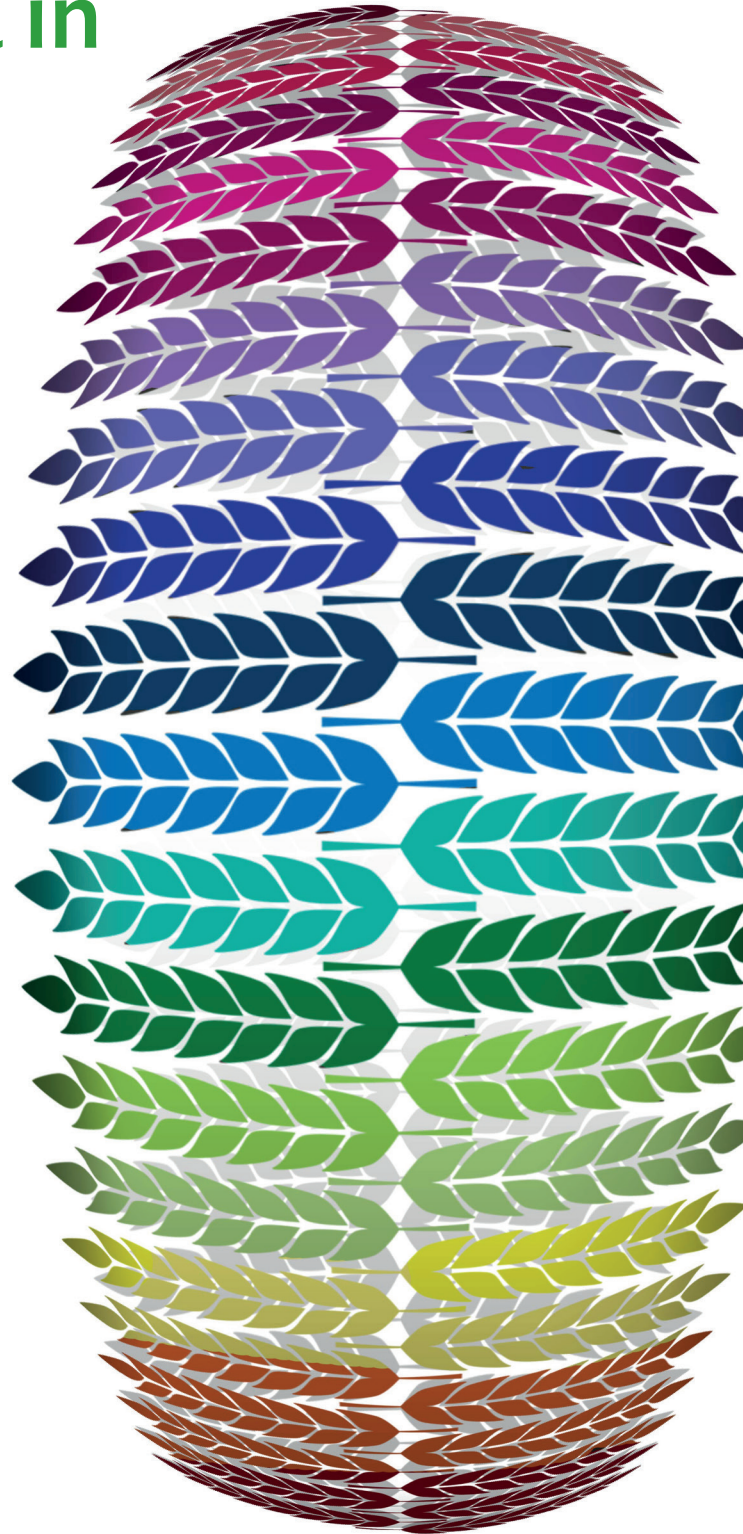


Pearson BTEC Level 3 National Extended Diploma in Agriculture



Specification

First teaching from January 2019

First certification from 2021

Issue 6

Pearson BTEC Level 3 National Extended Diploma in Agriculture Specification

First teaching September 2019
Issue 6

About Pearson

We are the world's leading learning company operating in countries all around the world. We provide content, assessment and digital services to learners, educational institutions, employers, governments and other partners globally. We are committed to helping equip learners with the skills they need to enhance their employability prospects and to succeed in the changing world of work. We believe that wherever learning flourishes so do people.

This specification is Issue 6. We will inform centres of any changes to this issue. The latest issue can be found on our website.

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ISBN 978 1 446 94779 1

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Welcome

With a track record built over 30 years of learner success, BTEC Nationals are widely recognised by industry and higher education as the signature vocational qualification at Level 3. They provide progression to the workplace either directly or via study at a higher level. Proof comes from YouGov research, which shows that 62 per cent of large companies have recruited employees with BTEC qualifications. What's more, well over 100,000 BTEC students apply to UK universities every year and their BTEC Nationals are accepted by over 150 UK universities and higher education institutes for relevant degree programmes either on their own or in combination with A Levels.

Why are BTECs so successful?

BTECs embody a fundamentally learner-centred approach to the curriculum, with a flexible, unit-based structure and knowledge applied in project-based assessments. They focus on the holistic development of the practical, interpersonal and thinking skills required to be able to succeed in employment and higher education.

When creating the BTEC Nationals in this suite, we worked with many employers, higher education providers, colleges and schools to ensure that their needs are met. Employers are looking for recruits with a thorough grounding in the latest industry requirements and work-ready skills such as teamwork. Higher education needs students who have experience of research, extended writing and meeting deadlines.

We have addressed these requirements with:

- a range of BTEC sizes, each with a clear purpose, so there is something to suit each learner's choice of study programme and progression plans
- refreshed content that is closely aligned with employers' and higher education needs for a skilled future workforce
- assessments and projects chosen to help learners progress to the next stage. This means some are set by you to meet local needs, while others are set and marked by Pearson so that there is a core of skills and understanding that is common to all learners. For example, a written test can be used to check that learners are confident in using technical knowledge to carry out a certain job.

We provide a wealth of support, both resources and people, to ensure that learners and their teachers have the best possible experience during their course. See *Section 10* for details of the support we offer.

A word to learners

Today's BTEC Nationals are demanding, as you would expect of the most respected applied learning qualification in the UK. You will have to choose and complete a range of units, be organised, take some assessments that we will set and mark and keep a portfolio of your assignments. But you can feel proud to achieve a BTEC because, whatever your plans in life – whether you decide to study further, go on to work or an Apprenticeship, or set up your own business – your BTEC National will be your passport to success in the next stage of your life.

Good luck, and we hope you enjoy your course.

Collaborative development

Learners completing their BTEC Nationals in Agriculture will be aiming to go on to employment, often via the stepping stone of higher education. It was, therefore, essential that we developed these qualifications in close collaboration with experts from professional bodies, businesses and universities, and with the providers who will be delivering the qualifications. To ensure that the content meets providers' needs and provides high-quality preparation for progression, we engaged experts. We are very grateful to all the university and further education lecturers, teachers, employers, professional body representatives and other individuals who have generously shared their time and expertise to help us develop these new qualifications.

In addition, universities, professional bodies and businesses have provided letters of support confirming that these qualifications meet their entry requirements. These letters can be viewed on our website.

Summary of Pearson BTEC Level 3 National Extended Diploma in Agriculture specification Issue 6 changes

Summary of changes made between the previous issue and this current issue	Page number
Change made to <i>Unit 13: Managing Activities for Agricultural Enterprises</i> Assessment criteria C.P5 and C.M4 wording for clarity.	Page 144
Removal of references to MyBTEC, as that service is retiring.	Pages 306, 311, 316, 331, 332

If you need further information on these changes or what they mean, contact us via our website at: qualifications.pearson.com/en/support/contact-us.html.

Contents

Introduction to BTEC National qualifications for the agriculture sector	1
Total Qualification Time	2
Qualifications, sizes and purposes at a glance	3
Structures of the qualifications at a glance	5
Qualification and unit content	7
Assessment	7
Grading for units and qualifications	9
UCAS Tariff points	9
1 Qualification purpose	10
2 Structure	13
3 Units	16
Understanding your units	16
Index of units	19
4 Planning your programme	305
5 Assessment structure and external assessment	308
Introduction	308
Internal assessment	308
External assessment	308
6 Internal assessment	310
Principles of internal assessment	310
Setting effective assignments	312
Making valid assessment decisions	314
Planning and record keeping	316
7 Administrative arrangements	317
Introduction	317
Learner registration and entry	317
Access to assessment	317
Administrative arrangements for internal assessment	318
Administrative arrangements for external assessment	319
Dealing with malpractice in assessment	321
Certification and results	323
Additional documents to support centre administration	323
8 Quality assurance	324
9 Understanding the qualification grade	325
10 Resources and support	331
Support for setting up your course and preparing to teach	331
Support for teaching and learning	331
Support for assessment	331
Training and support from Pearson	332
Appendix 1 Links to industry standards	334
Appendix 2 Glossary of terms used for internally-assessed units	335

Introduction to BTEC National qualifications for the agriculture sector

This specification contains the information you need to deliver the Pearson BTEC Level 3 National Extended Diploma in Agriculture. The specification signposts you to additional handbooks and policies. It includes all the units for this qualification.

This qualification is part of the suite of agriculture qualifications offered by Pearson. In the suite there are qualifications that focus on different progression routes, allowing learners to choose the one best suited to their aspirations.

All qualifications in the suite share some common units and assessments, allowing learners some flexibility in moving between qualifications where they wish to select a more specific progression route. The qualification titles are given below.

Within this suite are BTEC National qualifications for post-16 learners who want to specialise in a specific industry, occupation or occupational group. The qualifications give learners specialist knowledge and technical skills, enabling entry to an Apprenticeship or other employment, or progression to related higher education courses. Learners taking these qualifications must have a significant level of employer involvement in their programmes.

In the agriculture sector these are:

Pearson BTEC Level 3 National Extended Certificate in Agriculture (603/0872/2)

Pearson BTEC Level 3 National Foundation Diploma in Agriculture (603/0871/0)

Pearson BTEC Level 3 National Diploma in Agriculture (603/1212/9)

Pearson BTEC Level 3 National Extended Diploma in Agriculture (603/2676/1).

The Extended Certificate (360 GLH) and Extended Diploma (1080 GLH) are approved as Tech Level qualifications for 2020 performance measures by the DFE. The Foundation Diploma (540 GLH) and Diploma (720 GLH) are not currently recognised for performance measures. Please check our website for details of subsequent availability for future DFE performance measures.

Other BTEC National qualifications in this sector provide a broad introduction that gives learners transferable knowledge and skills. These qualifications are for post-16 learners who want to continue their education through applied learning. The qualifications prepare learners for a range of higher education courses either by meeting entry requirements in their own right or by being accepted alongside other qualifications at the same level and adding value to them. Learners may progress to one of the qualifications in this specification having completed a smaller qualification that provides suitable fundamental knowledge and skills.

This specification signposts all the other essential documents and support that you need as a centre in order to deliver, assess and administer the qualification, including the staff development required. A summary of all essential documents is given in *Section 7*. Information on how we can support you with this qualification is given in *Section 10*.

The information in this specification is correct at the time of publication.

Total Qualification Time

For all regulated qualifications, Pearson specifies a total number of hours that it is estimated learners will require to complete and show achievement for the qualification: this is the Total Qualification Time (TQT). Within TQT, Pearson identifies the number of Guided Learning Hours (GLH) that we estimate a centre delivering the qualification might provide. Guided learning means activities, such as lessons, tutorials, online instruction, supervised study and giving feedback on performance, that directly involve teachers and assessors in teaching, supervising and invigilating learners. Guided learning includes the time required for learners to complete external assessment under examination or supervised conditions.

In addition to guided learning, other required learning directed by teachers or assessors will include private study, preparation for assessment and undertaking assessment when not under supervision, such as preparatory reading, revision and independent research.

BTEC Nationals have been designed around the number of hours of guided learning expected. Each unit in the qualification has a GLH value of 60, 90 or 120. There is then a total GLH value for the qualification.

Each qualification has a TQT value. This may vary within sectors and across the suite, depending on the nature of the units in each qualification and the expected time for other required learning. The following table show all the qualifications in this sector and their GLH and TQT values.

Qualifications, sizes and purposes at a glance

Title	Size and structure	Summary purpose
Pearson BTEC Level 3 National Extended Certificate in Agriculture	360 GLH (540 TQT) Equivalent in size to one A Level. Four units of which three are mandatory and one is external. Mandatory content (83%). External assessment (33%).	This qualification offers an engaging programme to support learners who want to pursue a career in the agriculture sector. It is intended as a Tech Level qualification. This size of qualification allows learners to study related and complementary qualifications alongside it, without duplication of content. The qualification can prepare learners for a range of apprenticeships in the agriculture sector, or direct entry to roles such as trainee agricultural technician or general farm worker. When taken alongside further Level 3 qualifications, it supports progression to a range of higher education courses in agriculture or agricultural sciences.
Pearson BTEC Level 3 National Foundation Diploma in Agriculture*	540 GLH (850 TQT) Equivalent in size to 1.5 A Levels. Seven units of which five are mandatory and two are external. Mandatory content (78%). External assessment (44%).	This qualification is designed as a one-year, full-time course, or as part of a two-year, full-time study programme for learners who want to take it alongside another area of complementary study. It is intended as a Tech Level qualification and supports progression to careers in the agriculture sector. This qualification is primarily for learners who are intending to gain employment directly, in roles such as assistant herdsman and assistant machinery operator, but can also be used to progress to an apprenticeship or a higher education course in agriculture or agricultural sciences.
Pearson BTEC Level 3 National Diploma in Agriculture*	720 GLH (1085 TQT) Equivalent in size to two A Levels. Ten units of which seven are mandatory and two are external. Mandatory content (75%) External assessment (33%).	This qualification is designed to be the substantive part of a study programme for learners aged 16–19 who want a strong core of sector study. It is intended as a Tech Level qualification and supports progression to careers in the agricultural management sector. The qualification is an introduction to the sector and is primarily for learners who are intending to gain employment directly in roles such as stockperson, herdsman, machinery operator or trials officer. When taken alongside further Level 3 qualifications, it supports progression to a range of higher education courses in agriculture or agricultural sciences.

Title	Size and structure	Summary purpose
Pearson BTEC Level 3 National Extended Diploma in Agriculture	1080 GLH (1650 TQT) Equivalent in size to three A Levels. Fifteen units of which nine are mandatory and three are external. Mandatory content (67%) External assessment (33%).	This qualification is a two-year, full-time course for learners aged 16–19 and is intended as a Tech Level qualification. It is designed for learners who want to focus their studies on the agricultural sector, with a firm intention of progressing to employment in one of the agricultural management or specialist roles available. The qualification also supports progression for those learners who intend to further their studies in higher education.

Learners must not register on the BTEC Level 3 Nationals in Countryside Management, the BTEC Level 3 Nationals in Horticulture or the BTEC Level 3 Nationals in Forestry and Arboriculture at the same time as the BTEC Level 3 Nationals in Agriculture, owing to overlap of content and assessment.

* These qualifications are not currently recognised by DFE for performance measures.

Structures of the qualifications at a glance

This table shows all the units and the qualifications to which they contribute. The full structure for this Pearson BTEC Level 3 National in Agriculture is shown in *Section 2*. **You must refer to the full structure to select units and plan your programme.**

Key

	Unit assessed externally	M	Mandatory units	O	Optional units
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Unit (number and title)	Unit size (GLH)	Extended Certificate (360 GLH)	Foundation Diploma* (540 GLH)	Diploma* (720 GLH)	Extended Diploma (1080 GLH)
1 Professional Working Responsibilities	120	M	M	M	M
2 Plant and Soil Science	120		M	M	M
3 Contemporary Issues in the Land-based Sectors	120				M
4 Work Experience in the Land-based Sectors	60	M	M	M	M
5 Estate Skills	60	O	O	M	M
6 Crop Production	60		O	O	O
7 Farm Livestock Husbandry	60		O	O	O
8 Land-based Machinery Operations	60	O	M	M	M
9 Managing Environmental Activities in Agriculture	60		M	M	M
10 Crop Handling, Storage and Quality Assurance	60		O	O	O
11 Livestock Health and Diseases	60		O	O	O
12 Developing a Land-based Enterprise	60		O	O	O
13 Managing Activities for Agricultural Enterprises	60			M	M
14 Root Crop and Field Vegetable Production	60			O	O
15 Combinable Crop Production and Processing	60			O	O
16 Grass and Forage Crop Production	60			O	O
17 Poultry Production	60			O	O
18 Pig Production	60			O	O
19 Sheep Production	60			O	O
20 Beef Production	60			O	O

Unit (number and title)	Unit size (GLH)	Extended Certificate (360 GLH)	Foundation Diploma* (540 GLH)	Diploma* (720 GLH)	Extended Diploma (1080 GLH)
21 Dairy Production	60			O	O
22 Livestock Nutrition	60			O	O
23 Organic Agricultural Production	60			O	O
24 Land-based Workshop Practices	60			O	O
25 Agricultural Business Improvements	60				M
26 Selecting and Managing Land-based Machinery	60				O
27 Animal Genetics	60				O
28 Applied Agricultural Farming Practice	120	M			

* These qualifications are not currently recognised by DFE for performance measures.

Qualification and unit content

Pearson has developed the content of the new BTEC Nationals in collaboration with employers and representatives from higher education and relevant professional bodies. In this way, we have ensured that content is up to date and that it includes the knowledge, understanding, skills and attributes required in the sector.

Each qualification in the suite has its own purpose. The mandatory content provides a balance of breadth and depth ensuring that all learners have a strong basis for developing technical skills required in the sector. Learners are then offered the opportunity to develop a range of technical skills and attributes expected by employers with some opportunity to select between optional units where a degree of choice for individual learners to study content relevant to their own progression choices is appropriate. It is expected that learners will apply their learning in relevant employment and sector contexts during delivery and have opportunities to engage meaningfully with employers. The proportion of mandatory content ensures that all learners are following a coherent programme of study and acquiring the knowledge, understanding and skills that will be recognised and valued. Learners are expected to show achievement across mandatory units as detailed in *Section 2*.

BTEC Nationals have always required applied learning that brings together knowledge and understanding (the cognitive domain) with practical and technical skills (the psychomotor domain). This is achieved through learners performing vocational tasks that encourage the development of appropriate vocational behaviours (the affective domain) and transferable skills. Transferable skills are those such as communication, teamwork, planning and completing tasks to high standards, which are valued in both the workplace and in higher education.

Our approach provides rigour and balance, and promotes the ability to apply learning immediately in new contexts. Further details can be found in *Section 2*.

Centres should ensure that delivery of content is kept up to date. Some of the units within the specification may contain references to legislation, policies, regulations and organisations, which may not be applicable in the country you deliver this qualification in (if teaching outside of England), or which may have gone out-of-date during the lifespan of the specification. In these instances, it is possible to substitute such references with ones that are current and applicable in the country you deliver subject to confirmation by your Standards Verifier.

Assessment

Assessment is specifically designed to fit the purpose and objective of the qualification. It includes a range of assessment types and styles suited to vocational qualifications in the sector. There are three main forms of assessment that you need to be aware of: external, internal and synoptic.

Externally-assessed units

Each external assessment for a BTEC National is linked to a specific unit. All of the units developed for external assessment are of 90 or 120 GLH to allow learners to demonstrate breadth and depth of achievement. Each assessment is taken under specified conditions, then marked by Pearson and a grade awarded. Learners are permitted to resit external assessments during their programme. You should refer to our website for current policy information on permitted retakes.

The styles of external assessment used for qualifications in the agriculture suite are:

- examinations – all learners take the same assessment at the same time, normally with a written outcome
- set tasks – learners take the assessment during a defined window and demonstrate understanding through completion of a vocational task.

Some external assessments include a period of preparation using set information. External assessments are available twice a year. For detailed information on the external assessments please see the table in *Section 2*. For further information on preparing for external assessment see *Section 5*.

Internally-assessed units

Most units in the sector are internally assessed and subject to external standards verification. This means that you set and assess the assignments that provide the final summative assessment of each unit, using the examples and support that Pearson provides. Before you assess you will need to become an approved centre, if you are not one already. You will need to prepare to assess using the guidance in *Section 6*.

In line with the requirements and guidance for internal assessment, you select the most appropriate assessment styles according to the learning set out in the unit. This ensures that learners are assessed using a variety of styles to help them develop a broad range of transferable skills. Learners could be given opportunities to:

- demonstrate practical and technical skills using appropriate tools or processes
- complete realistic tasks to meet specific briefs or particular purposes
- write up the findings of their own research
- use case studies to explore complex or unfamiliar situations
- carry out projects for which they have choice over the direction and outcomes.

You will make grading decisions based on the requirements and supporting guidance given in the units. Learners may not make repeated submissions of assignment evidence. For further information see *Section 6*.

Synoptic assessment

Synoptic assessment requires learners to demonstrate that they can identify and use effectively, in an integrated way, an appropriate selection of skills, techniques, concepts, theories and knowledge from across the whole sector as relevant to a key task. BTEC learning has always encouraged learners to apply their learning in realistic contexts using scenarios and realistic activities that will permit learners to draw on and apply their learning. For these qualifications we have formally identified units that contain a synoptic assessment task. Synoptic assessment must take place after the teaching and learning of other mandatory units in order for learners to be able to draw from the full range of content. The synoptic assessment gives learners an opportunity to independently select and apply learning from across their programmes in the completion of a vocational task. Synoptic tasks may be in internally- or externally-assessed units. The particular units that contain the synoptic tasks for this qualification are shown in the structure in *Section 2*.

Language of assessment

Assessment of the internal and external units for these qualifications will be available in English. All learner work must be in English. A learner taking the qualifications may be assessed in British or Irish Sign Language where it is permitted for the purpose of reasonable adjustment. For information on reasonable adjustments see *Section 7*.

Grading for units and qualifications

Achievement in the qualification requires a demonstration of depth of study in each unit, assured acquisition of a range of practical skills required for employment or progression to higher education, and successful development of transferable skills. Learners achieving a qualification will have achieved across mandatory units, including external and synoptic assessment.

Units are assessed using a grading scale of Distinction (D), Merit (M), Pass (P), Near Pass (N) and Unclassified (U). The grade of Near Pass is used for externally-assessed units only. All mandatory and optional units contribute proportionately to the overall qualification grade, for example a unit of 120 GLH will contribute double that of a 60 GLH unit.

Qualifications in the suite are graded using a scale of P to D*, **or** PP to D*D*, **or** PPP to D*D*D*. Please see *Section 9* for more details. The relationship between qualification grading scales and unit grades will be subject to regular review as part of Pearson's standards monitoring processes on the basis of learner performance and in consultation with key users of the qualification.

UCAS Tariff points

The BTEC Nationals attract UCAS points. Please go to the UCAS website for full details of the points allocated.

