmer and Grower

Crop

Dairy Farmer

Farmers Weekly

Grass and Forage Farmer

Grass and Forage Science

Websites

www.aber.ac.uk/en/ibers	The Institute of Biological, Environmental and Rural Sciences (IBERS) is a world class research and education centre at Aberystwyth University.
www.adas.co.uk	ADAS is the UK's largest independent provider of environmental consultancy, rural development services and policy advice.
www.britishgrassland.com	The British Grassland Society is a forum for those with an active interest in the science and practice of temperate grassland production and utilization.
www.defra.gov.uk	Defra is the UK government department responsible for policy and regulations on the environment, food and rural affairs.
www.niab.com	NIAB spans the crop development pipeline, combining within a single resource the specialist knowledge, skills and facilities required to support the improvement of crop varieties, to evaluate their performance and products derived from them, and to ensure these advances are transferred into on-farm practice through efficient agronomy.

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	planning and carrying out soil sampling
	analysing the results obtained from soil samples
	providing recommendations for soil improvements
Reflective learners	carrying out presentations of the results of their research
Team workers	working together to gather soil samples
	carrying out improvements to grassland sites
Effective participators	carrying out grassland improvement activities.

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	questioning their own assumptions about differing methods of grassland management
	thinking about alternatives to harvesting and storing grass
	recommending options for improving grassland management
Self-managers	planning work for soil analysis
	preparing for practical management tasks.

Functional Skills – Level 2

Skill	When learners are …
ICT – Use ICT systems	
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	creating a project timetable for the routine maintenance of a grassland site
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	researching sources of information on different grass harvest and conservation techniques
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	writing a report for the grassland improvement plan
Bring together information to suit content and purpose	combining field work and other research to create a grassland improvement plan
Present information in ways that are fit for purpose and audience	preparing an annotated poster on common grass species creating a leaflet to describe the processes involved in harvesting and storing grass
Mathematics	
Identify the situation or problem and the mathematical methods needed to tackle it	calculating the amounts of fertilisers or pesticides required to improve a grassland field
Select and apply a range of skills to find solutions	calculating field areas and recommended weights of fertiliser and volumes of liquid applications
Draw conclusions and provide mathematical justifications	making recommendations for grassland improvements based upon calculations of amounts of fertiliser or pesticide required
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	planning and carrying out improvements to grassland habitats
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	gathering information to justify recommendations for grassland improvements
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing a report for the grassland improvement plan.