1 Qualification purpose

Pearson BTEC Level 3 National Extended Diploma in Agriculture

In this section, you will find information on the purpose of this qualification and how its design meets that purpose through the qualification objective and structure. We publish a full 'Statement of Purpose' for each qualification on our website. These statements are designed to guide you and potential learners to make the most appropriate choice about the size of qualification suitable at recruitment.

Who is this qualification for?

The Pearson BTEC Level 3 National Extended Diploma in Agriculture is intended as a Tech Level qualification, equivalent in size to three A Levels and, as such, is designed to meet the Tech Bacc measure if studied alongside Level 3 mathematics and the Extended Project Qualification (EPQ). Outside the Tech Bacc, it will normally be the only qualification in a two-year study programme and is ideal for learners who are looking for a full-time course specialising in the agriculture sector, and who have a firm intention of progressing to employment in one of the wide variety of roles available.

As well as direct entry to employment, this qualification will prepare learners for higher study of a specialist degree or BTEC Higher National Diploma. This route gives them the opportunity to enter the sector at a higher level, or in a more specialist role.

No prior study of the sector is needed but learners should normally have a range of achievement at Level 2, in GCSEs or equivalent qualifications, including English, mathematics and science.

It is intended as a Tech Level, and as such is designed to meet the Tech Bacc measure when studied alongside Level 3 mathematics and the Extended Project Qualification (EPQ).

What does this qualification cover?

The content of this qualification has been developed in consultation with employers and professional bodies to ensure that it is appropriate for those interested in working in the sector. In addition, higher education representatives have been involved to ensure that it fully supports entry to the relevant range of specialist degrees.

There are nine mandatory units, which cover the following aspects of agriculture:

- professional working responsibilities
- plant and soil science
- contemporary issues in land-based sectors
- work experience in land-based sectors
- estate skills
- land-based machinery operations
- managing environmental activities in agriculture
- managing activities for agricultural enterprises
- agricultural business improvements.

Learners will be able to add six optional units to the mandatory content. These have been designed to support their progression to a range of employment opportunities in the agricultural sector, and to a range of higher education courses. Optional units will introduce learners to a sector-specialist area of their choice, including working in particular environments, and link with relevant occupational areas. The optional units cover the following areas:

- crop production
- forage crops and grassland management
- developing a land-based enterprise
- farm livestock husbandry
- livestock health and diseases
- poultry production
- sheep production
- beef production
- dairy production

- pig production
- land-based workshop practices
- root crop and vegetable production
- crop handling, storage and quality assurance
- organic agricultural production
- selecting and managing machine purchases in the land-based sectors
- combinable crop production
- livestock nutrition
- animal genetics.

While taking this qualification, learners will be required to engage with sector employers as part of their course, including 300 hours of work experience with an employer in the sector, where they will be given opportunities to develop practical skills in preparation for employment.

What could this qualification lead to?

This qualification will prepare learners for direct employment in the agriculture sector, and is suitable if they wish to enter a particular specialist area of work, such as:

- stockperson
- herdsman
- livestock contractor
- crop contractor
- agricultural technician
- arable operator
- farm mechanic
- unit manager (for example dairy, pigs, poultry).

Will this qualification lead to further learning?

There are many roles in this sector where recruitment is at graduate level. This qualification is recognised by higher education providers as contributing to admission requirements for many relevant courses. This qualification could lead to a degree course such as:

- BSc in Agriculture
- BSc (Hons) in Agriculture with Animal Science
- BSc (Hons) in Agriculture with Crop Management
- BSc (Hons) in Agriculture with Environmental Management
- BSc (Hons) in Agriculture with Farm Business Management
- BSc (Hons) in Agriculture with Mechanisation.

Learners should always check the entry requirements for degree programmes with specific higher education providers.

How does the qualification provide employability and technical skills?

In the BTEC National units, there are opportunities during the teaching and learning phase to give learners practice in developing employability skills. Where employability skills are referred to in this specification, we are generally referring to skills in the following three main categories:

- **cognitive and problem-solving skills:** using critical thinking, approaching non-routine problems applying expert and creative solutions, using systems and technology
- **interpersonal skills:** communicating, working collaboratively, negotiating and influencing, self-presentation
- **intrapersonal skills:** self-management, adaptability and resilience, self-monitoring and development.

There are also specific requirements in some units for assessment of these skills where relevant, for example, where learners are required to undertake real or simulated activities.

Many of the mandatory and specified optional units encourage learners to develop the specific practical skills that employers are looking for.

How does the qualification provide transferable knowledge and skills for higher education?

All BTEC Nationals provide transferable knowledge and skills that prepare learners for progression to university or other higher study either immediately or for career progression. The transferable skills that universities value include:

- the ability to learn independently
- the ability to research actively and methodically
- the ability to give presentations and be active group members.

BTEC learners can also benefit from opportunities for deep learning where they are able to make connections among units and select areas of interest for detailed study. BTEC Nationals provide a vocational context in which learners can become prepared for lifelong learning through:

- effective writing
- analytical skills
- preparation for assessment methods used in degrees.

2 Structure

Qualification structure

Pearson BTEC Level 3 National Extended Diploma in Agriculture

Mandatory units

There are nine mandatory units, six internal and three external. Learners must complete and achieve at Near Pass grade or above in all mandatory external units. Learners must complete and achieve a Pass or above in all mandatory internal units in Group A. Learners must complete the mandatory internal units in Group B.

Optional units

Learners must complete at least six optional units.

Learners must complete and achieve at pass grade or above at least seven units across groups B and C.

Pearson BTEC Level 3 National Extended Diploma in Agriculture				
Unit number	Unit title	GLH	Type	How assessed
Mandatory units group A – learners complete and achieve all units				
1	Professional Working Responsibilities	120	Mandatory	External
2	Plant and Soil Science	120	Mandatory	External
3	Contemporary Issues in the Land-based Sectors	120	Mandatory	External
13	Managing Activities for Agricultural Enterprises	60	Mandatory and Synoptic	Internal
25	Agricultural Business Improvements	60	Mandatory and Synoptic	Internal
Mandatory units group B – learners complete all units and achieve at least one unit				
4	Work Experience in the Land-based Sectors	60	Mandatory	Internal
5	Estate Skills	60	Mandatory	Internal
8	Land-based Machinery Operations	60	Mandatory	Internal
9	Managing Environmental Activities in Agriculture	60	Mandatory	Internal
Optional units group C – learners complete six units				
6	Crop Production	60	Optional	Internal
7	Farm Livestock Husbandry	60	Optional	Internal
10	Crop Handling, Storage and Quality Assurance	60	Optional	Internal
11	Livestock Health and Diseases	60	Optional	Internal
12	Developing a Land-based Enterprise	60	Optional	Internal
14	Root Crop and Field Vegetable Production	60	Optional	Internal
15	Combinable Crop Production and Processing	60	Optional	Internal

Pearson BTEC Level 3 National Extended Diploma in Agriculture				
Unit number	Unit title	GLH	Type	How assessed
Optional units group C – learners complete six units <i>continued</i>				
16	Grass and Forage Crop Production	60	Optional	Internal
17	Poultry Production	60	Optional	Internal
18	Pig Production	60	Optional	Internal
19	Sheep Production	60	Optional	Internal
20	Beef Production	60	Optional	Internal
21	Dairy Production	60	Optional	Internal
22	Livestock Nutrition	60	Optional	Internal
23	Organic Agricultural Production	60	Optional	Internal
24	Land-based Workshop Practices	60	Optional	Internal
26	Selecting and Managing Land-based Machinery	60	Optional	Internal
27	Animal Genetics	60	Optional	Internal

External assessment

This is a summary of the type and availability of external assessment, which is of units making up 33 per cent of the total qualification GLH. See *Section 5* and the units and sample assessment materials for more information.

Unit	Type	Availability
Unit 1: Professional Working Responsibilities	<ul style="list-style-type: none"> • A task set and marked by Pearson and completed under supervised conditions. • The supervised assessment is 3 hours in a specified session timetabled by Pearson. • Written submission of evidence. • 60 marks. 	Jan and May/June First assessment January 2020
Unit 2: Plant and Soil Science	<ul style="list-style-type: none"> • A written examination set and marked by Pearson. • 1 hour 30 minutes. • Written submission. • 80 marks. 	Jan and May/June First assessment January 2020
Unit 3: Contemporary Issues in the Land-based Sectors	<ul style="list-style-type: none"> • A task set and marked by Pearson and completed under supervised conditions. • Learners will be given preparatory information before the supervised assessment. • The supervised assessment is 2 hours and 30 minutes in a specified session timetabled by Pearson. • Written submission of evidence. • 64 marks. 	Jan and May/June First assessment January 2021

Synoptic assessment

The mandatory synoptic assessment requires learners to select and apply learning from across the qualification to the completion of defined key vocational tasks.

Across the assessment for *Unit 13: Managing Activities for Agricultural Enterprises* and *Unit 25: Agricultural Business Improvements*, learners plan and carry out regular operational activities required for the successful running of an agricultural enterprise that informs their management strategies required to identify opportunities and plan for improvements in an agricultural business. Learners complete the tasks using knowledge and understanding from their studies of the sector and apply both transferable and specialist knowledge and skills.

Learners approach the assessment having completed study and skills development relating to: safe working practices and waste management in *Unit 1: Professional Working Responsibilities*; the role of plant growth, soil and plant management in agricultural activities in *Unit 2: Plant and Soil Science*; a broad range of issues facing agricultural enterprises in *Unit 3: Contemporary Issues in the Land-based Sectors*; supervision of others undertaking activities on the agricultural enterprise in *Unit 5: Estate Skills*; working practically and safely with a wide range of machinery in *Unit 8: Land-based Machinery Operations*; environmental management strategies in *Unit 9: Managing Environmental Activities in Agriculture*. Additionally, learners will have completed *Unit 4: Work Experience in the Land-based Sectors*, and gained experience of and insight into real working practices and business priorities in the sector.

In assessing these units assignments will require learners to select from and apply their learning from across their programme. The unit provides further information.

Employer involvement in assessment and delivery

You need to ensure that learners on this qualification have a significant level of employer involvement in programme delivery or assessment. See *Section 4* for more information.

3 Units

Understanding your units

The units in this specification set out our expectations of assessment in a way that helps you to prepare your learners for assessment. The units help you to undertake assessment and quality assurance effectively.

Each unit in the specification is set out in a similar way. There are two types of unit format:

- internal units
- external units.

This section explains how the units work. It is important that all teachers, assessors, internal verifiers and other staff responsible for the programme review this section.

Internal units

Section	Explanation
Unit number	The number is in a sequence in the sector. Numbers may not be sequential for an individual qualification.
Unit title	This is the formal title that we always use and it appears on certificates.
Level	All units are at Level 3 on the national framework.
Unit type	This shows if the unit is internal or external only. See structure information in <i>Section 2</i> for full details.
GLH	Units may have a GLH value of 120, 90 or 60. This indicates the numbers of hours of teaching, directed activity and assessment expected. It also shows the weighting of the unit in the final qualification grade.
Unit in brief	A brief formal statement on the content of the unit that is helpful in understanding its role in the qualification. You can use this in summary documents, brochures etc.
Unit introduction	This is designed with learners in mind. It indicates why the unit is important, how learning is structured, and how learning might be applied when progressing to employment or higher education.
Learning aims	These help to define the scope, style and depth of learning of the unit. You can see where learners should be learning standard requirements ('understand') or where they should be actively researching ('investigate'). You can find out more about the verbs we use in learning aims in <i>Appendix 2</i> .
Summary of unit	This new section helps teachers to see at a glance the main content areas against the learning aims and the structure of the assessment. The content areas and structure of assessment are required. The forms of evidence given are suitable to fulfil the requirements.
Content	This section sets out the required teaching content of the unit. Content is compulsory except when shown as 'e.g.'. Learners should be asked to complete summative assessment only after the teaching content for the unit or learning aim(s) has been covered.

Section	Explanation
Assessment criteria	<p>Each learning aim has Pass and Merit criteria. Each assignment has at least one Distinction criterion.</p> <p>A full glossary of terms used is given in <i>Appendix 2</i>. All assessors need to understand our expectations of the terms used.</p> <p>Distinction criteria represent outstanding performance in the unit. Some criteria require learners to draw together learning from across the learning aims.</p>
Essential information for assignments	<p>This shows the maximum number of assignments that may be used for the unit to allow for effective summative assessment, and how the assessment criteria should be used to assess performance.</p>
Further information for teachers and assessors	<p>The section gives you information to support the implementation of assessment. It is important that this is used carefully alongside the assessment criteria.</p>
Resource requirements	<p>Any specific resources that you need to be able to teach and assess are listed in this section. For information on support resources see <i>Section 10</i>.</p>
Essential information for assessment decisions	<p>This information gives guidance for each learning aim or assignment of the expectations for Pass, Merit and Distinction standard. This section contains examples and essential clarification.</p>
Links to other units	<p>This section shows you the main relationship among units. This section can help you to structure your programme and make best use of materials and resources.</p>
Employer involvement	<p>This section gives you information on the units that can be used to give learners involvement with employers. It will help you to identify the kind of involvement that is likely to be successful.</p>

External units

Section	Explanation
Unit number	The number is in a sequence in the sector. Numbers may not be sequential for an individual qualification.
Unit title	This is the formal title that we always use and it appears on certificates.
Level	All units are at Level 3 on the national framework.
Unit type	This shows if the unit is internal or external only. See structure information in <i>Section 2</i> for full details.
GLH	Units may have a GLH value of 120, 90 or 60 GLH. This indicates the numbers of hours of teaching, directed activity and assessment expected. It also shows the weighting of the unit in the final qualification grade.
Unit in brief	A brief formal statement on the content of the unit.
Unit introduction	This is designed with learners in mind. It indicates why the unit is important, how learning is structured, and how learning might be applied when progressing to employment or higher education.
Summary of assessment	This sets out the type of external assessment used and the way in which it is used to assess achievement.
Assessment outcomes	These show the hierarchy of knowledge, understanding, skills and behaviours that are assessed. Includes information on how this hierarchy relates to command terms in sample assessment materials (SAMs).
Essential content	For external units all the content is obligatory, the depth of content is indicated in the assessment outcomes and sample assessment materials (SAMs). The content will be sampled through the external assessment over time, using the variety of questions or tasks shown.
Grade descriptors	We use grading descriptors when making judgements on grade boundaries. You can use them to understand what we expect to see from learners at particular grades.
Key terms typically used in assessment	These definitions will help you analyse requirements and prepare learners for assessment.
Resources	Any specific resources that you need to be able to teach and assess are listed in this section. For information on support resources see <i>Section 10</i> .
Links to other units	This section shows the main relationship among units. This section can help you to structure your programme and make best use of materials and resources.
Employer involvement	This section gives you information on the units that can be used to give learners involvement with employers. It will help you to identify the kind of involvement that is likely to be successful.

Index of units

This section contains all the units developed for this qualification. Please refer to *pages 5–6* to check which units are available in all qualifications in the agriculture sector.

Unit 1:	Professional Working Responsibilities	21
Unit 2:	Plant and Soil Science	31
Unit 3:	Contemporary Issues in the Land-based Sectors	41
Unit 4:	Work Experience in the Land-based Sectors	49
Unit 5:	Estate Skills	59
Unit 6:	Crop Production	69
Unit 7:	Farm Livestock Husbandry	79
Unit 8:	Land-based Machinery Operations	89
Unit 9:	Managing Environmental Activities in Agriculture	99
Unit 10:	Crop Handling, Storage and Quality Assurance	109
Unit 11:	Livestock Health and Diseases	121
Unit 12:	Developing a Land-based Enterprise	131
Unit 13:	Managing Activities for Agricultural Enterprises	139
Unit 14:	Root Crop and Field Vegetable Production	151
Unit 15:	Combinable Crop Production and Processing	161
Unit 16:	Grass and Forage Crop Production	171
Unit 17:	Poultry Production	181
Unit 18:	Pig Production	193
Unit 19:	Sheep Production	205
Unit 20:	Beef Production	217
Unit 21:	Dairy Production	229
Unit 22:	Livestock Nutrition	241
Unit 23:	Organic Agricultural Production	251
Unit 24:	Land-based Workshop Practices	261
Unit 25:	Agricultural Business Improvements	271
Unit 26:	Selecting and Managing Land-based Machinery	283
Unit 27:	Animal Genetics	293

Unit 1: Professional Working Responsibilities

Level: **3**

Unit type: **External**

Guided learning hours: **120**

Unit in brief

Learners study professional responsible working practices with a focus on ensuring health and safety, wellbeing, resource management and waste management in the land-based sectors.

Unit introduction

The land-based sectors are made up of diverse industries, with the majority of people being self-employed. The sectors directly manage almost 90% of the UK's land mass. Promoting and maintaining welfare, health and safety, and effective waste management in the working environment is essential for all the sectors. It is also a key requirement for the development of all employees.

In this unit, you will investigate the impact that professional working responsibilities have on personal welfare. You will learn about health and safety legislation, safe working practices, risk assessments, and the professional skills required to work safely and effectively in the land-based sectors. You will develop skills in and knowledge of good practice and professional responsibility towards self and others in the workplace, including the duty of care for the environment, relating this to resource efficiency and responsible management. You will develop your skills to interpret appropriate policies, plans, audits, maps and schematic diagrams in relation to safe working practices, reducing the impact of waste, and analysing documentation to review operational plans. You will develop a sound understanding of personal and professional responsibilities required to enter employment, with a strong awareness of how to be safe and keep others safe. To complete the assessment task within this unit, you will need to draw on your learning from across your programme.

This unit will prepare you for progression to employment in a trainee or supervisory role in the land-based sectors or to set up your own land-based business. You will also gain skills that prepare you for further or higher education courses, including agricultural science, plant science, environmental studies and land management.

Summary of assessment

This unit is assessed by a task set by Pearson.

In the assessed task, learners are given information and will complete a number of activities demonstrating their knowledge and understanding of professional working responsibilities.

The task will be carried out under supervised conditions in a single three-hour session timetabled by Pearson.

The number of marks for the unit is 60.

The assessment availability is January and May/June each year. The first assessment availability is January 2020.

Sample assessment materials will be available to help centres prepare learners for assessment.

Assessment outcomes

AO1 Demonstrate knowledge and understanding of personal and professional working responsibilities and practices, risk management and waste management in the land-based sectors.

AO2 Analyse the application of personal and professional working responsibilities and practices, to risk management, and waste management in the land-based sectors.

AO3 Evaluate approaches to working personal and professional responsibilities and practices, risk management, and waste management in the land-based sectors.

AO4 Make connections between principles and practices of health and safety management in the land-based sectors.

Essential content

The essential content is set out under content areas. Learners must cover all specified content before the assessment.

A Professional responsibilities associated with the workplace

A1 Characteristics of professional working responsibilities and sources of relevant information

- Understanding the scope of professional working responsibilities in the land-based sectors, including:
 - compliance with current legislation and industry codes of practice
 - minimising risk to self, others and the environment
 - following industry best practice
 - working to industry standards
 - developing skills through continuing professional development (CPD).
- Stakeholders associated with developing, promoting and upholding professional responsibilities, including the role of:
 - employers
 - employees
 - government departments and agencies
 - trades unions
 - professional bodies and trade associations.
- Sources of information on professional working responsibilities, including:
 - staff handbooks, staff lists and staff induction documents
 - internet-based resources, including government legislation
 - professional publications
 - codes of conduct
 - contracts of employment.

A2 Characteristics and scope of personal responsibilities in the workplace

- Promoting a working environment and culture that is healthy, safe and effective, including awareness of the role of:
 - industry schemes
 - employer awareness campaigns
 - external training programmes and training providers
 - workplace policies, including whistleblower policies.
- Promoting effective working relationships.
- Awareness of factors that may have a negative impact on own and others' personal welfare and workplace performance, including:
 - personal stress
 - illness
 - work-related stress and workload
 - lone working.
- Accessing sources of assistance and support for wellbeing in the workplace, and their importance, including:
 - NHS services
 - charities
 - professional and trade organisations
 - professional counselling and mental health organisations
 - industry schemes.

- Awareness of the importance of CPD, including:
 - formal and informal opportunities for skills development
 - job shadowing
 - upskilling
 - awareness of industry-specific certificates of competence.

B Health and safety responsibilities

B1 Introduction to health and safety and associated legislation

Awareness of current health and safety legislation that applies in a working environment and how legislation impacts on working activities.

- Statutes and regulations current at the time of assessment:
 - Management of Health and Safety at Work Regulations 1999
 - Health and Safety at Work etc. Act 1974
 - Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013
 - Control of Substances Hazardous to Health (COSHH) Regulations 2002
 - Manual Handling Operations Regulations 1992
 - Work at Height Regulations 2005
 - Provision and Use of Work Equipment Regulations (PUWER) 1998
 - Lifting Operations and Lifting Equipment Regulations (LOLER) 1998
 - The Electricity at Work Regulations 1989.
- Health and safety audit, including:
 - analysis of previous incidents and near misses
 - identifying good practice, poor practice and gaps in health and safety policies and procedures
 - suggesting improvements
 - setting objectives
 - considering cost-benefit implications of issues identified and improvements suggested.

B2 Safe working practices

Awareness of key concepts of safe working practices, with reference to health and safety and the environment.

- The importance of training staff and implementing policies and practices in order to maintain appropriate standards in health and safety practices.
- Access to adequate welfare facilities, including drinking water, toilets, wash facilities.
- Provision of an appropriate and safe working environment, including ventilation, temperature, lighting and adequate maintenance of the working area.
- Provision of first-aid training and equipment, including first aid at work training.
- Using personal protective equipment (PPE) correctly, including when:
 - operating, maintaining and repairing machinery
 - handling organic or hazardous substances
 - requiring protection from ultraviolet (UV) light
 - requiring protection from weather conditions.
- Minimising risk of disease, including:
 - wearing correct clothing
 - using the correct equipment and in the correct manner
 - practising appropriate standards of biosecurity, including hygiene and self-awareness
 - awareness of causes and symptoms of common diseases affecting those working in land-based sectors, including legionnaires' disease, leptospirosis, tetanus, salmonella, Lyme disease, E. coli, cryptosporidium.
- Safe use of machinery, including standard operating procedures (SOPs) for common land-based machinery and the consequences if SOPs are not followed.

- Fire safety, including:
 - fire alarms, extinguishers and blankets
 - ensuring combustible materials are stored in a safe and appropriate way
 - taking reasonable steps to minimise risk of fire and arson in buildings and in the environment.
- Producing and displaying an evacuation plan for all areas, including evacuation in the event of fire.
- Electrical safety, including:
 - requirement for all electrical work to be carried out by a competent person
 - ensuring all electrical equipment is in an appropriate state for use
 - portable appliance testing (PAT) and residual current devices (RCDs)
 - overhead lines and underground cables
 - using rechargeable equipment and tools where appropriate.
- Displaying safety information, including symbols on machinery and product labels.
- Signage, including:
 - fire safety signage
 - signs prohibiting certain behaviour
 - warning signs
 - signs prescribing specific behaviour
 - signs indicating emergency escape or first aid.
- Reporting of accidents and near misses.
- Importance of working in ways that avoid or minimise negative environmental impacts, including:
 - knowledge and application of legislation relevant to environmental impacts
 - being aware of the potential environmental impact, both negative and positive, of activities carried out in the workplace
 - steps that can be taken in order to minimise the negative environmental impacts of work carried out.

B3 Risk assessment

The requirement to carry out risk assessments, dynamic risk assessments and the relationship to current relevant legislation.

- Using and interpreting risk assessments:
 - written or static risk assessments prepared before the activities
 - dynamic risk assessment carried out while undertaking activities
 - qualitative or subjective analysis of risk
 - numerical or objective analysis of risk, including severity and likelihood, hierarchy of controls.
- Risk mitigation strategies and their implementation to manage identified risks, including:
 - cost–benefit analysis of specific mitigation strategies.
- Producing dynamic risk assessments:
 - presence of the general public, employees and contractors
 - interpretation of given information, including product labels, signage and COSHH data sheets
 - lone working practices.

B4 Schematics and maps

The importance of maps and schematic diagrams in establishing the locations of services and drainage, for purposes relating to health and safety, land management and the environment.

- Interpreting and using maps and schematics at a variety of scales.
- Using maps and schematics to analyse and record information, including:
 - the role of Global Positioning System (GPS), aerial photographs and online mapping services.
- Determining and checking the location of services, both overground and underground.

- Equipment and techniques required to locate services accurately, including the:
 - use of cable avoidance tool (CAT) and Genny
 - importance of safe digging techniques
 - importance of isolating services, including gas, water and electric.

B5 Purpose of risk assessment

- Uses and implementation of risk assessments.
- Scenarios for risk assessment use:
 - application of health and safety, environmental and waste management policies and procedures
 - response to a specific incident, including incidents reported in the press
 - the permanent or temporary change of use of land or buildings
 - the purchase or installation of new equipment
 - the development of a new enterprise or new methods of working
 - implementing new initiatives, including changes to legislation.

C Managing waste responsibly and safely

Classify waste, understand the relevant legal responsibilities and develop waste management strategies that consider the cost–benefit implications of waste management.

C1 Animal, plant and non-organic waste

- Definition and sources of organic and inorganic wastes in the land-based sectors, including:
 - aggregates, plastics and metals
 - biodegradable waste
 - controlled waste
 - hazardous waste
 - dirty or foul water
 - grey water.
- Awareness that designated areas in the working environment have specific types of items and processes for waste disposal and management.

C2 Legal responsibilities for waste management

- Current waste management legislation and documentation specific to land-based sectors, including:
 - duty of care
 - waste exemptions
 - waste disposal documentation
 - hazardous and controlled waste
 - custody of waste.
- The waste hierarchy system, including:
 - prevention, including procurement to reduce waste
 - prepare to reuse
 - recycle
 - other recovery, including incineration, anaerobic digestion and gasification, and pyrolysis with energy recovery
 - disposal, including landfill and incineration without energy recovery.
- The potential impact of waste and waste disposal on sustainability, climate change and the environment, including:
 - advantages and disadvantages
 - social factors
 - economic factors
 - environmental factors.
- Innovations in waste management.

C3 Environmental and waste management policies, plans and audits

Documents and processes related to health, safety, the environment and waste management.

- Use of audits to establish the current situation in a business or enterprise.
- Audit procedures, including frequency, checklists, logs, metering and measurements.
- The role of audits to inform or update plans and policies.
- Financial implications and cost–benefit analysis of waste storage and disposal, including:
 - economic advantages and disadvantages of specific waste management strategies
 - environmental advantages and disadvantages of specific waste management strategies.

Grade descriptors

To achieve a grade learners are expected to demonstrate these attributes across the essential content of the unit. The principle of best fit will apply in awarding grades.

Level 3 Pass

Learners will demonstrate knowledge and understanding of basic professional working and safe working in a land-based setting. Learners will demonstrate that they can apply safe working practices to a given context. They will identify areas of good practice, areas where standards could be raised and outline basic methods of doing this. Learners will be able to make some connections between the risks that are associated with a specific activity in a given context, with a range of variables. Learners will apply some valid concepts to the correct and safe management of different types of waste, they will understand the need to apply legal and environmental considerations to this and the management of resources, and its link to sustainability.

Level 3 Distinction

Learners will demonstrate detailed knowledge and understanding of professional working and safe working in a land-based setting. Learners will demonstrate that they can apply justified safe working practices to a given context. They will identify areas of good practice, areas where standards could be raised and outline accurate recommendations for doing this, using a detailed and appropriate action plan. Learners will be able to make appropriate and justified connections between the risks that are associated with a specific activity in a given context, with a range of variables. Learners will apply accurate and detailed concepts to the correct and safe management of different types of waste, they will understand the need to apply legal and environmental considerations to this and the management of resources, and its link to sustainability.

Key words typically used in assessment

The following table shows the key words that will be used consistently by Pearson in our assessments to ensure learners are rewarded for demonstrating the necessary skills.

Please note: the list below will not necessarily be used in every paper/session and is provided for guidance only.

Command or term	Definition
Analyse	Learners present the outcome of methodical and detailed examination either: <ul style="list-style-type: none"> to discover the meaning or essential features of a theme, topic or situation by breaking something down into its components or examining factors methodically and in detail by identifying separate factors, stating how they are related and explaining how each one contributes to the topic.
Complete	Learners enter relevant information or data as required to a structured item such as a table or diagram.
Dynamic risk assessment	The process of identifying risks and hazards continuously and in response to changes in situations and activities.

Command or term	Definition
Evaluate	Learners review information before bringing it together to form a conclusion or come to a supported judgement of a subject's qualities in relation to its context, drawing on evidence: strengths, weaknesses, alternative actions, significance, relevant data or information.
Health and safety audit	The auditing of information on the effectiveness of health and safety policies and procedures.
Interpretation	Learners are able to draw the meaning, purpose or qualities of something from a stimulus.
Justify/Justification	Learners give reasons or evidence to: <ul style="list-style-type: none"> • support an opinion and/or decision • prove something right or reasonable.
Recommend	Learners put forward someone or something with approval as being suitable for a particular purpose or role.
Strategies	Method or plan to bring out a desired outcome, such as the achievement of a goal or solution to a problem.
Waste management plan	A plan for the disposal of a range of waste materials, showing consideration of legal requirements, environmental responsibilities and sustainability.

Links to other units

This unit links to *Unit 4: Work Experience in the Land-based Sectors*.

Employer involvement

This unit would benefit from employer involvement in the form of:

- masterclasses
- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 2: Plant and Soil Science

Level: **3**

Unit type: **External**

Guided learning hours: **120**

Unit in brief

Learners study the structural and functional features of plants and soils that inform management practices.

Unit introduction

Plants are one of the most amazing and varied living organisms on our planet. They supply us with our oxygen, provide us with food and shape our landscape. Understanding how plants grow and what they need to be successful is essential for their management in a range of sectors and for a broad range of purposes, including growing crops for people or livestock, growing decorative plants and providing environments for leisure or habitat conservation.

In this unit, you will develop an understanding of external and internal plant structures, including plant cells. You will learn about the relationship between these structures and their function, such as how they obtain their nutrition and how they reproduce. You will gain an understanding of important life processes of plants and how these are affected by their environment. You will learn about the physical and chemical characteristics of soil. You will also learn different types of soil, their characteristics and the essential nutrition in soils that plants need to ensure their success.

The knowledge and skills gained in this unit are fundamental to any role where you grow, plant, manage or establish plants. Whether you are working in forestry, arable farming, sports turf, landscaping or gardening, this unit will give you a foundation for further study at higher education or roles in your chosen sector.

Summary of assessment

This unit is assessed by an examination set and marked by Pearson.

The examination will last for 1 hour and 30 minutes. The number of marks for the paper is 80.

The paper will consist of a variety of question types, including extended open response.

The assessment availability is January and May/June each year. The first assessment availability is January 2020.

Sample assessment materials will be available to help centres prepare learners for assessment.

Assessment outcomes

AO1 Demonstrate knowledge of structures and functions in plant and soil science

Command words: complete, describe, give, identify, match, name, state

Marks: ranges from 1 to 4 marks

AO2 Demonstrate understanding of plant and soil science, including soil and plant management practices

Command words: define, describe, explain, give, label, link, match, outline

Marks: ranges from 1 to 4 marks

AO3 Apply knowledge and understanding of plant and soil science in the context of managing plant growth

Command words: analyse, assess, compare, discuss, evaluate, examine, explain

Marks: ranges from 6 to 8 marks

AO4 Make connections between managing soil and plant growth in different contexts

Command words: analyse, assess, compare, discuss, evaluate

Marks: ranges from 6 to 8 marks

Essential content

The essential content is set out under content areas. Learners must cover all specified content before the assessment.

A Plant structure and systems

Structures and functions of plants, including cells, life processes and their role in the growing of healthy plants.

A1 Plant cell structure and specialisations

Structure and function of plant cells and their components linked to their role and location.

- Cell structure and organelles: cell wall, plasma membrane, nucleus, vacuole, cytoplasm, ribosome, mitochondria, chloroplasts, rough endoplasmic reticulum, smooth endoplasmic reticulum, Golgi apparatus, microtubules.
- Cell division by mitosis and meiosis, including prophase, metaphase, anaphase, telophase, cytokinesis, genetic differences.
- Cell specialisations, including distribution of chloroplasts:
 - root, including leucoplasts, endodermis, epidermis, stele, apical meristem, parenchyma, root hair, root cap
 - stem, including parenchyma, lenticels, meristems
 - leaf, including guard cells, epidermis, palisade mesophyll, spongy mesophyll, vascular bundle
 - flowering parts, including chromoplasts, pollen, gametes, zygote.

A2 Plant structure and function

Functions of plant structures in relation to plant growth and development, including changes to seasonal conditions.

- Root and stem structure:
 - root structure, including fibrous, adventitious and taproot system; functions, including anchorage, osmosis and absorption of minerals, transport system to plant, food storage
 - storage organs, including bulbs, corms, rhizomes, tubers
 - shoot structure, stem characteristics, node, internode, lateral bud, terminal bud; leaf arrangements, including alternate, opposite and whorled, lenticel; function, including support, bear leaves, transport system of water and nutrients around the plant, growth
 - vascular bundles, including xylem, phloem, cambium.
- Leaf structure:
 - leaf characteristics, petiole, lamina, margin, midrib, apex, base; venation, including reticulated and parallel
 - differences between evergreen and deciduous leaves
 - leaf types, including simple and compound, petiolated and sessile, leaf shapes.
- Characteristics of evergreen plants, to include *Ilex*, *Taxus* and *Picea*.
- Characteristics of deciduous plants, to include *Betula*, *Fagus* and *Fraxinus*.
- Characteristics of grasses: *Triticum* and *Hordeum*.

A3 Plant processes

Processes and requirements for healthy plant growth, including the features, structure and function of relevant plant tissues.

- Photosynthesis, including:
 - role of chloroplast structure and chlorophylls
 - light dependent and independent stages, carbon fixation
 - factors influencing the rate of photosynthesis, to include temperature, carbon dioxide levels, leaf colour, leaf area, light availability, water supply, nutrients.
- Respiration:
 - aerobic and anaerobic respiration
 - factors influencing respiration rates, including temperature, oxygen, light, carbon dioxide, water availability, plant growth.
- Compensation point in relation to respiration and photosynthesis, including plasmodesmata.
- The role of osmosis in turgidity, flaccidity and plasmolysis.
- Diffusion of carbon dioxide, oxygen and water vapour into and out of plants.
- Translocation in the phloem.
- Transpiration in the xylem:
 - factors affecting transpiration, including the sun, air temperature, humidity, air movement, water supply
 - guard cells and stomata, including regulation of opening and closing to facilitate gas exchange and control transpiration in plants.

A4 Plant nutrition

Nutritional requirements for growth and development of healthy plants.

- Role of the elements required for plant growth:
 - elements from soil water and the atmosphere, carbon (C), hydrogen (H), oxygen (O)
 - macronutrients: nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), sulfur (S)
 - micronutrients: boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), zinc (Zn), nickel (Ni).

Effects of lack of nutrition on growth and development of plants.

- Effects of the lack of macro and micro nutrients and how these are shown in the plant:
 - signs of deficiencies, chlorosis of the leaves, stunted growth, distorted foliage, aborted flowers or pods, absence of flowering, fruiting, weak stems, leaf striping, leaf spotting, necrosis or plant death
 - causes of nutritional deficiencies, acidic or alkaline soil, deviation from optimum pH, soil type, leaching, drought, waterlogging.

A5 Reproduction systems

- Structure and function of reproductive parts of flowering plants:
 - differences between dioecious, monoecious and hermaphrodite flowering plants
 - angiosperms and characteristics of monocotyledon and dicotyledonous flowers
 - parts of the flower, receptacle, calyx, corolla, perianth, pedicel, peduncle, bract
 - androecium, including filament, anther
 - gynoecium: carpels, ovary, style, stigma.
- Pollination processes:
 - self-pollination and cross-pollination
 - entomophilous pollination and anemophilous pollination and pollen transfer.
- Fertilisation processes – development and characteristics of pericarp in:
 - simple and compound succulent fruit
 - dry fruit, including dehiscent, indehiscent and schizocarpic seeds.

- Germination:
 - parts of the seed, testa, embryo, including cotyledon(s), epicotyl, plumule, hypocotyl, radicle
 - seed dispersal systems, dormancy, viability, vigour
 - hypogeal germination
 - epigeal germination
 - factors that affect successful germination, including age of seed, light, air, moisture, temperature and viability.
- Asexual reproduction, including rhizome and stolon.

B Soil

The characteristics of soil and the importance of soil fertility in relation to plant health and successful growth.

B1 Soil types and texture

- Soil types, to include sand, silt, clay, chalk, peat and loam.
- Soil texture:
 - soil particles for sand, silt, clay and loam, including water holding capacity, permeability, workability, organic matter, particle size, fertility, pH
 - soil grading and particle sizes, including use of hand texturing.

B2 Soil structure

- Soil profiles and horizons in relation to rooting depths, including aggregates, topsoil, subsoil, parent rock.
- Structural characteristics: single grain, granular, blocky, platy, columnar and prismatic structures, including particles, water and air space, and air-filled porosity.
- Effects of topography and weathering on soil:
 - aspect, shape of the land, slopes, dips, free-draining soils, poor drainage, water table
 - climatic factors, including wind, rain, frost, erosion
 - physical, chemical and biological effects on soil formation.

B3 Biological and chemical activities affecting soil health and fertility

Impact on soil health and fertility, and plant growth, of biological and biochemical activities.

- Biological activity in the soil profile: bacteria, fungus, actinomycetes, saprophytic fungi and mycorrhizae.
- Role of rhizobium bacteria in fixing atmospheric nitrogen.
- Indicators of good soil fertility and impact on soil health:
 - interaction of animals and vegetation with soil and links to biological weathering
 - role of organisms in improving soil condition and health
 - living organisms in the soil profile: slugs, snails, earthworms, woodlice, springtails, beetles and eelworms.
- Sources and cycles of carbon and nitrogen.
- The role of organic matter, including humus, peat, farmyard manure, including pig, horse, cow and chicken, slurry, leaf mulch, bark, composts, seaweed, green manure, sewage sludge, straw, industrial waste.

B4 Soil acidity and alkalinity

- Effects on plant and root growth:
 - plant health, nutrient availability, microbial activity, plant yield
 - characteristics of calcifuge, calcicole plants.
- Interpretation of pH scale test results.
- Causes of changes in soil acidity and alkalinity:
 - applications of lime, aluminium sulfate, ferrous sulfate, organic matter
 - poor drainage, watering, buffering capacity.

B5 Soil water

Processes affecting water availability in soil and its effect on plant growth.

- Relationship of soil characteristics to infiltration and permeability rates.
- Cause and effect of water availability, water tables, natural springs, cultivation techniques and drainage.
- Water stress on soils, including drought and flooding.
- Water content and the relationship between:
 - gravitational water and saturation point
 - capillary rise and field capacity
 - hygroscopic action and permanent wilting point
 - moisture holding and water holding capacity.

C Managing plant growth media**C1 Soil management**

Managing soil for optimum plant growth in indoor and outdoor soils, including protective environments, gardens, fields and sports turf.

- Soil aeration: purpose and methods.
- Integration of organic matter: purpose and methods.
- Irrigation methods, including water conservation: recycling and rain capture, plant choice, application timings, use of moisture-sensing equipment/computer control.
- Soil drainage methods, including changes to soil texture, water courses and ditches.
- Characteristics of fertilisers:
 - nitrogen (N), phosphorus (P) and potassium (K) ratios
 - length of nutrient release related to fertiliser form
 - application methods for liquid, granular, powder, pellets, granules, powders, prills, frits.
- Adjusting soil acidity and alkalinity: purpose and methods.
- Effects of over application of fertiliser on soil health and plant growth.
- Impact on environment of fertiliser leaching.

C2 Soil alternatives

Purposes and methods of using soil alternatives.

- Purpose of growing plants without the use of soil: yield increase, quicker growth, less use of chemicals, lower incidences of disease, recycling water solutions.
- Drip irrigation (slow feed system), deep water culture (root immersion in nutrient water supply), ebb and flow (periodic flooding of plants).
- Types and characteristics of non-soil material and loam-free composts:
 - large particle material, to include sand and gravel
 - fibrous material, to include sphagnum peat moss
 - porous and absorbent material, to include perlite, vermiculite, rock wool and oasis cubes
 - composted or aged material, to include pulverised bark, coconut coir.

Grade descriptors

To achieve a grade learners are expected to demonstrate these attributes across the essential content of the unit. The principle of best fit will apply in awarding grades.

Level 3 Pass

Learners demonstrate a basic understanding of the structures and functions of plant cells. They are able to identify the main features and requirements of plants as related to their growth. Learners demonstrate an understanding of the characteristics of different soil types and basic methods for managing and improving soil to promote healthy plant growth.

Level 3 Distinction

Learners demonstrate a thorough understanding of plant structure linked to function, from a cellular to whole plant level. They are able to articulate practices used in soil management for optimising plant growth and yield. Learners can analyse data and information relating to plant and soil science and management practices, interpreting this in order to draw reasoned conclusions. They can make connections between the characteristics of different soils, the requirements of plants and the potential implications of soil management practices.

Key words typically used in assessment

The following table shows the key words that will be used consistently by Pearson in our assessments to ensure learners are rewarded for demonstrating the necessary skills.

Please note: the list below will not necessarily be used in every paper/session and is provided for guidance only.

Command or term	Definition
Analyse	Present the outcome of methodical and detailed examination of information or data to interpret and study key trends and interrelationships.
Apply	Put knowledge, understanding or skills into action in a particular context.
Assess	Evaluate or estimate the nature, ability or quality of something.
Compare	Identify the main factors relating to two or more items/situations or aspects of a subject that is extended to explain the similarities, differences, advantages and disadvantages.
Complete	Place a word(s) or number(s) in a sentence, paragraph, table or graph to give the correct answer/sense.
Define	State or describe the nature, scope or meaning of a subject as objective facts.
Describe	Give an account in words of someone or something, including all of the relevant characteristics, qualities or events.
Discuss	Consider different aspects of a topic, how they interrelate and the extent to which they are important.
Draw	Create a graphical or visual representation of information.

Command or term	Definition
Explain	Understand the origins, functions and objectives of a subject and its suitability for purpose. Give reasons to support an opinion, view or argument, with clear details.
Give	Provide one or more piece(s) of information.
Identify	Establish or indicate the origin, nature or definitive character of something. Usually requires some key information to be selected from a given stimulus/source.
Label	Name or provide key information about a stimulus material.
Name	Give the correct term for something.
Outline	Provide a general description of key principles, usually in relation to a process, method or concept.
State	Express the condition of or facts about something definitely or clearly.

Links to other units

This is an underpinning unit for the qualification.

Employer involvement

Centres can involve employers in the delivery of this unit if there are local opportunities to do so. There is no specific guidance related to this unit.

Unit 3: Contemporary Issues in the Land-based Sectors

Level: **3**

Unit type: **External**

Guided learning hours: **120**

Unit in brief

Learners critically explore contemporary issues in the land-based sectors through research and analysis.

Unit introduction

For those working in a land-based sector keeping up to date with issues affecting the sector, for example environmental politics, emerging technologies and working practices, is essential. When you are exploring contemporary issues, as well as being aware of the 'next big thing', you will need to be able to apply your skills to make judgements about the relevance and importance of the issue to the organisation or sector in which you work.

In this unit, you will study, from a range of perspectives, the different issues that affect your sector, and consider how information and knowledge is transferred across and between land-based industries. You will develop the skills needed to assess the validity and reliability of sources of information as well as how data and information are used or misused in different situations. These skills will help you to form reasoned opinions about the issues you come across in your working life. Completion of this unit will help you to progress to a management role or to self-employment in the land-based sector. The unit will also prepare you to study a higher education course in your chosen field.

Summary of assessment

This unit is assessed by a task set by Pearson, consisting of Part A and Part B. For Part A, learners will be given information relating to a specific contemporary issue in the land-based sector two weeks before the supervised assessment, in order to carry out monitored preparatory research. Learners are expected to spend approximately six hours on this research.

For Part B, learners will complete the set task using their preparatory research. The task will contain a number of activities enabling them to demonstrate their knowledge and understanding of contemporary issues. Learners will take Part B in a supervised assessment in a single two-hour and 30 minute session timetabled by Pearson.

The number of marks for the unit is 64.

The assessment availability is January and May/June each year. The first assessment availability is January 2021.

Sample assessment materials will be available to help centres prepare learners for assessment.

Assessment outcomes

AO1 Demonstrate understanding of how contemporary issues affect the land-based sectors

AO2 Demonstrate understanding of critical approaches to the reporting of contemporary issues in the land-based sectors

AO3 Analyse information and data from a range of sources to draw conclusions and present findings related to contemporary issues in the land-based sectors

AO4 Evaluate the relevance and validity of information on contemporary issues in the land-based sectors for given contexts

AO5 Make connections between differing perspectives when considering recommendations on contemporary issues in the land-based sectors

Essential content

The essential content is set out under content areas. Learners must cover all specified content before the assessment.

A Land-based contemporary issues

Learners investigate significant issues for the land-based sectors that are affected by current developments in the industries and for which information and research is made available.

Learners focus on cross-sector issues and issues related to their specific sub-sector.

A1 Issues facing the land-based sector

People and employment.

- Issues relating to: education; professionalisation of career paths; development and assessment of competencies, including certification and health and safety practices; managing physical and mental health; skills shortages and seasonal employment.
- Sub-sector specific issues, including: *agriculture* – age profile of industry, average wages; *countryside management* – urban job migration, purchasing of second homes in the countryside and the impact on rural services, impact of volunteers on employment opportunities; *forestry and arboriculture* – international trade, imports; *horticulture* – international sourcing.

Technology.

- Issues relating to: mechanisation and automation of systems and processes; technology in monitoring and precision of production; GPS and mapping technology.
- Sub-sector specific issues, including: *agriculture* – varietal improvement, reduction in emissions, research, use of robotics; *countryside management* – erosion control, environmental modelling, climate change modelling; *forestry and arboriculture* – clonal selection, genetic provenance; *horticulture* – development of protected growing techniques, extending the production season to reduce imports.

Land use.

- Issues relating to: loss of rural land to urbanisation; service and leisure focus.
- Sub-sector specific issues, including: *agriculture* – production efficiency, land cost in relation to production costs; *countryside management* – green belt development, impacts of tourists on designated geographic areas such as Sites of Special Scientific Interest (SSSIs), fracking, quarrying, conflict arising from land use for conservation and land use for recreation and other uses resulting in habitat loss; *forestry and arboriculture* – plantation management; *horticulture* – land costs in relation to production or use.

Pests and pest control.

- Issues relating to: awareness of pests, including new threats and available controls, and their risks and limitations; development of resistance to control methods; control of transmissible plant disease.
- Sub-sector specific issues, including: *agriculture* – control of infectious livestock diseases, pesticide use; *countryside management* – impact of pesticides and herbicides on wild populations, impact and control of alien species, impact of the reintroduction of native predatory species; *forestry and arboriculture* – ash dieback, sudden oak death, phytosanitary precautions on imports; *horticulture* – biological and non-chemical controls, genetically modified organisms (GMOs).

Interaction with the public.

- Issues relating to: public opinion and differing perception of rural and urban populations; retail methods; access and rights of way.
- Sub-sector specific issues, including: *agriculture* – GMOs, ethical food production, educating public in food production; *countryside management* – tourism, diversification, education to increase understanding of wildlife and habitats; *forestry and arboriculture* – right to roam, use of forestry and woodland for leisure and recreation; *horticulture* – retail developments and planning, customers, users of amenity green space, public parks and public open spaces.

Environmental management.

- Issues relating to: environmental legislation, climate change and extreme weather events, sources of air, land and water pollution, waste, recycling, biodiversity.
- Sub-sector specific issues, including: *agriculture* – application of fertilisers, Nitrate Vulnerable Zones (NVZs), soil degradation and conservation, stewardship schemes; *countryside management* – environmental interactions, landfill waste, threats to native species, endangered species, disaster mitigation; *forestry and arboriculture* – short rotation coppice for electricity and heat production, land drainage for forestry, returning the landscape to pre-plantation state; *horticulture* – escaping and alien species.

Sustainability.

- Issues relating to: resource and waste management.
- Sub-sector specific issues, including: *agriculture* – food miles, organic production, anaerobic digestion, sustainable production techniques; *countryside management* – government grants for environmental enhancement, wind and solar power, anaerobic digestion; *forestry and arboriculture* – land renewal, afforestation, reforestation and deforestation, coppicing; *horticulture* – composting, use of non-renewable growing media, e.g. peat.

A2 Perspectives

Perspectives to explore and investigate contemporary issues.

- Political and ideological, including: national and international governments' views and policies, lobbyists, non-governmental organisations (NGOs) and pressure groups.
- Economic, including: funding, cost-effectiveness, business performance.
- Social and cultural, including: history, the needs and views of people from different communities.
- Legal and ethical, including: constraints of national law and ethical considerations on actions.

B Sources of evidence, information and data

B1 Establishing validity and reliability of sources

Methods by which information is gained and disseminated through the industry, and approaches used to recognise reliable sources of information and establish the validity of claims made.

- Peer-review process, e.g. journals and papers.
- Organisations involved in research and development:
 - universities
 - commercial organisations
 - non-governmental government-sponsored bodies, e.g. Forestry Commission (FC), Forestry Commission Scotland, Natural Resources Wales (NRW)
 - UK government areas, e.g. Department for Environment, Food and Rural Affairs (Defra), Office for National Statistics (ONS)
 - charities and community organisations, e.g. National Trust, Forestry Commission (FC), Royal Society for the Protection of Birds (RSPB), Royal Horticultural Society (RHS)
 - media and dissemination of information
 - industry publications and reviews
 - radio and television programmes.

B2 Using evidence to explore contemporary issues

Determining the validity and reliability of sources of evidence available for the exploration of contemporary issues.

- Identifying relevant and reliable sources of information.
- Exploring diverse views and opinions, while recognising potential sources of bias, e.g. 'cherry-picking' evidence, potential gains for the author of endorsing products or opinions, prejudice, vested interest.

- Distinguishing between fact and opinion.
- Style and tone according to intended audience: use of photographs and diagrams, layout, language.
- Use and misrepresentation of information: primary and secondary evidence, reliance on out-of-date or unreliable sources.
- Differences between qualitative and quantitative data.
- Use and misuse of data, including: sample sizes, use of control groups, presentation, statistical significance.
- Interrogating research:
 - the research or activity that has been carried out
 - why the research or activity has been carried out
 - how stakeholders, groups, individuals and the public may be affected by the research or activity
 - the potential positive and negative implications of the research or activity.

C Using research to inform decisions

C1 Research methods

Methods and approaches enabling the development of supported arguments and decisions on contemporary issues.

- Types of research:
 - quantitative – collection and use of data, summarising data presented, inferences obtained from data sources
 - qualitative – gathering information from the written word, analysis of text, understanding reasons to develop opinions, exploratory research to extend knowledge.
- Reading methods:
 - skimming – basic quick reading to determine the quality of the information
 - scanning – reading to locate key words or phrases
 - extensive – reading for pleasure at a relaxed pace
 - intensive – in-depth reading of all the information.
- Researching information:
 - obtaining and selecting information, identifying key details and issues, examining case studies and scenarios
 - relevance of information through use of a variety of sources, books, magazines, journals and the internet.
- Organisation of information, e.g. significance of information and detail, grouping together related points of evidence.
- Analysis of information:
 - examining claims from conflicting interests and perspectives
 - references to factual information and evidence sources.

C2 Evidence-based reasoning

- Presenting researched arguments:
 - use of supporting and opposing evidence, including judgements on reliability and validity
 - presenting information and solutions in a range of formats
 - linking information to source material and use of referencing methods, e.g. Harvard referencing
 - structure of arguments and analysis: introductions, presentation and discussion of research evidence and sources accounting for different perspectives, summaries and conclusions.

Grade descriptors

To achieve a grade learners are expected to demonstrate these attributes across the essential content of the unit. The principle of best fit will apply in awarding grades.

Level 3 Pass

Learners will demonstrate a basic knowledge and understanding of current issues affecting the land-based sector. They will show an understanding of how knowledge is transferred through the sector, applying their knowledge and understanding of how data and information is obtained and presented to establish valid and reliable sources of information. They will be able to make straightforward connections between different issues in the sector and draw conclusions, giving reasoned, evaluative judgements of the sources.

Level 3 Distinction

Learners will be able to integrate relevant knowledge and understanding of current issues to demonstrate a deeper understanding of their own industry and the sector as a whole. They will show a sound understanding of the processes by which valid and reliable sources are judged. Learners will be able to interpret, analyse and evaluate sources of data and information, making effective links between these and their own research. They will apply their knowledge and understanding to rationally justify their own opinions and suggested courses of action, fully supporting their conclusions with appropriate and relevant evidence.

Key words typically used in assessment

The following table shows the key words that will be used consistently by Pearson in our assessments to ensure learners are rewarded for demonstrating the necessary skills.

Please note: the list below will not necessarily be used in every paper/session and is provided for guidance only.

Command or term	Definition
Contemporary issue	A topic or subject related to the land-based sectors as defined in the unit content (section A1).
Perspective	A viewpoint or approach from which to consider an issue, as defined in the unit content (section A2).
Scenario or context	An imagined or real-life situation used in assessment as a means to evidence understanding of an issue.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 2: Plant and Soil Science
- Unit 4: Work Experience in the Land-based Sectors.

Employer involvement

This unit would benefit from employer involvement in the form of:

- masterclasses
- contribution of ideas to unit assignment and project materials
- support from local land-based organisation staff as mentors.

Unit 4: Work Experience in the Land-based Sectors

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners research work opportunities in the land-based sectors and the skills needed to attain them, developing communication and employability skills through study and work experience.

Unit introduction

Where do you picture yourself in five years' time? Do you know about the wide range of career opportunities open to you in the land-based sectors? Discovering these opportunities and understanding the skills and qualifications needed in order to gain employment in these sectors will help you to answer these questions as well as to plan your career.

In this unit, as well as investigating employment opportunities, you will examine how good communication and employability skills can improve your prospects in gaining and staying in employment. You will learn how and where to access information about employment vacancies and further courses of study as well as how to develop your curriculum vitae (CV) and adapt it for specific vacancies. You will also learn how to develop good communication, interview and customer service skills. You will apply for and take on available work experience roles in the sector and reflect on your own progress.

This unit will help prepare you for employment in the land-based sectors in areas such as forestry, arboriculture, aquaculture, landscaping, horticulture, fencing, fisheries management, floristry, gamekeeping, conservation, countryside management and wildlife management, and their related service industries. It will also help you progress to higher education in courses such as BSc (Hons) degrees in agriculture, countryside management, horticulture and forestry management.

Learning aims

In this unit you will:

- A** Investigate employment opportunities in the land-based sectors to target progression
- B** Develop communication and interview skills to improve employment prospects in the land-based sectors
- C** Undertake work experience in the land-based sectors to contribute to personal and professional development.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate employment opportunities in the land-based sectors to target progression	A1 Scope of the land-based sectors A2 Requirements for progression A3 Relevant legislation for work placement opportunities	A portfolio of work-related learning research, completed application documents and mock interview outcomes, e.g. observation, video.
B Develop communication and interview skills to improve employment prospects in the land-based sectors	B1 Applying for work-related activities B2 Interview skills B3 Reflecting on preparation and performance	
C Undertake work experience in the land-based sectors to contribute to personal and professional development	C1 Practical work experience C2 Work behaviours C3 Reflecting on workplace practice	A report reflecting on work experience, informed by employer verification of participation and other feedback.

Content

Learning aim A: Investigate employment opportunities in the land-based sectors to target progression

A1 Scope of the land-based sectors

- Analysis of progression opportunities to determine desirability, suitability and feasibility.
- Land-based sectors – appropriate broad representation of current industries, e.g. production crops, agricultural livestock, aquaculture, environmental conservation, countryside management, fencing, fisheries management, floristry, gamekeeping and wildlife management, land-based engineering, landscaping, production and amenity horticulture, forestry and arboriculture.
- Opportunities – the range of career and progression opportunities available within chosen sector and opportunities within related sectors, e.g. retail, leisure, tourism, hospitality.
- Higher education – UCAS, entry requirements, student loans.
- Apprenticeships – requirements, timescales, pay scales, balance between academic and practical work, assessment, higher apprenticeships.
- Employment sectors:
 - public sector, e.g. education, government, local government, countryside officer/ranger, public grounds and parks
 - private sector, e.g. country parks, garden centres
 - voluntary sector or charities, e.g. wildlife trusts, wildlife parks.
- Employment sectors, to include an appropriate broad representation of current industries, e.g. agricultural sales, food production, aquaculture, floristry, production horticulture, land-based engineering.
- Self-employment, e.g. gamekeeper, agricultural contractor, arborist, gardener.

A2 Requirements for progression

Knowledge of formal and informal requirements for progression.

- Entry criteria, including qualifications, skills and knowledge.
- Self-management, including study skills, presentation and attitude, time management and planning.
- Exit criteria for specific progression routes.
- Soft skills, including communication, problem solving, individual and team and leadership skills, personal management.

A3 Relevant legislation for work placement opportunities

- Safeguarding at work placements.
- Contracts of employment and working hours (in relation to age), including zero-hours contracts/fixed-term/hourly-paid/permanent (full-/part-time) contracts, Working Time Regulations 1998, Pay As You Earn (PAYE), statutory leave, maternity/paternity leave, employment status.
- Different legal status of business: single owner (self-employed)/partnership/limited company/self-employed subcontractor.
- Awareness of the impact of current legislation supporting conduct in the workplace for employers and employees (full-time, part-time, casual, interns and work placements), such as:
 - Health and Safety at Work etc. Act 1974
 - Equality Act 2010
 - Data Protection legislation
 - Control of Substances Hazardous to Health (COSHH) Regulations 2002
 - Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013
 - Animal Welfare Act 2006.

Learning aim B: Develop communication and interview skills to improve employment prospects in the land-based sectors

B1 Applying for work-related activities

- Selection of work, including different sources of vacancies such as websites, trade publications and sector-wide bodies, e.g. Lantra.
- Importance of reading job description, personal specification, including relevance of essential or desirable criteria, to include qualifications, skills, experience.
- Completion of CV and adapting CV or job application to specified vacancy.
- Letters of application, supporting statements and completing application forms, to include standing out from the crowd, addressing relevance to employers and how they might shortlist candidates.
- Correct use of language, grammar, spelling and punctuation.

B2 Interview skills

Creating an impression through effective communication.

- Preparation and presentation skills, including:
 - planning and practice for the interview
 - interview styles, e.g. competency or behaviour-based, knowledge-focused
 - personal appearance and hygiene
 - interpersonal skills and attitude
 - body language.
- Listening and talking skills, including:
 - interview conventions
 - use of language – what is/what is not appropriate
 - building rapport
 - developing a dialogue
 - effective listening and questioning
 - non-verbal communication, e.g. eye contact.

B3 Reflecting on preparation and performance

- Reflecting on preparation for interviews and interview performance, including knowledge of employer and role, communication skills, professional behaviour.

Learning aim C: Undertake work experience in the land-based sectors to contribute to personal and professional development

C1 Practical work experience

Operating in workplace practices, including:

- knowledge of the purpose of the business and/or environment
- knowledge of reporting procedures with regard to behaviour and expectations, e.g. lateness, sickness, emergency
- health and safety protocols, e.g. fire safety, emergency procedures
- procedures to maintain confidentiality.

C2 Work behaviours

- Completion of role to add value in the workplace:
 - understanding the extent and limitation of own roles and responsibilities
 - carrying out tasks according to roles and responsibilities
 - following instructions
 - communicating with others
 - self-management
 - working safely
 - reliability, regular attendance and commitment
 - punctuality
 - use of initiative
 - cooperation with colleagues and end users, e.g. customers, clients, other organisations.
- Obtaining feedback, including:
 - timesheets signed by an appointed person at work experience employment, confirming appropriate attendance and punctuality
 - employer or teacher observation/witness statements
 - employer feedback sheets, provided at intervals.

C3 Reflecting on workplace practice

Reflecting on personal performance in relation to own career progression, to include:

- formative feedback from employer(s), colleagues, teacher, stakeholders
- performance self-assessment
- review of areas for development, to include SWOT (strengths, weaknesses, opportunities, threats) analysis, SMART (specific, measurable, achievable, relevant, time-based) target setting, knowledge of SWOT and SMART in learning development.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate employment opportunities in the land-based sectors to target progression		
<p>A.P1 Explain the value of own research and preparation carried out for work experience, related opportunities and progression routes.</p> <p>A.P2 Explain accurately the relevant legislation relating to a work placement.</p>	<p>A.M1 Analyse the value of own research and preparation carried out for work experience, related opportunities and progression routes.</p>	
Learning aim B: Develop communication and interview skills to improve employment prospects in the land-based sectors		
<p>B.P3 Explain the preparation and research carried out for a work experience interview.</p> <p>B.P4 Demonstrate communication and interpersonal skills as an interviewee for a selected work experience.</p>	<p>B.M2 Perform proficiently as an interviewee for a selected work experience, using appropriate communication and interpersonal skills.</p>	
Learning aim C: Undertake work experience in the land-based sectors to contribute to personal and professional development		
<p>C.P5 Explain how the work experience undertaken has improved occupational and personal skills for future opportunities.</p> <p>C.P6 Review how own performance during work experience contributed to the employer.</p>	<p>C.M3 Assess the value of the occupational and personal skills developed during work experience for future opportunities.</p> <p>C.M4 Analyse the impact on the employer of own performance during work experience.</p>	
		<p>A.D1 Evaluate how effective preparation for work experience can significantly enhance employment prospects.</p> <p>B.D2 Evaluate own preparation for and performance in work experience interview, including review of all future opportunities.</p> <p>C.D3 Evaluate the effectiveness of the work experience carried out in improving occupational and personal skills to make best use of opportunities for employment.</p>

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aims: A and B (A.P1, A.P2, B.P3, B.P4, A.M1, B.M2, A.D1, B.D2)

Learning aim: C (C.P5, C.P6, C.M3, C.M4, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to a work experience role, for example work placement, part-time work, volunteering etc. Employers must be external to the centre.

Teachers should consider devising a set of criteria they can use to give feedback when carrying out practice interviews.

Essential information for assessment decisions

Learning aims A and B

For distinction standard, learners will produce a written report evaluating the quality of their own preparation when seeking work experience. This will include their investigation and research carried out, completion of application documents adapted for specific roles, and completion of a mock interview or employer-evidenced real interview. The report will include conclusions about the quality of each step of the preparation, linking this to the teacher's evaluation of the mock interview and the chance of securing employment. Learners will write a conclusion that includes clear understanding of best practice in this area.

For merit standard, learners will produce a written analysis of the quality of their own preparation when seeking work experience. This will include their investigation and research carried out, completion of application documents adapted for specific roles, and completion of a good mock interview or employer-evidenced real interview. The analysis will include a detailed examination of each step of the preparation, linking this to the chance of securing employment. Learners will include an analysis of the teacher's evaluation of the mock interview.

For pass standard, learners will consider the value of their own preparation when seeking work experience, for example investigation and research carried out, completion of application documents adapted to specific roles, and completion of a mock interview or employer-evidenced real interview. Learners will include links to the teacher's evaluation of the mock interview. Learners could include a SWOT analysis.

Learning aim C

Learners need to review and reflect on their time undertaking work experience. This will relate to the number of hours required by the qualification.

For distinction standard, learners will undertake work experience and supply reasoning in their reflective reports to determine the effectiveness of the completed work experience and its capacity to improve their opportunities for employment. Their reasoning will consider the relationship between the occupational and personal skills developed during the work experience and how these may help them in securing future employment. The relationship between learners' own performance during work experience and its impact on the employer will also be covered. Learners will consider how well they prepared themselves for the work experience activities in order to gain the most from the experience(s). Learners' reflections should take account of employer and teacher feedback, and observations of them during their work experience.

For merit standard, learners will undertake work experience and present in their reflective reports a relationship between the occupational and personal skills developed during the work experience, and a discussion about how these skills will help secure employment. Learners will consider the relationship between their own performance during the work experience and its impact on the employer. Learners' reflections should take account of employer and teacher feedback, and observations of them during their work experience.

For pass standard, learners will undertake work experience and present in their reflective reports a consideration of how they developed different occupational and personal skills during their placement. Learners will make a formal assessment of their own performance during work experience based on feedback, including a SWOT analysis, and link this to their contribution to the employer. Learners' reflections should take account of employer and teacher feedback, and observations of them during their work experience.

Links to other units

This unit links with all others in the specification.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 5: Estate Skills

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners develop the skills needed to manage and maintain habitats, structures, surfaces, boundaries and services that are found in the land-based sector.

Unit introduction

Managing the physical environment of the land-based sectors means you need to be able to maintain, repair and install a variety of different structures, surfaces, boundaries and services, as well as maintain habitats, ensuring that work is carried out efficiently and safely.

In this unit, you will develop the knowledge and skills needed to manage the repair, maintenance and installation of the fabric of businesses and organisations working in the land-based sectors. These include forestry, horticulture and agriculture as well as more general countryside management. You will learn to plan, implement and reflect on maintenance tasks, including those you carry out yourself and those completed by others such as staff or professional contractors whose work you will manage. In this unit, you will draw on your learning from across the programme to complete assessment tasks.

This unit will give you the skills required to progress to employment as a trainee farm or forestry worker, garden centre assistant or as part of an estate management team. It is also an excellent introduction to a degree in estate management.

Learning aims

In this unit you will:

- A** Explore estate skills for the management and maintenance of habitats and environments
- B** Undertake estate skills and their management for the land-based sector
- C** Carry out the supervision of others engaged in maintenance, repair and installation tasks in the land-based sector.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
<p>A Explore estate skills for the management and maintenance of habitats and environments</p>	<p>A1 The nature and scope of estate skills for land-based sector management</p> <p>A2 Assessing needs</p> <p>A3 Planning tasks</p>	<p>A portfolio of evidence that plans for estate management projects. The portfolio should include:</p> <ul style="list-style-type: none"> • surveys • relevant legislation and codes of practice • a plan, including schedules and specifications.
<p>B Undertake estate skills and their management for the land-based sector</p>	<p>B1 Working safely</p> <p>B2 Practical estates tasks</p> <p>B3 Reflecting on tasks undertaken</p>	<p>Evidence of tasks carried out and reflection on task outcomes, to include:</p> <ul style="list-style-type: none"> • logbooks, observation records and witness statements of tasks undertaken • a review of task outcomes.
<p>C Carry out the supervision of others engaged in maintenance, repair and installation tasks in the land-based sector</p>	<p>C1 Workforce supervision</p> <p>C2 Supervise estate skills undertaken</p> <p>C3 Evaluate estate skills tasks completed</p>	<p>Evidence of the supervision of others in carrying out tasks, to include:</p> <ul style="list-style-type: none"> • an evaluation framework that includes task outcome and workforce supervision • observation records and witness statements that demonstrate supervision and management of scheduled tasks • a review of the outcomes of tasks carried out by others • a review of own supervision of a workforce.

Content

Learning aim A: Explore estate skills for the management and maintenance of habitats and environments

A1 The nature and scope of estate skills for land-based sector management

Understanding the form and function of estate skills elements that are found in the land-based sector.

- Boundaries, including:
 - deer or rabbit fencing, electric fencing, stock fencing, and post and rail fencing
 - decorative fencing.
- Surfaces, including:
 - paths, tracks, rides, accommodation flooring, grassed surfaces
 - drainage of surfaces, including field drains.
- Structures to provide for land-based management, including:
 - field structures, e.g. field shelters, stiles and way markers, greenhouses, cold frames, raised beds
 - gates and water troughs
 - internal structures, e.g. drinkers, stall furniture and feeders
 - finishes, including paints, varnishes and preservatives.
- Habitat maintenance for land-based management, including:
 - weed and invasive plant control, scrub clearance, hedgerow cutting/layering
 - wildlife refuges, e.g. nesting/resting boxes, woodpiles, hedgehog tunnels.
- Supply, distribution or storage of mains services and utilities, including:
 - water and gas, including bottled gas, electricity, fuel, oil
 - sewerage, including mains, cesspit and septic tank.
- Materials, tools and construction methods used for estate skills tasks:
 - basic construction materials, e.g. wood, concrete, woodchip, tarmac, type 1 aggregate, fencing, galvanised sheets, polypropylene piping
 - common specialist tools and basic test equipment, e.g. circuit tester
 - fixtures and fittings, e.g. hinges, locks, ball valves, pipe connections
 - selection, transport, maintenance and storage of tools, materials and equipment.

A2 Assessing needs

Inspection of boundaries, surfaces, structures, services and habitats.

- Inspecting boundaries, surfaces, habitats and structures for their maintenance, repair, construction and installation needs.
- Inspection and basic fault-finding of electrical circuits and devices using non-contact test equipment.
- Inspection of drainage, gas and water services for leaks and blockages.
- Methods and processes for reporting inspection findings, to include verbal and written, use of appropriate maps, plans and diagrams.

A3 Planning tasks

The application of regulations and specific, current regulations and guidance notes relevant to estate skills for land-based management, including health and safety at work and those relating to animal welfare.

- Government welfare codes of practice for specific animals and plants.
- Use of risk assessments, their purpose and types, including static, dynamic, qualitative and quantitative.
- Correct selection and use of personal protective equipment (PPE).
- Assessing the task, including measuring, estimating, use of maps, diagrams and plans.
- Creating and using schedules of tasks.

- Job specifications, to include job description and rationale, timescales, tools, equipment, materials, location of work, costs, skill sets, health and safety considerations, environmental issues and supervising arrangements.
- Sourcing tools, equipment, materials, skill sets, e.g. internal workforce, external contractors.
- Processes and aids to planning tasks, including budgets, schedules and flow charts.
- The use of IT in raising and monitoring repair and maintenance tasks.
- Communications with contractors and employees to ensure efficient planning.

Learning aim B: Undertake estate skills and their management for the land-based sector

B1 Working safely

- Compliance with appropriate health and safety regulations and guidance, e.g. PPE, animal welfare.
- Selection of the correct tools, equipment and materials.
- Transportation of tools, equipment and materials.
- Preparation of the work area.
- Correct and safe use of tools and equipment.
- Waste disposal in accordance with regulations.
- Maintaining and storing tools, equipment and materials.

B2 Practical estates tasks

Maintenance, repair, construction and installation of:

- boundaries, to include post and rail fencing, hedgerows, electric fencing and strained fencing, e.g. stock or chain link fencing
- surfaces, to include aggregate or concrete, woodchip, wood, sand or artificial products, e.g. woodchip or grassed paths, forest access roads, ornamental paving
- structures, e.g. greenhouses, field shelters, gates, stalls, troughs, feeders, stiles, signage
- drainage, e.g. unblocking drains or field drains, clearing an open ditch
- isolation of mains services in the event of leaks or for maintenance, repair, construction and installation tasks
- basic repair of electrical appliances or circuits, e.g. changing a plug or fuse, resetting a circuit
- use of basic equipment to locate underground or hidden services
- installation of temporary electric supply for both indoor and outdoor power requirements, e.g. extension leads, electric fence batteries, small generators
- repair, maintenance or installation of systems to supply water, e.g. to a water trough, irrigation system or to allow a tap and hose to be connected to an existing system
- habitats, e.g. brush clearance, hedgerow cutting, construction of wildlife refuges.

B3 Reflecting on tasks undertaken

Process for reviewing the tasks undertaken to assess the impact on land-based management, to include:

- matching skills to tasks
- taking account of problems that arise and using problem-solving techniques
- comparing the time taken with the time allocated and the time needed
- identifying inefficient working practices
- monitoring actual costs against estimates and identifying cost overruns
- examining specifications to improve clarity and eliminate ambiguity
- monitoring compliance with regulations, guidance and advice notes
- assessing communication to identify improvements.

Learning aim C: Carry out the supervision of others engaged in maintenance, repair and installation tasks in the land-based sector

C1 Workforce supervision

- Identifying skill sets, e.g. internal workforce, external contractors.
- Communicating maintenance, repair, construction and installation needs to in-house teams and outside contractors, to include raising orders, issuing instructions orally and in writing, getting estimates and quotations, commissioning contractors and understanding contracts.
- Using written communication skills:
 - using correct spelling, punctuation and grammar
 - adopting different styles, including formal and informal.
- Using oral communication skills:
 - using tone, inflexion and style when speaking
 - using aids, e.g. maps and plans.

C2 Supervise estate skills undertaken

- Ensuring the work is proceeding according to expectations, e.g. site visits, problem solving and evaluating the progress of estate skills tasks, ensuring compliance with specifications, checking the progress of work against the specification, regulations and codes of practice and risk assessments.
- Using problem-solving skills to assess issues, examine alternative solutions, decide on a course of action, implement solutions and monitor outcomes.

C3 Evaluate estate skills tasks completed

Using evaluation frameworks to enable assessment of completed tasks and workforce management.

- Creating evaluation frameworks using details of the original specification as a checklist.
- Evaluating completed products, including compliance with specifications, regulations, and codes of practice and risk assessments.
- Communicating evaluation outcomes, ensuring correct task completion, including situations where there is a dispute.
- Creating evaluation frameworks for assessing workforce management, to include:
 - selection of workforce
 - communication of task
 - supervision of work in progress
 - application of problem-solving skills
 - feeding back on outcomes of task.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Explore estate skills for the management and maintenance of habitats and environments		
<p>A.P1 Explain findings of own surveys undertaken to establish estate skills needs.</p> <p>A.P2 Select information from the findings of own surveys undertaken to plan for the management of an estate skills task.</p>	<p>A.M1 Analyse the results of own surveys undertaken to produce a schedule for the management of estate skills tasks.</p>	<p>A.D1 Evaluate the likely impact of the schedule produced for the management of estate skills tasks resulting from own surveys undertaken.</p>
Learning aim B: Undertake estate skills and their management for the land-based sector		
<p>B.P3 Perform simple estate skills tasks to an agreed specification.</p> <p>B.P4 Explain how own estate skills tasks undertaken meet job specifications.</p>	<p>B.M2 Perform complex estate skills tasks to an agreed specification and within an agreed timescale.</p> <p>B.M3 Assess own performance in carrying out estate skills tasks to meet job specifications.</p>	<p>B.D2 Evaluate the standard of own estate skills tasks undertaken in relation to job specifications.</p>
Learning aim C: Carry out the supervision of others engaged in maintenance, repair and installation tasks in the land-based sector		
<p>C.P5 Demonstrate the management and supervision of a simple estate skills task.</p> <p>C.P6 Explain the effectiveness of own workforce supervision of an estate skills task.</p>	<p>C.M4 Demonstrate the management and supervision of a complex estate skills task.</p> <p>C.M5 Analyse the effectiveness of own workforce supervision of an estate skills task, identifying areas for improvement.</p>	<p>C.D3 Evaluate the effectiveness of own workforce supervision of a complex estate skills task, detailing improvements.</p>

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of three summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aim: B (B.P3, B.P4, B.M2, B.M3, B.D2)

Learning aim: C (C.P5, C.P6, C.M4, C.M5, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- a range of common and specialist hand tools, including power tools and testing equipment
- suitable PPE
- a wide range of suitable estate skills tasks, including the provision of mains and temporary services.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will conduct surveys of land-based establishments. They will use a range of appropriate test equipment independently and proficiently. They will readily understand complex estate skills issues, considering causes and making connections with usage and consequences if unaddressed, exploring the situation thoroughly. Learners will present meticulous findings in the form of annotated maps, plans, diagrams and accompanying notes. They will be assured in their assessment of issues and their decisions in respect of repair, maintenance or installation needs.

Learners will produce comprehensive and flexible plans, reprioritising tasks where appropriate in order to use time and resources efficiently. Plans will include a detailed appraisal of work required and a thoroughly considered, time-specific schedule of work. Learners will give a clear rationale for all their recommendations, demonstrating detailed awareness of the influence of relevant governing legislation and codes of practice, and the impact on the establishment if the work is delayed or not completed. Job specifications produced will be comprehensive. Learners will show that they have considered how their plans will be effective in terms of, for example, use of resources, completion of tasks, meeting identified needs.

For merit standard, learners will conduct surveys of land-based establishments. They will use a range of appropriate test equipment safely and without supervision. They will interrogate the causes of issues, suggesting remedial action and, where appropriate, prevention in relation to repair, maintenance or installation needs. They will explore the complexity of faults and issues, considering less obvious factors. Learners will present detailed findings in the form of annotated maps, plans, diagrams and accompanying notes.

Learners will plan proactively with clear timescales for repair, maintenance and installation needs. Their plans will clearly demonstrate an understanding of the need to prioritise work, and an appreciation of realistic timescales and resources. Their planning will demonstrate a detailed assessment of the work required and a time-specific schedule of work. Consideration will be given to relevant governing legislation and codes of practice. Job specifications produced will be clear and detailed.

For pass standard, learners will conduct surveys of land-based establishments. They will use a range of appropriate test equipment, under supervision where necessary. Learners will understand major issues and correctly identify methods of repair, maintenance or installation. They will record correct findings appropriate to each situation surveyed, presenting the information in the form of annotated maps, plans, diagrams and accompanying notes. The notes and annotations will give clear reasoning for their findings.

Learners' plans will address key repair, maintenance and installation needs, correctly prioritising works using broad timescales. Where appropriate, their plans will take into account governing legislation and codes of practice. Job specifications produced will contain key information.

Learning aim B

For distinction standard, learners will carry out complex tasks that require multiple operations, using appropriate equipment and a variety of tools and materials. Tasks will be undertaken efficiently, accurately and completely, meeting the specification. Learners will work to a professional industry standard and they will comply with best workplace practice.

Learners will review the qualitative standard of practical work undertaken to improve the completion of tasks, supporting their views with reasoned judgements.

For merit standard, learners will carry out complex tasks that require multiple operations, using appropriate equipment and a variety of tools and materials. Tasks will be undertaken efficiently, accurately and completely, meeting the specification. Learners will work to the standard of a competent employee. They will carry out complex tasks that require the installation, maintenance or repair of boundaries, surfaces, habitats and either mains or temporary services.

Learners will demonstrate best workplace practice by working safely and in accordance with relevant legislation, ensuring the workplace is prepared and cleared. They will understand the need for, and demonstrate, correct tool, material and equipment procedures, including selection, use, transport, maintenance and storage.

Learners will review their work in light of the job specification and the standard achieved, giving valid suggestions for improvements in tasks.

For pass standard, learners will carry out simple estate skills tasks, requiring few operations and a limited range of tools and materials. Tasks will be undertaken efficiently, accurately and completely, meeting the specification. They will work to the standard of a novice employee. Learners will carry out simple tasks that require the installation, maintenance or repair of boundaries, surfaces, habitats and either mains or temporary services.

Learners will demonstrate acceptable workplace practice by working safely and in accordance with relevant legislation, ensuring the workplace is cleared after task completion. They will demonstrate correct tool, material and equipment procedures, including selection, use, transport, maintenance and storage.

Learners will review their work in light of the job specification.

Learning aim C

For distinction standard, learners will carry out effective and comprehensive workforce supervision that demonstrates clear, concise, unambiguous, oral and written communications suited to the recipient, such as contractors or colleagues.

Learners will delegate responsibilities appropriately according to skill sets and resources. They will monitor and assess task progression, advising only when necessary, using positive and flexible problem-solving skills when needed. They will assess the completed task against the specification and communicate their findings concisely and assertively.

Learners will draw up a valid and reliable evaluation framework to use when assessing their management of completed tasks. They will identify specific areas where their management of the task could have improved efficiency, safety or cost-effectiveness, and will make valid recommendations that would achieve this.

For merit standard, learners will demonstrate they can communicate clearly and appropriately with a workforce, such as contractors or colleagues, both orally and in writing.

Learners will delegate responsibilities. They will accurately assess the progress of a complex task and demonstrate problem-solving skills when needed. They will communicate appropriately their assessment of the progress of a task.

Learners will draw up an accurate evaluation framework to use when assessing workforce management. They will make recommendations for improvements in their own performance.

For pass standard, learners will demonstrate that they can issue simple workforce instructions, both orally and in writing.

Learners will carry out supervision of tasks, including checks on progress and identifying obvious issues that may hinder task completion to the specification. Where problems occur, learners will make suggestions and may intervene directly. Learners will provide basic feedback to the workforce on the progress of the task.

Learners will draw up a simple evaluation framework to use when assessing their management of the workforce, identifying their own strengths and weaknesses.

Links to other units

This unit links to *Unit 4: Work Experience in the Land-based Sectors*.

Employer involvement

This unit would benefit from employer involvement in the form of:

- masterclasses
- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 6: Crop Production

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners develop the skills to undertake crop maintenance, harvest and storage. They gain a detailed understanding of crop species and products.

Unit introduction

Crop production underpins all aspects of agriculture, forming the basis of all products of the industry, including animal feedstuffs and bedding, human food, pharmaceutical and industrial products, fuel and fibre.

In this unit, you will gain the skills needed to identify a range of commercially grown crops and their products, including annual, biennial and perennial plants. You will find out how and why crops are grown in specific situations and how crop growth is maintained throughout the production cycle. This will include recognising weeds, pests, diseases and deficiency symptoms, together with recommendations of remedial action that can be undertaken. You will understand the principles of harvesting and develop harvesting skills. You will investigate how crops are monitored in store, and consider how crops are treated while there, to maintain them in an acceptable condition. In order to maintain or improve the quality of crop products, you will learn about conditioning, cleaning, sorting and grading, together with the use of associated equipment.

This unit will help you to progress to employment or further education. The insight gained from this unit will help to prepare you for and inform you of the challenges and opportunities facing the agriculture industry in the 21st century as food security becomes increasingly important, both nationally and globally.

Learning aims

In this unit you will:

- A** Understand crop species and their products
- B** Establish and maintain healthy crops throughout the production cycle
- C** Use accepted working practices to carry out harvesting and crop storage.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Understand crop species and their products	A1 Crop plants and their products A2 Factors determining crop-growing locations	An illustrated report or presentation examining crop species, their products and where they are grown, supported by a portfolio of evidence relating to the recognition of crop plants and their products.
B Establish and maintain healthy crops throughout the production cycle	B1 The principles of crop establishment B2 The principles of maintaining healthy crops	A report or presentation examining the production, harvesting and storage of crop species, supported by a portfolio of evidence relating to the maintenance of healthy crops and appropriate remedial actions taken when necessary.
C Use accepted working practices to carry out harvesting and crop storage	C1 Safe harvesting of crops C2 The principles of safe storage of crop products	A portfolio of evidence relating to the safe harvesting of crops to meet given objectives, and the safe storage of crop products.

Content

Learning aim A: Understand crop species and their products

A1 Crop plants and their products

Characteristics and purpose of crop species grown commercially.

- Annual, biennial, perennial crops.
- Identifying crop types, including:
 - cereals, e.g. wheat, barley, oats, rye, triticale
 - oilseeds, e.g. oilseed rape, linseed
 - forage crops, e.g. grass, maize
 - root crops, e.g. sugar beet, fodder beet, potatoes
 - vegetable crops, e.g. brassicas, salad crops
 - top fruit, e.g. apples, plums
 - soft fruit, e.g. strawberries, raspberries
 - legumes and pulses, e.g. peas, beans
 - minor and specialist crops, e.g. miscanthus, borage, canary seed.
- The principles of rotations and cropping sequences.
- The products and by-products derived from different crop types.
- Quality parameters for different types of crop products, e.g. selecting a cultivar for yield, quality and end market.

A2 Factors determining crop-growing locations

- Location of end users, including proximity to markets.
- Transport links.
- Climate, topography and soil type.

Learning aim B: Establish and maintain healthy crops throughout the production cycle

B1 The principles of crop establishment

- Plant propagation from seed and vegetative material.
- Target populations, seed rates and plant spacing.
- Timing of establishment, e.g. autumn or spring.
- Crop establishment systems.
- Cultivation and establishment machinery.
- Seedbed conditions, planting depth and the importance of seed–soil contact.
- Seed dressings.

B2 The principles of maintaining healthy crops

- Recognising healthy and unhealthy crops, e.g. crop growth stages.
- Recognising growth and development stages.
- Control of weeds, pests and diseases, including:
 - cultural, physical, chemical and biological control
 - effect on yield and quality.
- Crop nutrient requirements and calculating plant nutrient requirements, including:
 - major nutrients (nitrogen, phosphate and potassium (potash), sulfur, magnesium)
 - minor and trace elements, e.g. boron, manganese.
- Recognising crop nutrient deficiencies.
- Effect of pH on nutrient availability.
- Effect of waterlogging.

- Sources of plant nutrients, including:
 - organic fertilisers
 - inorganic fertilisers
 - plant residues.
- Use of mapping and remote sensing.
- Specific current relevant legislation and codes of practice relating to crop production.
- Manipulating plant growth, e.g. plant growth regulation, planting timings.
- Ripening and crop maturity.
- Protected cropping, e.g. strawberry production using polytunnels.

Learning aim C: Use accepted working practices to carry out harvesting and crop storage

C1 Safe harvesting of crops

- Pre-harvest management, e.g. desiccation, dehauling.
- Harvesting methods for combinable crops, fresh crops and manual harvesting.
- Health and safety issues relevant to crop harvesting, including:
 - safe working practices
 - potential consequences of not complying with safe working practices, e.g. injury to self or others, prosecution, invalidation of insurance.
- The use and disposal of by-products and crop waste products, e.g. chopping and spreading, biofuel, animal feed and bedding.

C2 The principles of safe storage of crop products

- Key aspects in safe storage of fresh and dry products:
 - methods of conditioning crops in store and the use of additives
 - control of storage vermin
 - pest and disease control.
- Store hygiene and monitoring.
- In-store climate control, e.g. temperature, humidity.
- The effect of storage on crop quality.
- Long-term storage, short-term storage, central storage, packhouses.
- Safe manual and mechanised grading, cleaning and sorting crops, including packhouses.
- Crop segregation and the reasons why crops are segregated.
- Safe loading, unloading and transport of crops.
- On-farm use of crops and crop by-products.
- Specific health and safety requirements relating to potential hazards and risks in a store environment, e.g. dust, crushing, burial in a crop product, asbestos.
- Use of personal protective equipment (PPE).
- Food safety requirements, e.g. assurance schemes.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Understand crop species and their products		
<p>A.P1 Explain identifying characteristics of annual, biennial and perennial crops, and their products.</p> <p>A.P2 Explain the basic parameters that determine where crops are grown.</p>	<p>A.M1 Assess the parameters that influence the production, quality and yield of crops.</p>	<p>A.D1 Evaluate reasons for the production of specified crops in particular locations, and the effect on quality and yield.</p>
Learning aim B: Establish and maintain healthy crops throughout the production cycle		
<p>B.P3 Explain the production cycles required to successfully grow two contrasting crops.</p> <p>B.P4 Recognise general signs of health and deficiency symptoms in two contrasting crops.</p> <p>B.P5 Suggest appropriate remedial action to maintain crop health.</p>	<p>B.M2 Recommend actions to maintain healthy crops throughout the production cycles required to grow two contrasting crops.</p>	<p>B.D2 Justify appropriate remedial actions taken to maintain the health of crops in given situations.</p>
Learning aim C: Use accepted working practices to carry out harvesting and crop storage		
<p>C.P6 Safely carry out a given crop harvesting task to meet objectives.</p> <p>C.P7 Safely carry out a given crop monitoring task to meet objectives within given storage facilities.</p>	<p>C.M3 Relate the results of monitoring to crop harvest conditions and conditioning, grading, sorting and/or cleaning requirements within given storage facilities.</p>	<p>C.D3 Carry out a monitoring task with a high degree of accuracy, evaluating the impact of growing, harvesting and storage of crops on the quality of the final product.</p>

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of three summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aim: B (B.P3, B.P4, B.P5, B.M2, B.D2)

Learning aim: C (C.P6, C.P7, C.M3, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- growing crops
- crop storage facilities
- a suitable range of equipment and machinery used for crop production
- suitable software used commercially to support crop production (to demonstrate to learners).

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will produce a convincing, in-depth evaluation that fully considers crop production. The evaluation will identify the location of crop production and be clearly focused on the climatic, topographical and soil type influences regarding where crops are grown commercially, with no irrelevancies. Learners will consider thoroughly the quality parameters, the selection of cultivars for specific end uses, the restrictions (if any) imposed by crop rotations, and the use, or disposal, of by-products. They will give specific details relating to the location of end users and transport links, and show accurately how these influence the location of the production of specific crops. The evaluation will be relevant at a local and regional level and supported by reasoned, valid judgements. The evidence will make use of appropriate, accurate agricultural terminology throughout.

For merit standard, learners will produce a clear, balanced assessment of the factors that affect quality parameters for crop production. Learners will draw on their breadth of understanding of climate, topography and soil type relating to the production of crops. They will demonstrate a clear understanding that certain cultivars are bred for specific end uses, and assess how crops can be grown over a period of time, considering the appropriateness of rotations and cropping sequences. The evidence will be supported by relevant examples of how the location of end users and the available transport links influence where crops are grown. The evidence will make accurate use of appropriate agricultural terminology.

For pass standard, learners will recognise a range of crops and their products in each definition. They will accurately identify at least 20 crop species across the various crop types listed in the unit content, indicating if the crops recognised are perennial, biennial or annual. Learners will provide a realistic explanation of the reasons for the growth of crops in certain locations. They will select a number of different factors and describe the interconnections, although some of their explanations may be generic. The explanation of the effect of climate, topography and soil type will be limited and may be unbalanced in parts. There may be some minor irrelevancies in the evidence, and some agricultural terminology may be omitted.

Learning aim B

Teachers should note that the application of any plant-protection products or fertiliser is outside the scope of this unit. Across the standard for pass, merit and distinction, it is acceptable for learners to recognise a condition in a crop but give reasons to suggest that a treatment is inappropriate. Reasons could be, for example, that the weed population is too low to warrant control or that a control measure would be more appropriate in the next crop.

For distinction standard, learners will correctly recognise the symptoms of nutrient deficiencies, weed infestations, pests and diseases in two contrasting crops throughout all stages of the growing season. Learners will fully recognise that poor crop establishment conditions and suboptimal soil pH will have an adverse effect on nutrient availability and plant health. They will draw on their breadth and depth of learning to make well-reasoned, specific recommendations for actions to maintain crop health and explain thoroughly how these recommendations can be justified. The evidence will make use of appropriate agricultural terminology throughout, and will form a well-structured, considered and reasoned response.

For merit standard, learners will correctly recognise most of the symptoms of nutrient deficiencies, weed infestations, pests and diseases in two contrasting crops, recommending actions to maintain healthy crops throughout the production cycles required to grow two contrasting crops. The justification for any remedial action taken to maintain the health of plants will be clear, appropriate and mostly relevant. However, some of the more subtle interactions will not be recognised, for example the relationship between soil pH and nutrient availability. The evidence will be structured and use appropriate agricultural terminology.

For pass standard, learners will correctly recognise most of the symptoms of nutrient deficiencies, weed infestations, pests and diseases in two contrasting crops but not necessarily at all stages of the growing season. Learners will make reasonable, generalised suggestions for remedial action to maintain healthy crops. The evidence is, however, likely to be supported by limited use of relevant reasons for the action to be taken. There may be some minor irrelevancies in the evidence and some agricultural terminology may be omitted.

Learning aim C

For distinction standard, learners will safely harvest (including loading) and monitor given crops. They will undertake monitoring tasks with a very high degree of accuracy and make detailed, insightful suggestions on how crops should be stored. It is likely, but not essential, that learners will relate their suggestions to the harvesting and monitoring tasks they undertook. Learners will relate accurately the effects of growing, harvesting and storage conditions to the quality of the crop and food safety. They will demonstrate robust understanding of the importance of store hygiene in reducing infestations, and evaluate how such infestations can affect crop quality, and, in turn, affect food hygiene. Learners will provide specific, valid reasons that link logically to their views. Learners will make effective judgements on the relative importance of different aspects of crop harvesting and storage, drawing on the results of their monitoring and harvesting activities. The evidence will consistently use relevant and accurate terminology that supports a considered, comprehensive response.

For merit standard, learners will safely harvest (including loading) and monitor given crops. They will monitor stored crop products to a high degree of accuracy. They will clearly relate harvesting conditions and the results of monitoring to crop storage conditions and make relevant suggestions on how these issues relate to crop quality. Learners will show clear understanding of the importance of store hygiene and give mainly accurate justification for this, including reducing pest, disease or vermin infestation, but not necessarily relating the effects of infestations to long-term food safety. The evidence will make accurate use of appropriate agricultural terminology.

For pass standard, learners will safely harvest (including loading) and monitor given crops. They will undertake monitoring tasks with an appropriate degree of accuracy but might be limited in scope and might not relate harvesting and conditioning to crop quality. Learners will suggest appropriate on-farm use, unloading, transportation, segregation, conditioning, grading, sorting, or cleaning requirements, as appropriate. They will demonstrate a realistic understanding of the importance of store hygiene but will not necessarily indicate the reasons in any depth or detail. There may be some minor irrelevancies in the evidence, and some agricultural terminology may be omitted.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 2: Plant and Soil Science
- Unit 10: Crop Handling, Storage and Quality Assurance.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 7: Farm Livestock Husbandry

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners study the breadth and purposes of farm livestock in the UK, including husbandry techniques required to maintain animal welfare and aid productivity.

Unit introduction

Supplying the world with animal products such as meat, dairy and wool requires knowledge about how to raise, care and handle a variety of farm livestock successfully. The successful farmer needs to balance productivity with high standards of animal welfare.

In this unit, you will explore a range of farming systems and develop specialist knowledge and understanding of farmed livestock handling and husbandry. You will explore farm livestock nutrition and feed systems, creating balanced diets that meet the needs of the animal and the producer. You will develop the skills and experience needed to confidently and safely manage large and sometimes unpredictable animals.

This unit will support your progression to employment with common farm livestock, or to further study in an apprenticeship or higher education establishment.

Learning aims

In this unit you will:

- A** Understand the production systems used for farm livestock in the UK
- B** Explore the nutritional needs of farm livestock in order to maintain good standards of health
- C** Carry out handling and routine husbandry of farm livestock to meet current standards.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Understand the production systems used for farm livestock in the UK	A1 Farm livestock types and breeds A2 Production systems	An illustrated report/essay examining the common and unconventional farm livestock species, and how these are produced.
B Explore the nutritional needs of farm livestock in order to maintain good standards of health	B1 Nutrition for farm livestock B2 Feeding and watering regimes and equipment B3 Feed ration formulation	Portfolio of evidence relating to the practical handling, feeding, watering and husbandry of farm livestock species. A report examining feeds and composition, equipment, methods and techniques of feeding and watering.
C Carry out handling and routine husbandry of farm livestock to meet current standards	C1 Health and safety requirements when working with farm livestock C2 Animal health checks prior to handling common species C3 Practical animal handling techniques and equipment for common farm livestock species C4 Farm animal accommodation	

Content

Learning aim A: Understand the production systems used for farm livestock in the UK

A1 Farm livestock types and breeds

Characteristics and purposes of livestock breeds in the UK, including native and imported.

- Sheep for food, wool and by-products, including pure-bred and cross-bred sheep, e.g. Border Leicester, Suffolk, Jacob, Lincoln Longwool, Texel, Charollais.
- Pigs for food and by-products, including hybrid and pure breeds, e.g. Tamworth, Saddleback, Gloucestershire Old Spot, Large White, Landrace, Duroc.
- Poultry for meat, eggs and by-products, hybrid and pure breeds, e.g. Buff Orpington, Araucana, Legbar, Faverolles, Aylesbury ducks.
- Cattle for beef, dairy, and by-products, e.g. Hereford, Red Poll, Longhorn, Angus, Welsh Black, Galloway, Jersey, Limousin.
- Goats for milk, meat and by-products, including hybrid and pure breeds, e.g. Bagot, British Toggenburg, Golden Guernsey, Angora and British Primitive goats, Saanens.
- Unconventional livestock diversification, e.g. ostriches for meat, alpacas for fleece, crocodiles for skins.

A2 Production systems

- Variety and characteristics of common production systems for common livestock and standards of welfare and quality of product produced:
 - intensive, organic, semi-intensive, extensive
 - poultry (broilers, laying hens)
 - cattle (beef and dairy)
 - pigs (breeding stock, pork, bacon, heavy pigs, alternative breeds)
 - sheep (lowland, upland, hill)
 - fish (extensive and intensive)
 - mega-farming systems – dairy, pork, poultry and beef
 - sustainability and suitability of systems – water conservation, pollution and impact of each on animal/human health
 - slaughter practices for each group, including cultural and ethical issues
 - welfare monitoring and measuring, legal obligations for all systems.
- Unconventional livestock production systems and standards of welfare and quality of product produced, e.g. ostrich, alpaca, crocodile.
- Impact on production and welfare of supply and demand, time constraints, costs.
- Class of stock, ages of stock, length of time animals are in production.

Learning aim B: Explore the nutritional needs of farm livestock in order to maintain good standards of health

B1 Nutrition for farm livestock

The purpose of understanding feeds, composition and nutritional requirements of species to maximise the value of the animal, including:

- feed types, straights, blends, compound feed, concentrates, forage and fodder
- hay, haylage, silage and straw production
- nutrient requirements for farm species
- absorption and utilisation of nutrients in feed by species
- palatability of feeds and impact on behaviour.

B2 Feeding and watering regimes and equipment

- Feeding and watering equipment from protocols for livestock species, including:
 - automatic drinkers
 - plastic and metal troughs
 - buckets and bucket feeders
 - mobile and fixed hay racks
 - automatic feeding systems.
- Developing productive feeding protocols for livestock species to maximise the value of the animal, to include:
 - planning nutrition
 - charts and records
 - storage of feeds, including regulations and practical considerations
 - preparation of feed
 - hygiene
 - personal protective equipment (PPE).

B3 Feed ration formulation

Methods and techniques in ration formulation.

- Balancing rations using algebraic methods, the Pearson square and computer formulation software, e.g. Format International.
- Creating the 'least cost' rations.
- Testing the results for accuracy and making adjustments to feeding of the species, if needed.

Learning aim C: Carry out handling and routine husbandry of farm livestock to meet current standards

C1 Health and safety requirements when working with farm livestock

- Health and safety legislation related to eliminating hazards and controlling risks.
- Risk assessments, including identifying health and safety requirements for self, other people and animals, when working with livestock.
- PPE.
- Principles of handling livestock safely and securely in a farm environment.

C2 Animal health checks prior to handling common species

- Visual health assessments.
- Behavioural assessments, including species-specific behaviour, patterns, interaction with other animals.

C3 Practical animal handling techniques and equipment for common farm livestock species

- Cattle, sheep, pigs, poultry – handling safely and humanely.
- Restraining and handling equipment and systems, including tethers, halters, ropes, bull poles, pig boards, paddles, flat slap sticks, electric fencing, crushes, yoke units, pens, hurdles, crates, cattle races.
- Use of weighing scales.
- Handling animals in different locations inside and in the open, loading and unloading for transport, e.g. for sale and slaughter.
- Body condition scoring/assessment.

C4 Farm animal accommodation

Accommodation considerations, including:

- indoor and outdoor accommodation
- types, structures, materials
- maintenance of accommodation for security and safety of animals and humans
- disposal of organic and inorganic waste
- impact of accommodation considerations on production and production costs
- impact of accommodation on animal welfare, including stress
- requirements for animals at different life stages
- legislation and codes of practice specific to common farm livestock
- application of the five welfare needs.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Understand the production systems used for farm livestock in the UK		A.D1 Evaluate the suitability of livestock production systems for different species, giving recommended changes.
A.P1 Explain the characteristics of different production systems. A.P2 Explain why different production systems for different breeds can affect animal welfare in different ways.	A.M1 Assess the different factors of livestock production systems for different species of farm livestock.	
Learning aim B: Explore the nutritional needs of farm livestock in order to maintain good standards of health		BC.D2 Carry out techniques proficiently, to evaluate diets and feeding strategies designed and recorded for different species of farm livestock, making coherent recommendations for improvement to promote higher welfare. BC.D3 Evaluate use of husbandry techniques in maintaining livestock to meet current standards.
B.P3 Explain the nutritional requirements for different species of farm livestock. B.P4 Carry out procedures to balance and record animal rations for different species. B.P5 Explain the correct feeding and watering equipment for farm livestock species.	B.M2 Analyse and record correct feed ingredients for nutritional composition of feed for different species of farm livestock.	
Learning aim C: Carry out handling and routine husbandry of farm livestock to meet current standards		
C.P6 Demonstrate correct techniques for routine cleaning, maintenance, feeding and watering of different livestock species. C.P7 Demonstrate correct standard health and safety practices when assessing and handling farm livestock.	C.M3 Demonstrate proficient handling techniques and use of equipment to assess condition, clean and maintain different species of farm livestock.	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aims: B and C (B.P3, B.P4, B.P5, C.P6, C.P7, B.M2, C.M3, BC.D2, BC.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have:

- regular access to farm livestock, sheep, pigs, cattle (beef and dairy), poultry (chickens and ducks) and alternative livestock species, as per content
- species-specific handling equipment (cattle crush and race, sheep turner, pig boards, hurdles, electric fencing, sheep handling system (mobile or fixed), halters and crates)
- personal protective equipment appropriate for species
- livestock weighing scales
- computer ration formulation software.

Essential information for assessment decisions

Learning aim A

Learners must base this assignment on four species of conventional farm livestock, as listed in the content.

For distinction standard, learners will articulate arguments concisely and professionally to competently evaluate common production systems, including intensive, extensive and organic systems, giving detailed lines of reasoning for justifications made. Learners will use detailed analysis and research to independently suggest improvements, and assess the advantages and disadvantages for each production system. Learners will include clear examples of how each system impacts on the welfare of the four species of livestock and the breeding of specific animals.

For merit standard, learners will carefully consider the suitability of livestock production systems, including intensive, extensive and organic systems for the species of farm livestock. They will include why the systems are appropriate for each type of livestock, drawing suitable conclusions. Learners should be independent in their approach, showing that they have used research to extend their understanding to less familiar contexts.

For pass standard, learners will recall knowledge and understanding to clearly explain intensive, extensive and organic production systems, including the advantages and disadvantages of each system. Learners will explain the differences in breeds of four species of conventional farm livestock and the benefits of keeping those species, considering costs (animals, feed, and equipment), ease of handling, safety and how humans can use breed characteristics to their advantage.

Learning aims B and C

Learners must base this assignment on four different species of livestock. These can be the same livestock considered in learning aim A, or four different species.

Learners must be given a witness statement from a workplace supervisor that describes, in sufficient detail for the assessor to make a judgement, how learners carried out the required skills and techniques. Alternatively, they should be given an assessor observation record that details how the learner carried out the required skills and techniques, and how it met the assessment criteria.

For distinction standard, learners will show how they used the most appropriate techniques to competently handle and successfully assess the body conditions of four conventional farm livestock species, in order to justify the diets and feeding strategies for the different species. They will show that they can use practical skills in complex situations and that they are capable of performing and evaluating safely while handling livestock, demonstrating safe and correct use of common handling equipment. Learners will also communicate clearly and concisely in a professional discussion, or in a professional manner during the practical assessment.

They will explore the advantages and disadvantages of handling techniques and systems used for the four species being assessed, highlighting areas of concern and referring to health, hygiene and safety of handler and animal. Learners will independently select and evaluate diets and feeding strategies for the four species of farm livestock, making significant and relevant recommendations for improvement to promote higher welfare. Learners will demonstrate an understanding of nutritional requirements, and demonstrate methods and techniques to accurately balance feed rations in at least four animals to meet the required purpose, independently using manual and computer-based ration formulation techniques.

Learners will draw together knowledge and understanding from across the learning aims to evaluate how their use of techniques has contributed to meeting current livestock standards, making suitable justifications and recommendations.

For merit standard, learners will select and use appropriate techniques to analyse and record feed ingredients for nutritional composition. They will assess the condition of, and competently handle, four species of farm livestock using the correct handling techniques and selection of equipment. Learners will demonstrate and communicate, in a structured and defined way, the advantages and disadvantages of handling techniques and systems used for the four species being assessed. Learners will be able to demonstrate a structured approach to balancing rations for the four animals and an awareness of the nutritional needs for the breed/species.

For pass standard, learners will practically select and use appropriate routine cleaning and maintenance techniques on animal accommodation for four species of farm livestock species. Learners will work safely and correctly, following protocols given. Learners will accurately demonstrate and communicate, using some technical language, the correct health and safety practices when working with farm livestock to meet current legislative requirements. Learners will recall knowledge to outline the nutritional requirements of four farm livestock species and will correctly balance rations for the given species, recording the information in appropriate ways. Learners will explain the correct feeding and watering equipment needed for four farm livestock species, relating their knowledge to well-defined situations.

Links to other units

This unit links to Unit 1: Professional Working Responsibilities.

Employer involvement

This unit would benefit from employer involvement in the form of:

- masterclasses
- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- opportunities for observation during work experience
- support from local land-based organisation staff as mentors.

Unit 8: Land-based Machinery Operations

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners develop skills in the safe operation of machines used in the land-based sectors, including carrying out pre-start checks, basic maintenance and repair, and actual operation.

Unit introduction

Machines are used throughout the land-based sectors for a range of purposes, including transport and powering or pulling other equipment. The correct selection, maintenance and use of machinery are extremely important to the success of all enterprises and sustainable working practices.

In this unit, you will explore machines relevant to your particular sector of the industry, developing practical skills and understanding of the different conditions in which machinery might need to operate. You will learn how to carry out pre-start checks and maintenance on these machines as well as the safe use and operation of the machine for a variety of tasks. The skills and knowledge gained in this unit will help you to manage the potential dangers involved in operating land-based machinery, and enable you to carry out tasks in a way that prioritises safety and consideration of environmental impact.

This unit will support your progression to employment in the land-based sectors in a role such as machinery operations assistant and assistant technician, or to further study in an apprenticeship or higher education.

Learning aims

In this unit you will:

- A** Investigate the types, purpose and safe operation of land-based machinery
- B** Operate land-based machinery safely to complete a practical task
- C** Maintain land-based machinery safely in order to sustain its effectiveness.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate the types, purpose and safe operation of land-based machinery	A1 Types of machine and their purpose A2 Principles of operation A3 Range of conditions in which machinery may be operated A4 Health and safety considerations	A report examining machinery types, their uses and operation for a relevant sector of the land-based industries.
B Operate land-based machinery safely to complete a practical task	B1 Preparation B2 Operation	Evidence of safe completion of practical tasks that include the preparation and operation of a suitable machine to achieve the task being carried out.
C Maintain land-based machinery safely in order to sustain its effectiveness	C1 Maintenance C2 Servicing and repair	Evidence of a machine being checked before and after use, and maintenance requirements being identified. A report evaluating the effectiveness of the preparation, routine maintenance and repair carried out, and the options available to do this.

Content

Learning aim A: Investigate the types, purpose and safe operation of land-based machinery

A1 Types of machine and their purpose

The types of machine available and the purposes for which they are used in the land-based sector.

- Types of machine:
 - tractors, including two- and four-wheel-drive systems, track-layers
 - utility vehicles
 - all-terrain vehicles (ATVs)
 - special purpose vehicles, e.g. self-propelled harvesters or mowers, material handlers
 - pedestrian-operated and hand-held machines.
- Adaptations for different purposes, including working on slopes, inside buildings and on soft or unfirm ground.
- Purposes of machines:
 - transport of goods and people
 - estate maintenance, e.g. brush cutters, hedge cutters, flails
 - pulling other equipment, e.g. trailers, mowers
 - powering attached equipment via external services, e.g. powered cultivators, mowers
 - excavation, e.g. trenching, ditching, landscaping
 - application of materials, e.g. seed, organic material, fertiliser and plant protection products.

A2 Principles of operation

- Available power sources:
 - engines, to include spark ignition, two- and four-stroke cycle, compression ignition, four-stroke and electric motors
 - fuels, to include petrol, diesel, liquid petroleum gas (LPG), biofuels and electricity, including single phase, three phase and battery
 - potential environmental impact of different engine types.
- Drive systems:
 - belts, chains and gearboxes:
 - their characteristics and use
 - advantages and disadvantages
 - hydrostatic systems:
 - their characteristics and use
 - advantages and disadvantages
 - two- and four-wheel-drive systems
 - different and equal-size wheels.
- Machine layout, design and safety features:
 - location of controls for powered machines, e.g. on/off switches, brakes, clutch, throttle/accelerator, gear lever, lights and indicators, operating sequences, emergency stop mechanisms
 - access, including doors, steps, protective covers and guards
 - aspects of sustainability relevant to machine design and layout, e.g. fuel type, fuel efficiency, emissions, noise pollution, and lubrication.
- Ancillary equipment:
 - hitches to attach trailed equipment, e.g. pick-up hitches, clevis drawbars
 - three-point linkage to attach mounted or semi-mounted equipment, e.g. ploughs, mowers and cultivators
 - external services, e.g. electrical, power take-off (PTO), shafts, hydraulics.

- Machine safety features and procedures:
 - safe operating procedures, e.g. starting the machine when it is out of gear, starting the machine with the operator in the driving position
 - safety features to prevent starting of the machine, e.g. out of gear, being on seat, depressed clutch
 - engine stop, e.g. key and fuel cut off
 - access, to include steps and guards
 - other safety features, e.g. anti-reverse for working pedestrian rotary tillers, safety cabs or frames, seat belts.

A3 Range of conditions in which machinery may be operated

- In the field or on site:
 - slopes
 - size of field/working area and topography
 - soil types and ground conditions
 - access.
- Weather and seasonality:
 - drought, wet, rain, snow, normal conditions
 - tasks in relation to time of year and seasons.

A4 Health and safety considerations

Health and safety aspects relevant to the use of machinery in land-based sectors.

- Legislation relevant to the use of land-based machinery:
 - regulations regarding the permission and competence required to carry out certain land-based operations, including:
 - minimum driver age limits
 - Lifting Operations and Lifting Equipment Regulations (LOLER) and Provision and Use of Work Equipment Regulations (PUWER)
 - ‘on the road’ use of machinery
 - certificates of competence, e.g. spraying, material handling.
- Self-protection and protection of others:
 - Health and Safety at Work etc. Act 1974
 - personal protective equipment (PPE), e.g. safety boots, goggles, overalls, gloves
 - safe systems of work, use of manuals, safe use of controls and cut-outs
 - risk assessments
 - manual handling techniques.
- Potential consequences of not complying with health and safety requirements, such as:
 - injury to self and others
 - prosecution
 - invalidating insurance
 - ineffective and inefficient machines.

Learning aim B: Operate land-based machinery safely to complete a practical task

B1 Preparation

Preparing and checking machines before use and operation.

- Daily checks, adjustment, attachments, lubrication.
- Resources, to include consumables:
 - lubricants
 - cleaning agents, rags and towels
 - variety of tools
 - benches or workshop area.

- Use of PPE.
- Setting up of machine, e.g. position, mixed or draft control, guarding, setting maximum height or depth, working height or depth.

B2 Operation

Operation of relevant machinery in a field or site location.

- Pre-start checks, to include oil, fuel, water, ancillary fittings, tyres, visual checks, lights – where applicable.
- Attachment of equipment, e.g. trailer, link box, mower, spreader or cultivation equipment.
- In-field use, to include starting and stopping, work method, control of attached equipment, forward speed.
- Safe working procedures, e.g. knowledge of operator manual, safe mounting of and dismounting from machine, stopping machine to carry out adjustments and in-field maintenance.
- Aspects of sustainability relevant to machinery operation, e.g. use of energy-saving mode, correct gear and engine speed selection.

Learning aim C: Maintain land-based machinery safely in order to sustain its effectiveness

C1 Maintenance

Carrying out routine operator maintenance.

- Use of operator manuals.
- Understanding service intervals.
- Adjustments of drive devices, e.g. tension chains or belts.
- Checking of tyre pressures.
- Checking of liquids, e.g. fuel, coolant and oil levels, battery electrolyte level.
- Checking of guards for overall fitness for purpose and security of fittings.
- Checking of air filters.

C2 Servicing and repair

- Available options for carrying out servicing and repairs:
 - dealership services
 - in-house servicing and repairs by own mechanic
 - repairs in non-dealership workshop.
- Advantages and disadvantages of the different options for carrying out servicing and repairs, e.g. availability, time, warranty and cost.
- Understanding warranties, their advantages and disadvantages.
- Cost-effectiveness of servicing and repair, routine maintenance and maintenance intervals.
- Identifying faults and problems that require servicing and repair:
 - wear and tear, e.g. worn transmission and steering components, tyres, cutting blades, tines, knives, spark plugs, injectors, blocked filters
 - use of manufacturer part numbers and machine identification
 - health and safety issues, including loose, worn and missing guards.
- Carrying out simple servicing and repair:
 - use of operator's manual
 - renew oils
 - clean or renew filters
 - adjustments, e.g. tensions, pressures
 - maintain and update records of work
 - relevant repairs, e.g. replacement of belts, tines, blades, battery replacement, spark plug or injector replacement, guard replacement
 - recycling or disposing of waste materials and parts in line with accepted practice, e.g. recycling of waste oil, recycling of tyres, use of exchange parts and return.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate the types, purpose and safe operation of land-based machinery		A.D1 Justify the selection of different types of land-based machinery for a given land-based task.
<p>A.P1 Explain the purpose and operation of different types of land-based machine.</p> <p>A.P2 Explain the health and safety requirements in the operation of land-based machinery.</p>	<p>A.M1 Compare the principles of operation of different types of selected land-based machine.</p> <p>A.M2 Analyse the importance of health and safety requirements in the operation of land-based machinery.</p>	
Learning aim B: Operate land-based machinery safely to complete a practical task		B.D2 Evaluate own operation of land-based machinery against given objectives.
<p>B.P3 Safely prepare selected land-based machinery for work.</p> <p>B.P4 Safely operate simple land-based machinery to meet given objectives.</p>	B.M3 Efficiently use complex land-based machinery to meet given objectives.	
Learning aim C: Maintain land-based machinery safely in order to sustain its effectiveness		C.D3 Evaluate the effectiveness of techniques used to carry out routine maintenance and repair, and the options available to do this.
<p>C.P5 Explain the options available for the servicing and repair of land-based machinery.</p> <p>C.P6 Safely carry out routine operator maintenance and appropriate repairs for a chosen land-based machine.</p>	<p>C.M4 Assess potential faults on a given land-based machine, using manufacturer's data to specify replacement items during servicing and repair.</p> <p>C.M5 Carry out efficient routine operator maintenance and appropriate repairs for a chosen land-based machine.</p>	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of three summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.M2, A.D1)

Learning aim: B (B.P3, B.P4, B.M3, B.D2)

Learning aim: C (C.P5, C.P6, C.M4, C.M5, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- a range of common and specialist hand tools, including power tools and testing equipment
- suitable PPE
- a range of prime movers, including tractors and ride-on mowers and transporters
- a range of compatible attachments, including trailers and three-point linkage mounted equipment
- a flat, level site on which to operate
- basic workshop facilities, including vices, benches, fuels and lubricants.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will thoroughly investigate the machines available to a relevant sector of the land-based industry and fully justify the selection of two different types of machine for given tasks in a way that is logical, coherent and considers all relevant factors. The task will require the selection of some form of ride-on prime mover such as a tractor, haulage/transport vehicle or ride-on machine such as a mower. Evidence will display the accurate use of relevant terminology throughout to support a considered, well-reasoned response. Learners will make insightful references to the role of health and safety in the selection of different types of machines. Learners will meticulously investigate the problems associated with different conditions of use, produce robust, convincing solutions to these problems and make comprehensive, accurate references to relevant aspects of health and safety and sustainability.

For merit standard, learners will provide a clear, balanced review of the principles of operation of land-based machines and report on the principles of operation of two different machines for given tasks in the land-based sector. The task will require the selection of some form of ride-on prime mover such as a tractor, haulage/transport vehicle or ride-on machine such as a mower. The evidence provided will be technically accurate and compare clearly the principles of operation of the two machines. The solutions given by learners will be efficient and suitable. Clear and relevant consideration will be given to aspects of health and safety and sustainability. Learners' evidence will show relevant and accurate analysis of each machine and make use of appropriate technical language. Learners will explore the problems caused by different conditions and provide relevant justifications of their design solutions. Learners will provide a balanced, clear analysis of the importance of health and safety requirements in machine operation.

For pass standard, learners will examine the machines available to the land-based sectors and explain the selection of two different machines for given tasks. The task will require the selection of some form of ride-on prime mover such as a tractor, haulage/transport vehicle or ride-on machine such as a mower. Most of the evidence will be technically accurate and relevant. Learners will report on the suitability of the machines for a range of conditions. Their response might be limited in scope or unbalanced in parts but will be mostly appropriate, including realistic, specific references to health and safety, and limited but appropriate references to sustainability.

Learning aim B

For distinction standard, learners will evaluate the qualitative standard of practical work undertaken to achieve the completion of tasks against the given objectives, which include meeting relevant health and safety requirements. Learners will support their views with well-reasoned, convincing judgements. Learners will provide specific, well-selected evidence to show how and why their work meets the given requirements, making logical, robust connections between their performance and the given brief.

Learners will demonstrate use of complex machinery, requiring multiple operations and use of appropriate equipment. The evidence will include the use of power take-off (PTO)-powered three-point linkage mounted equipment. Tasks will be undertaken efficiently, accurately and completely, meeting the specification requirements. Learners will work safely to a professional industry standard and they will comply with best workplace practice at all times.

For merit standard, learners will safely carry out tasks involving complex machinery that requires multiple operations, using appropriate equipment and a variety of tools and materials. Learners will demonstrate the use of PTO-powered three-point linkage mounted equipment. Learners will show clear evidence of both preparing and operating complex land-based machinery to meet given objectives. Tasks will be undertaken efficiently, accurately and completely, meeting the specification requirements. Learners will work to the standard of a competent employee.

Learners will demonstrate best workplace practice by working safely and in accordance with relevant legislation, ensuring the workplace is prepared and cleared. They will understand the need for, and demonstrate, correct tool, material and equipment procedures, including selection, use, transport, maintenance and storage.

For pass standard, learners will undertake tasks competently, safely and completely, meeting the specification requirements. Learners will safely prepare and operate simple land-based machines such as ride-on mowers and tractors for haulage. They will work to the standard of a novice employee.

Learners will demonstrate acceptable workplace practice by working safely and in accordance with relevant legislation, ensuring the workplace is cleared after task completion. They will demonstrate mostly correct tool, material and equipment procedures, including selection, use, transport, maintenance and storage.

Learners will show a realistic understanding of how different operator techniques may be used, although some aspects of their understanding might be limited in scope.

Learning aim C

For distinction standard, learners will review thoroughly the effectiveness of the techniques and workshop practices used to undertake the completion of tasks, supporting their views with well-reasoned judgements that cover all relevant factors. Learners will evaluate and report on how the techniques and practices used resulted in routine operator maintenance and repair being undertaken efficiently, accurately and completely. Learners will similarly provide an in-depth evaluation of the options available to carry out routine operator maintenance and repair, providing specific reasons that link logically to their views. Learners will dispose of any waste materials in a manner that fully complies with accepted practices and which shows full regard for the concepts and practices of sustainability. Evidence will use relevant and accurate terminology throughout, which supports a considered, comprehensive response.

For merit standard, learners will undertake tasks efficiently, accurately and completely, meeting the specification. Learners will proficiently, without errors, carry out routine maintenance and repair tasks, using appropriate equipment and a variety of tools and materials. They will work to the standard of a competent employee.

Learners will demonstrate best workplace practice by working safely and in accordance with relevant legislation, ensuring that the workplace is prepared and cleared. They will understand the need for, and demonstrate, correct tool, material and equipment procedures, including selection, use, transport, maintenance and storage. Learners will dispose of any waste materials in a manner that fully complies with accepted practices.

Learners will demonstrate clear understanding of the options for repair and maintenance by correctly assessing and reporting on potential faults in a machine and using the manufacturer's data to correctly specify replacement parts. Learners' assessment will be clear and technically accurate. They will use appropriate technical language in their evidence but this may be inconsistent.

For pass standard, learners will demonstrate that they can work safely and completely, meeting the specification requirements. There may, however, be a few minor inaccuracies or inefficiencies. They will carry out simple routine operator maintenance tasks, requiring few operations and a limited range of tools and materials. They will work to the standard of a novice employee.

Learners will demonstrate acceptable workplace practice by working safely and in accordance with relevant legislation, ensuring that the workplace is cleared after task completion. They will demonstrate correct tool, material and equipment procedures, including selection, use, transport, maintenance and storage. Any waste materials will be disposed of in line with acceptable working practices.

Learners will give realistic but limited explanations of the options available for the servicing and repair of machinery, using some technical language.

Links to other units

This unit links to Unit 1: Professional Working Responsibilities.

Employer involvement

This unit would benefit from employer involvement in the form of:

- masterclasses
- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 9: Managing Environmental Activities in Agriculture

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners select and apply the skills required to undertake the key vocational task of habitat surveys and management, to manage the relationship between agriculture and the environment.

Unit introduction

Agriculture is the main use of land in the UK and this has a significant influence on the environment. As food production keeps up with demand, farming methods change and the many changes that have been carried out to farm landscapes have resulted in the loss of habitats and associated species. Agri-environmental policies have been introduced to reverse this. To determine their effectiveness, the agricultural sector needs to examine the impact of agricultural activities on local environments and habitats.

In this unit, you will study the changes in farming practices and their impact on the environment. You will undertake habitat and species surveys to measure this impact. Building on your learning from across the qualification, including soil management, plant growth science and land-based and farming practices, you will then undertake a key vocational task for agricultural and land workers. You will plan and carry out habitat management in order to reduce the impact of agricultural activities on the environment.

To be able to complete the assessment activity in this unit, you will select and apply knowledge and skills developed in your study of the mandatory content and in your wider learning from across the programme. The skills and knowledge you will use follow on from those developed in *Unit 1: Professional Working Responsibilities*, *Unit 2: Plant and Soil Science* and *Unit 8: Land-based Machinery Operations*. You will also use your experience of sector standards and practices that you gained in *Unit 4: Work Experience in the Land-based Sectors*.

This unit will help you to progress to employment where you may have responsibility for managing agri-environmental schemes or habitats, in a role such as farmer, gamekeeper or wildlife manager. If you want to progress to higher education or to a course in, for example, land management, agricultural environmental management or countryside management, this unit will give you an excellent introduction to environmental and habitat management.

Learning aims

In this unit you will:

- A** Examine the impact of agricultural practices on the environment and farm habitats
- B** Plan activities to manage agricultural impact on the environment and species within a farm habitat
- C** Carry out planned activities to manage the environment of farm habitats.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Examine the impact of agricultural practices on the environment and farm habitats	A1 Changes in agricultural practices and environmental impacts A2 Characteristics of farmland habitats and species A3 Agricultural environment management methods	A report from a farm visit on: <ul style="list-style-type: none"> the positive and negative impacts of agricultural practices on the environment habitats in this environment the methods used by the farm to manage the impacts.
B Plan activities to manage agricultural impact on the environment and species within a farm habitat	B1 Assessing the agricultural environment B2 Development of an environment and habitat management plan	Planning and management of an agricultural environment, including: <ul style="list-style-type: none"> habitat and species surveys to manage their environment habitat management plans based on survey monitoring and research information a portfolio of evidence of practical habitat management tasks, e.g. logbook, observation records, witness statements, photographs. Learners will be expected to select and apply learning from other mandatory units and optional units as appropriate.
C Carry out planned activities to manage the environment of farm habitats	C1 Manage habitat environment activities C2 Evaluate the effectiveness of habitat management activities	

Content

Learning aim A: Examine the impact of agricultural practices on the environment and farm habitats

A1 Changes in agricultural practices and environmental impacts

- Changes in agricultural practices in the UK, e.g. technology, mechanisation, increasing outputs, consumer pressures, farming for energy, sustainable farming, legislation.
- Interrelationships between farming practices and the environment, e.g. organic farming, whole farm management, food safety and animal welfare, stewardship schemes.
- Agricultural and economic environmental value of habitat sites on farms, e.g. advantages such as cost saving, local community involvement, waste control.
- Agricultural production practice, resulting potentially in both positive and negative impacts.
- Environmental impact of agriculture practices, including climate change, deforestation, genetic engineering, water challenges, pollutants, soil degradation and waste.
- Positive and negative environmental impacts: positive, e.g. use of cover crops, conservation, reusing waste, carbon storage; negative, e.g. conservation and habitat loss, soil erosion, water loss and eutrophication.
- Government and non-government organisations involved in environmental issues, e.g. Department for Environment, Food and Rural Affairs (Defra), Environment Agency, Farming and Wildlife Advisory Group (FWAG), Linking Environment and Farming (LEAF), Organic Farmers and Growers, Soil Association.
- Current relevant legislation and codes of practice, e.g. Enclosure Acts, Corn Laws, Common Agriculture Policy, Wildlife and Countryside Act 1981 (as amended), Environmental Protection Act 1990, Hedgerows Regulations 1997, Water Framework Directive, Nitrates Directive, Waste Management (England and Wales) Regulations 2006, Environmental Impact Assessment (Agriculture) (England) Regulations 2006.

A2 Characteristics of farmland habitats and species

- Habitats, flora and fauna: what to look for, how to identify them.
- Common habitats, to include hedges, stone walls, field margins, woods, trees, beetle banks, grasslands, rivers, streams, ponds and lakes, curlew and skylark plots.
- Common farmland fauna and flora, to include plants, birds, mammals, reptiles, amphibians, invertebrates, insects.
- Key factors that affect farm habitats, e.g. species present, types of habitat, nutrient levels, animals that live in different habitats and why they require that environment, soil type, microclimate, competition, predation and human control.

A3 Agricultural environment management methods

- Agricultural practices for managing the environment, e.g. land management, tree and wild flower planting, grazing methods, waste and water recycling.
- Importance of habitat management, e.g. reintroduction of species, conservation of areas, monitoring of species, meeting requirements of stewardship or other schemes.
- Recording and monitoring requirements, e.g. specific directives, designations, frameworks, schemes and programmes.
- Habitat management tasks, e.g. scrub and invasive plant management, grassland management, path clearance, re-establishment, hedge maintenance, e.g. thinning, pruning, planting, laying, controlling woody plants, e.g. removing unwanted species, thinning an area of established woodland, pond, stream or ditch maintenance, clearance, drystone walling, installing artificial habitats.

Learning aim B: Plan activities to manage agricultural impact on the environment and species within a farm habitat

In carrying out the key vocational task, planning and carrying out habitat management activities, learners must select, and apply in an integrated way, learning from *Unit 1: Professional Working Responsibilities*, *Unit 2: Plant and Soil Science*, *Unit 4: Work Experience in the Land-based Sectors* and *Unit 8: Land-based Machinery Operations*.

B1 Assessing the agricultural environment

- Planning a habitat and species survey – choice of survey, choice of survey area, survey methodology, e.g. capture-mark-release, equipment, e.g. quadrant.
- Carrying out a farm habitat and species survey:
 - considerations before carrying out surveys, e.g. permissions required, public rights of way, assessment of previous land use, adjacent land use, protected species
 - use of information to aid identification, e.g. use of keys to identify species, tracks, trails and signs, e.g. footprints and excrement
 - sampling techniques, e.g. random, systematic, stratified
 - health and safety considerations, e.g. personal safety, lone working, working near water or animals and use of personal protection equipment (PPE), legislation and restrictions that apply to the collection of data, risk assessment
 - methods to record results, e.g. tally charts, mapping, use of ICT.

B2 Development of an environment and habitat management plan

- Key elements of management plan including summary of findings, measurable outcomes, aim and purpose, habitat description, target species improvements.
- Task allocation and schedules, taking into account species present, facilities, sources of expertise, seasonality, objectives of plan.
- Tools, materials and equipment for practical tasks, including suitable general tools and species-specific tools.
- Map providing visual plan of the site, e.g. soil types, boundaries, roads, vegetation map.
- Risk assessment and health and safety considerations, including compliance with relevant legislation and codes of practice, site restrictions or designations.
- Communication of the habitat management plan, e.g. to colleagues involved in the work, to contractors.
- Monitoring programmes to evaluate outcomes, e.g. species counts, marking, clay pads.

Learning aim C: Carry out planned activities to manage the environment of farm habitats

C1 Manage habitat environment activities

Habitat types may include: hedgerows, water meadows, hay meadows, amenity areas, reed beds, water courses, woodlands, other field boundaries.

- Professional working responsibilities, including: safe working practices, waste management, compliance with relevant legislation, codes of practice and work specifications, e.g. Site of Special Scientific Interest (SSSI), habitat regulations.
- Correct selection, transport, use, maintenance and storage of tools, materials equipment and machinery.
- Minimising environmental damage and maintaining site conditions.
- Project management, including: preparation, timing, meeting planned objectives, monitoring progress and quality of work, problem-solving and contingency activities.

C2 Evaluate the effectiveness of habitat management activities

- Collect and review feedback on the plan, e.g. from farm managers.
- Create evaluation framework using the developed plan as a checklist.
- Creating evaluation framework for assessing plan and management effectiveness, e.g. processes, management of work, problem solving.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Examine the impact of agricultural practices on the environment and farm habitats		A.D1 Evaluate the effectiveness of methods used to manage the impact of agricultural activity on the environment and farm habitats.
A.P1 Explain the impact of agricultural practices on the environment in the UK. A.P2 Explain methods used to manage the impact of agricultural activity on the environment and habitats.	A.M1 Analyse positive and negative impacts of agricultural practices and the approaches used on the agri-environment and farm habitats.	
Learning aim B: Plan activities to manage agricultural impact on the environment and species within a farm habitat		B.D2 Produce a comprehensive plan for the management of an agricultural environment and habitat based on detailed survey. C.D3 Evaluate the effectiveness of selected planning and management processes used in managing the impact of agricultural activities on the environment and habitats.
B.P3 Carry out a farm habitat survey. B.P4 Plan environment and habitat management activities, using the findings of the survey to manage the impact of agricultural activities on the environment.	B.M2 Carry out a detailed farm habitat survey. B.M3 Plan complex environment and habitat management activities to manage the impact of agricultural activities on the environment.	
Learning aim C: Carry out planned activities to manage the environment of farm habitats		
C.P5 Perform environment and habitat management activities selected in line with own plan. C.P6 Explain the effectiveness of environment and habitat management activities.	C.M4 Perform environment and habitat management tasks, selecting and adapting techniques for changing circumstances. C.M5 Assess the effectiveness of environment and habitat management activities.	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M2, B.M3, C.M4, C.M5, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

The special resources required for this unit are:

- habitats to carry out practical work
- a suitable range of tools for undertaking a species survey
- a suitable range of tools for undertaking habitat management tasks.

Essential information for assessment decisions

Learning aim A

Teachers should ensure that the agricultural enterprise chosen by learners for this unit provides sufficient scope for them to fully complete the assessment.

For distinction standard, learners will show depth and breadth of understanding by thoroughly evaluating the positive and negative impacts of modern-day farming on the environment and farm habitats. Learners will support their evaluation with well-selected, robust examples from their study.

Learners will consider the influence of UK legislation, policies and environmental organisations on farming methods and make specific, relevant connections between influences and outcomes. Learners will make justified links to waste management and the legislation in considering and evaluating the effectiveness of methods used to manage the impact of agricultural activity on the environment.

Learners will show through their evaluation how specific farming methods have impacted on the environment and farm habitats. They will provide convincing justifications for any conclusions and recommendations in their report. Learners will draw on their knowledge on the growth of plants when reviewing the agricultural practices for managing environmental impact, showing links between management of soil and soils types on the types of species and impact on the habitat.

For merit standard, learners will demonstrate their understanding by presenting a clear, balanced analysis of at least three positive and negative impacts of agricultural practices on the agri-environment and farm habitats. Learners will use mostly relevant examples to support their understanding. Learners will analyse the positive and negative impacts of agricultural practices, linking them to environmental management and methods used to manage the impact on farm habitats. Learners will make reasoned, analytical judgements in relation to a number of developments in farming practices, the influence of UK legislation and environmental organisations, and how these impact on the agri-environment and farm habitats. Learners will make clear links to waste management and the legislation in considering the effectiveness of methods used, development in farming practices and influence of legislation in managing the impact of agricultural activity on the environment.

Learners will show through their evaluation how specific farming methods have impacted on the environment and farm habitats. In their report, they will provide some reasoned arguments for any conclusions and recommendations.

For pass standard, learners will recall knowledge to explain the changes in agricultural practices, the influence of legislation and environmental organisations. Learners will provide a realistic explanation of the relationships between farming practices, the environment and farm habitats, using specific examples.

Learners will demonstrate a realistic understanding of the impact of different farming practices on the environment and farm habitats. For example, the use of field margins to reintroduce bird life to an area. Learners will use specific examples from their own research and study but these might be limited in scope or relevance. Learners will make limited links between management of soil and soils types on the types of species and impact on the habitat.

Learning aims B and C

In achieving learning aims B and C, learners must prepare a plan for the management of agricultural environments, engage in planned activities and evaluate the effectiveness of the processes used and their own environmental management activities.

In completing the assessment tasks for these learning aims, learners are required to independently select, apply and demonstrate appropriate knowledge and skills from learning undertaken in the following.

Unit 1: Professional Working Responsibilities, in particular the scope of personal responsibilities in the workplace, safe working practices, use of schematics and maps when planning surveys, habitat management tasks and waste management.

Unit 2: Plant and Soil Science, in particular understanding the growth of plants when planning management techniques, particularly the timing of activities; soil management practices applied when considering mitigation of agricultural activities such as agricultural chemicals used, and their impact on the soil and the species to be introduced or managed.

Unit 4: Work Experience in the Land-based Sectors where learners will use the knowledge and skills to plan activities and review their effectiveness.

Unit 8: Land-based Machinery Operations, in particular the use of machinery for different purposes and the safe use and storage of machinery and equipment.

For distinction standard, learners will use logical, professional arguments that are well substantiated when reviewing their farm habitat and species survey, giving valid reasons for all elements. They will demonstrate how their own survey data and additional research will underpin the development of their farm habitat management plan.

Learners will robustly justify their habitat management plan, relating it logically to measurable outcomes, using their own analysis and research to support their recommendations.

Learners will show that their habitat management plan effectively and thoroughly addresses specific relationships between the target species and its environment. They will draw on knowledge from across their learning to reflect on the impact of their farm habitat management plan and practical tasks undertaken. In particular, learners will synthesise the understanding of the growth of plants and soil management when planning habitat management, specifically linking the types of soil and how this impacts on the timing of activities in the management of environmental habitats.

Learners will use appropriate technical language consistently and accurately throughout the plan.

Learners will demonstrate competency and proficiency in practical habitat management tasks, identifying effective solutions to deal with changing circumstances. For example, finding protected species in the habitat. Learners will draw up a valid and reliable evaluation framework to assess the management activities. Learners will show robust understanding that the activities undertaken may have both positive and negative impacts on the farm habitat and species. They will identify and justify relevant improvements in the habitat management tasks undertaken.

For merit standard, learners will make clear, balanced analytical judgements on their farm habitat and species survey, and how it relates to the development of their habitat management plan. They will support this with real examples.

Learners will produce a habitat management plan that details the site of the farm habitat, and the resources and tasks required, based on their own survey and research. Learners will use appropriate technical language throughout the plan but this may be inconsistent.

Learners will demonstrate competent practical habitat management tasks and select appropriate resources for completing the tasks. Learners will demonstrate practical habitat management tasks, identifying solutions to deal with changing circumstances. For example, finding protected species in the habitat.

Learners will draw up a valid and reliable evaluation framework to assess the management activities. Learners will analyse the impact of their task on the farm habitat and species through monitoring and reviewing the actual tasks against those planned. Any variations in the tasks undertaken will be supported by reasoned justifications.

For pass standard, learners will undertake a farm habitat and species survey safely and correctly. They will present their findings in an appropriate format. Learners will show some links to the scope of personal responsibilities in the workplace and safe working practices, undertaking surveys and preparing their habitat management plan.

Learners will prepare a habitat management plan using the results from their survey research. The plan will include details of the site where the habitat management will take place, the survey results and tasks to be undertaken. Learners will use some appropriate technical language in their plan.

Learners will demonstrate practical habitat management skills, showing that they can work safely and efficiently while taking account of the environment and habitat in which they are working. They will select the correct equipment and return it clean and ready for the next user.

Learners will draw up an evaluation framework to assess the management activities. Learners will review the habitat management activities, showing some relevant knowledge of the impact of the tasks on their species, how the actual tasks differed from the planned tasks and areas of their plan that could be improved.

Links to other units

For the Pearson BTEC National Foundation Diploma in Agriculture, this unit should be completed towards the end of the programme. In order to complete the synoptic assessment task in this unit, learners should build on the assessments from across the mandatory content, selecting and applying appropriate knowledge and skills, including safe working practice from *Unit 1: Professional Working Responsibilities*, plant growth and soil management from *Unit 2: Plant and Soil Science*, and operation, use and management of machinery from *Unit 8: Land-based Machinery Operations*. Additionally, learners will have completed *Unit 4: Work Experience in the Land-based Sectors* and will be able to apply their experience of and insight into real working practices in the sector.

Employer involvement

This unit would benefit from employer involvement in the form of:

- masterclasses and technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment and/or project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 10: Crop Handling, Storage and Quality Assurance

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners develop skills to handle and store crops through practical tasks and investigative research into quality assurance requirements.

Unit introduction

The efficient harvesting of a crop product is only part of successful crop production; the product also needs to be stored safely and handled without undue damage. This concept applies regardless of whether the crop product is destined for animal feedstuffs or bedding, human consumption, or further processing into pharmaceutical and industrial products.

This unit will enable you to identify appropriate storage and handling systems for a range of crop products and understand how crop products are managed post-harvest. You will learn to recognise the common pests and diseases found in stored products, and explore solutions to these issues, both for crops with a low moisture content, and for those with a higher moisture content that are stored fresh. You will gain knowledge of how crop products are maintained to an acceptable standard to meet the requirements of assurance schemes. This unit will help you to develop skills in using the equipment associated with safe storage and handling of crop products.

This unit will also help you to progress to employment or higher education. As food safety and reduction of food waste become increasingly important, both nationally and globally, the insight you gain from this unit will help you to prepare for and inform you of the important challenges and opportunities that face the agriculture industry in the 21st century.

Learning aims

In this unit you will:

- A** Investigate processes and systems to maintain dry crop products in storage
- B** Investigate processes and systems to maintain fresh crop products in storage
- C** Safely operate machinery and equipment used for handling, cleaning, grading and weighing crops.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate processes and systems to maintain dry crop products in storage	A1 The storage requirements of dry crop products A2 The management of dry crop products in storage	An illustrated report or presentation evaluating the storage requirements and systems of two contrasting dry crop products, and the impact on quality.
B Investigate processes and systems to maintain fresh crop products in storage	B1 The storage requirements of fresh crop products B2 The storage requirements of forage crop products B3 The management of fresh crop products in storage	An illustrated report or presentation evaluating the storage requirements and systems of two contrasting fresh crop products, and the impact on quality.
C Safely operate machinery and equipment used for handling, cleaning, grading and weighing crops	C1 Combinable crop handling equipment C2 Handling roots, fruit, field vegetables and forage crops	A portfolio of evidence relating to the safe handling of crop products.

Content

Learning aim A: Investigate processes and systems to maintain dry crop products in storage

The fundamental characteristics of crop storage facilities for dry products destined for either human or animal consumption.

A1 The storage requirements of dry crop products

- Current relevant legislation and codes of practice:
 - current relevant legislation
 - codes of practice, e.g. assurance schemes, assurance scheme requirements
 - specific end-user specifications, e.g. malting, milling, processing
 - crop properties, e.g. angle of repose, airflow properties, bulk density
 - segregation.
- Storage systems:
 - on the farm, including:
 - bins
 - silos
 - on the floor
 - temporary storage
 - long-term storage
 - central stores, including cooperative stores.
- Drying and conditioning:
 - moisture and temperature monitoring, including hand-held instrumentation and automated systems
 - drying systems, including batch drier, continuous flow driers, bulk drying
 - high and low temperature dryer design and operation
 - fans and airflow characteristics
 - sustainable sources of fuel and heat
 - cooling methods.

A2 The management of dry crop products in storage

The fundamental concepts of the maintenance of storage and handling systems for dry crop products.

- Legislation relating to food quality standards.
- Store maintenance, cleanliness and hygiene.
- Safe storage design, height and volume, depth and integrity.
- Health and safety in the store.
- Personal protective equipment (PPE), including prevention of dust inhalation.
- Transport in and around the store.
- Prevention of crop deterioration in store, including control of storage pests and diseases.
- Training and qualifications required to apply rodenticides and plant production products.
- The use and disposal of waste and by-products.
- Record-keeping requirements.
- Staff training.

Learning aim B: Investigate processes and systems to maintain fresh crop products in storage

The fundamental characteristics of crop storage facilities required for fresh products destined for either human or animal consumption.

B1 The storage requirements of fresh crop products

- Types of fresh crop materials destined for human consumption:
 - root crops, e.g. potatoes and sugar beet
 - field vegetables, e.g. onions, brassicas, lettuce, vining peas
 - soft fruit, e.g. strawberries, raspberries
 - top fruit, e.g. apples.
- Storage systems for fresh crops:
 - bulk stores
 - container stores
 - box storage
 - temperature-controlled storage
 - importance of time management when dealing with fresh produce
 - control of storage pests and diseases
 - crop assurance scheme requirements
 - record-keeping requirements.

B2 The storage requirements of forage crop products

- Silage and haylage production:
 - methods, e.g. baling, clamps, wrapping, inclusion of inoculants, additives, preservatives
 - measures to control deterioration in quality
 - storage design, e.g. height and volume
 - methods of forage crop storage, e.g. single or mixed crop
 - health and safety, e.g. preventing falls, appropriate PPE, use of additives, inoculants
 - pest and disease control, e.g. rodents and fungal infections.
- Hay and dry forage production:
 - preventing pest and disease ingress
 - storage requirements, including storage height
 - additional treatments, e.g. drying, steaming and soaking
 - health and safety considerations, e.g. preventing inhalation of fungal spores
 - reasons for maintaining dry storage.
- Other forage crops:
 - clamps for root crops, e.g. fodder beet
 - other locally important crops.

B3 The management of fresh crop products in storage

The fundamental concepts of the management of storage and handling systems for fresh crop products.

- Legislation relating to food quality standards.
- Store management:
 - instrumentation and systems control
 - ambient air quality amelioration systems
 - refrigeration and temperature regulation
 - store site management
 - store layout and access
 - store hygiene and its importance
 - food safety considerations and degree of risk, e.g. material that is consumed with no further processing compared to material that is cooked, further processed or fed to animals
 - drainage
 - pest and disease control measures, e.g. rodents and fungal infections
 - the use and disposal of outgrades, waste and by-products.

Learning aim C: Safely operate machinery and equipment used for handling, cleaning, grading and weighing crops**C1 Combinable crop handling equipment**

- Loading and unloading machinery:
 - staff training
 - machinery operation, e.g. trailers, chaser bins
 - material handlers
 - elevators, conveyors and augers
 - design considerations.
- Cleaning equipment:
 - staff training
 - dust extraction, e.g. for improved crop quality and health and safety requirements
 - aspirated screens
 - gravity separation
 - specialist sorting machinery, including optical sorters
 - documentation, e.g. crop passports before dispatching a load of product
 - health and safety and PPE requirements when operating and cleaning machinery and equipment.

C2 Handling roots, fruit, field vegetables and forage crops

The techniques required for the safe handling of fresh crop products during loading, unloading and within store.

- Loading and unloading machinery and equipment for roots, fruit and field vegetables:
 - box and bulk systems
 - box fillers
 - box handlers
 - the operation of conveyors and elevators
 - cleaning and grading machinery
 - loading equipment
 - documentation, e.g. requirements for factory receipt for sugar beet.
- Machinery and equipment for grading and packing:
 - store design
 - weighing machines
 - sizing and grading machinery
 - cleaning equipment, including washing and brushing
 - packaging systems, including bagging and shrink wrapping.
- Loading and unloading machinery and equipment for forage crops:
 - trailers and wagons
 - grabs
 - elevators and conveyors
 - material handlers
 - chopper blowers.
- Specific PPE and health and safety requirements when handling roots, fruit, field vegetables and forage crops.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate processes and systems to maintain dry crop products in storage		A.D1 Evaluate the suitability of storage systems for two contrasting dry crop products, relating it to the maintenance of quality.
<p>A.P1 Explain the basic physical storage requirements for two contrasting dry crop products.</p> <p>A.P2 Explain the key aspects involved in the management of dry crop products in storage.</p>	<p>A.M1 Assess the suitability of storage systems for two contrasting dry crop products.</p>	
Learning aim B: Investigate processes and systems to maintain fresh crop products in storage		B.D2 Evaluate the suitability of storage systems for two contrasting fresh crops, relating it to the maintenance of crop product quality.
<p>B.P3 Explain the basic physical storage requirements for two contrasting fresh crop products.</p> <p>B.P4 Explain the key aspects involved in the management of fresh crop products in storage.</p>	<p>B.M2 Assess the suitability of storage systems for two contrasting fresh crop products.</p>	
Learning aim C: Safely operate machinery and equipment used for handling, cleaning, grading and weighing crops		C.D3 Evaluate the impact of handling of the crop products on the quality of two final products.
<p>C.P5 Carry out a combinable crop handling task to meet quality and safety objectives.</p> <p>C.P6 Carry out a root, fruit, field vegetable or forage crop handling task to meet quality and safety objectives.</p>	<p>C.M3 Assess the impact of handling of crops on the quality of two contrasting final products.</p>	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of three summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aim: B (B.P3, B.P4, B.M2, B.D2)

Learning aim: C (C.P5, C.P6, C.M3, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- a range of crop storage facilities
- a suitable range of equipment and machinery used for crop handling and storage.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will provide a convincing, in-depth evaluation of the effectiveness of the storage of two contrasting dry crop products. The contrast between the crop products could be related to the characteristics of the material or to the end use and, if possible, to different storage systems. The evaluation will consider thoroughly the type of storage, relating this accurately and specifically to the crop product. The evidence will be clearly focused on the parameters used to safely store dry crop products commercially, with no irrelevancies. Learners will comprehensively consider quality parameters, the selection of storage facilities for specific end uses, the restrictions imposed by food safety and the use or disposal of by-products. The evaluation will be relevant at a local and regional level, robustly supported by reasoned, valid judgements. The evidence will make use of appropriate, accurate agricultural terminology throughout.

For merit standard, learners will provide a clear, balanced assessment of the suitability of storage facilities for two contrasting dry crop products. The contrast between the crop products could be related to the characteristics of the material or to the end use and, if possible, to different storage systems. Learners will draw on their breadth of understanding of the type of storage involved and relate this clearly to the crop product. The evidence will be focused on the parameters used to safely store dry crop products commercially and will be detailed and supported by mostly relevant examples. It will be structured and use appropriate agricultural terminology.

For pass standard, learners will provide a realistic explanation of the basic storage requirements of two contrasting dry crop products. The contrast between the crop products could be related to the characteristics of the material or to the end use of the material and, if possible, to different storage systems. Learners will explain the management of the crops in storage as well as the machinery required (as listed in the unit content). The evidence will be supported by some relevant examples. Learners will demonstrate realistic but limited knowledge of relevant legislation, codes of practice and assurance schemes, particularly those related to health and safety, and food hygiene. There may be some minor irrelevancies in the evidence and some agricultural terminology may be omitted.

Learning aim B

For distinction standard, learners will provide a convincing, in-depth evaluation of the effectiveness of the storage of two contrasting fresh crop products, one of which should be a forage crop or product destined for animal feed. The evaluation will thoroughly consider the type of storage, relating this accurately and specifically to the crop product. The evidence will be clearly focused on the parameters used to safely store fresh crop products commercially, with no irrelevancies. Learners will comprehensively consider quality parameters and the selection of storage facilities for specific end uses. They will show robust understanding of the restrictions imposed by food safety, including relating food safety risks to the amount of processing a product undergoes before consumption and the use or disposal of by-products. The evaluation will be relevant at a local and regional level and supported by reasoned, valid judgements. The evidence will make use of appropriate, accurate agricultural terminology throughout.

For merit standard, learners will provide a clear, balanced assessment of the suitability of storage facilities for two contrasting fresh crop products, one of which should be a forage crop or product destined for animal feed. The contrast between the crop products could be related to the characteristics of the material or to the end use. Learners will relate food safety risks logically to the amount of processing the product undergoes before consumption. They will draw on their breadth of understanding of the type of storage involved and relate this clearly to the crop product. The evidence will be focused on the parameters used to safely store fresh crop products commercially and will be detailed and supported by mostly relevant examples. It will be structured and use appropriate agricultural terminology.

For pass standard, learners will provide a realistic explanation of the basic storage requirements of two contrasting fresh crop products, one of which should be a forage crop or product destined for animal feed. The contrast between the crop products could be related to the characteristics of the material or to the end use of the material and, if possible, to different storage systems. They will explain the management of the crops in storage as well as the machinery required (as listed in the unit content). The evidence will be supported by some relevant examples. Learners will demonstrate realistic but limited knowledge of relevant legislation, codes of practice and assurance schemes, particularly those related to health and safety, and food hygiene risks. There may be some minor irrelevancies in the evidence and some agricultural terminology may be omitted.

Learning aim C

For distinction standard, learners will safely undertake crop-handling tasks with a very high degree of accuracy. They will provide in-depth, insightful suggestions regarding the impact of crop handling on crop products, relating their suggestions specifically and accurately to the handling tasks that they undertook. Learners will show in-depth understanding of the importance of safe handling with regard to food hygiene and health and safety. They will use specific, accurate agricultural terminology throughout, and provide specific, valid reasons that link logically to their views.

For merit standard, learners will safely undertake crop-handling tasks with a high degree of accuracy and make clear, mostly relevant suggestions regarding the impact of crop handling and storage on crop products. They will relate clearly their suggestions to the handling tasks that they undertook. Learners will demonstrate their breadth of knowledge of the importance of safe handling with regard to food hygiene and health and safety. Learners will use accurate agricultural terminology.

For pass standard, learners will safely carry out at least one given crop-handling task for a combinable crop and a root, fruit field vegetable crop or forage crop (i.e. two crop types in total). The tasks will be undertaken with an appropriate degree of accuracy but might be limited in scope, since learners are not expected to be able to use efficiently all the unloading, transportation, segregation, conditioning, grading, sorting, or cleaning equipment listed in the unit content. Learners will complete all relevant documentation required commercially for the task undertaken and meet all assurance scheme and food safety requirements. Some accurate agricultural terminology will be used.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 6: Crop Production.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 11: Livestock Health and Diseases

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners develop the skills to manage livestock health through the monitoring and recording of animal health, and the implementation of prevention methods to protect animals from diseases.

Unit introduction

Animals can become ill and, unlike humans, they cannot explain what might be wrong. As a stockperson, it is vital that you can reduce the risk of illness happening, recognise signs that indicate a disease or disorder may be present and manage the health of animals in your care.

In this unit, you will study the causes, signs and treatments of illness and disease in livestock, along with how pathogens and parasites grow, reproduce and cause infection. This will help you to understand infection identification and control, and the different treatment options available. You will explore practical ways to assess and manage livestock health, including assessment techniques, how to apply basic treatments and implementation of preventative measures. You will learn about the importance of, and skills involved in, planning strategies for managing livestock health along with monitoring and recording health and health care interventions. This will help you to promote and maintain the health status and productivity of livestock species.

The skills you learn in this unit are key to employment in the animal sector, including zoos, farms, and pet-related industries, and for progression to a higher education course in, for example, animal science and veterinary nursing.

Learning aims

In this unit you will:

- A** Understand how pathogens and parasites impact on livestock health management
- B** Undertake health assessments for effective management of livestock health and welfare
- C** Explore livestock health management strategies to prevent and control ill health.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Understand how pathogens and parasites impact on livestock health management	A1 Structure and reproduction of pathogens and parasites, and disease transmission A2 Defence against disease	A report exploring the structure, growth, reproduction and transmission of disease caused by pathogens and parasites of livestock.
B Undertake health assessments for effective management of livestock health and welfare	B1 Assessing general health in animals B2 Livestock diseases and disorders	A portfolio of evidence, including: <ul style="list-style-type: none"> witness statements and observation records of practical activities assessing the health of three different livestock species witness statements and observation records of practical activities recording and monitoring livestock health livestock health management plans and rationales report on the management of two diseases and disorders and two infestations in livestock health, productivity and welfare planning.
C Explore livestock health management strategies to prevent and control ill health	C1 Health and hygiene C2 Theory and administration of basic treatments and health management C3 Health planning, assessment, recording and monitoring	

Content

Learning aim A: Understand how pathogens and parasites impact on livestock health management

A1 Structure and reproduction of pathogens and parasites, and disease transmission

External and internal structure, life cycles and reproduction methods, pathogenesis and aetiology of diseases as appropriate to different types of pathogens and parasites.

- Bacteria:
 - cellular structure, including cell wall, membrane, DNA structures, flagella, morphology of bacteria, Gram-positive and Gram-negative
 - asexual reproduction and sexual reproduction, horizontal and vertical gene transmission, to include transfer of antibiotic-resistant genes
 - bacterial disease, e.g. *Bacillus anthrax*, *Salmonella* spp, *Escherichia coli* spp, *Mycobacterium bovis* and *Mycoplasma* spp.
- Viruses:
 - genome, capsid, morphology, capsomeres, nucleocapsid and envelopes, including bacteriophages
 - replication in host cells
 - viral diseases, e.g. bluetongue (BTV-8), foot and mouth disease (FMDV), influenza
 - prions, e.g. scrapie, bovine spongiform encephalopathy (BSE).
- Fungi:
 - cellular structure of yeast and moulds
 - asexual and sexual
 - fungal disease, e.g. food-borne mycotoxins, ringworm and *Aspergillus* spp.
- Parasites:
 - hosts and locations of life-cycle stages
 - lice, to include species of sucking and biting lice
 - mites, to include species of sucking and burrowing mites
 - worms (intestinal, stomach and lung), e.g. *Taenia* spp, *Haemonchus contortus*, *Dictyolcaulus* spp.
 - flukes, e.g. *Fasciola hepatica*
 - coccidia.
- Interaction with host, to include:
 - direct damage to cells
 - effect of toxin production
 - physiological response of host.
- Modes of transmission and average lengths of contamination, to include:
 - touch
 - body fluids (blood, semen, mucus, saliva)
 - air
 - food
 - water
 - insect vectors, e.g. flies
 - fomites, e.g. bedding and barbed wire.
- Growth of bacteria, viruses and fungi:
 - environmental factors affecting growth, including temperature, pH, water, oxygen, and the practical meaning of this in an animal's surroundings.

A2 Defence against disease

The role of the immune system in disease and prevention of disease in livestock.

- Non-specific (innate) immune response:
 - natural barriers to infection, including mechanical barriers, epithelia, and chemical and biological defence
 - inflammation, e.g. heat, swelling and pain
 - phagocytosis
 - role of blood in defence against disease, including blood clotting and thrombosis.
- Adaptive (acquired) immunity:
 - humoral immunity, antibody-mediated immunity
 - cell-mediated immunity
 - leucocyte structures and functions
 - adaptive immune system, including specific responses and interactions of different types of B cells and T cells.
- Different types of immunity:
 - natural/artificial and active/passive.
- Vaccination – interaction with the immune system, mode of action in the body and effectiveness over time, to include:
 - live attenuated
 - inactivated vaccines
 - toxoid vaccines
 - subunit vaccines.

Learning aim B: Undertake health assessments for effective management of livestock health and welfare**B1 Assessing general health in animals**

Techniques and equipment used to establish the health status of livestock, to include the indicators of good and poor health as appropriate in cattle, deer, game birds, goats, pigs, sheep and poultry.

- Indicators of health status in livestock species, to include:
 - behaviour, posture and movement
 - coat or feather condition
 - weight
 - body condition score
 - presence of lumps/bumps
 - normal parameters of temperature, pulse and respiration
 - normal levels and colour of discharge from eyes, ears and nose
 - intactness, colour and presence of teeth
 - colour and moistness of mucous membranes
 - colour of comb
 - faeces/urine output, e.g. volume, colour, texture.
- Assessment techniques and equipment as appropriate, to include:
 - condition scoring
 - weighing and measuring
 - postural changes
 - environmental assessment.

B2 Livestock diseases and disorders

Clinical signs, treatments, prognosis and prevention of livestock diseases and disorders as appropriate to cattle, deer, game birds, goats, pigs, sheep and poultry, to include when, why and how notifiable diseases must be reported to the Animal and Plant Health Agency (APHA).

- Bacterial infections, e.g. *Bacillus anthrax*, *Salmonella* spp, *Escherichia coli* spp and *Mycobacterium bovis*, *Mycoplasma* spp.
- Viral diseases, e.g. bluetongue (BTV-8), foot and mouth disease (FMDV), influenza.
- Fungal disease, e.g. food-borne mycotoxins, ringworm and *Aspergillus* spp.
- Prions, e.g. scrapie and bovine spongiform encephalopathy (BSE).
- Parasites, to include lice, mites, worms (intestinal, stomach and lung), flukes and coccidia.
- Zoonotic and notifiable diseases, to include anthrax, avian influenza, bovine spongiform encephalopathy (BSE), brucellosis, coxiella, foot and mouth, orf, rabies, ringworm, scrapie and tuberculosis.
- Nutritional disorders:
 - obesity
 - food toxicity, e.g. acidosis, dehydration.
- Endocrine disorders and their clinical signs, treatment and prevention.
- Metabolic disorders:
 - hypocalcaemia and hypomagnesaemia
 - ketosis.

Learning aim C: Explore livestock health management strategies to prevent and control ill health

C1 Health and hygiene

Appropriate uses, advantages and disadvantages of techniques and equipment required to prevent the transmission or development of diseases in cattle, deer, game birds, goats, pigs, sheep and poultry.

- Antimicrobial agents:
 - soap, including correct hand-washing techniques
 - external use of antiseptics on living organisms, to include alcohols, chlorhexidine and iodine
 - use of disinfectants on non-living objects, to include foot dipping, cleaning and disinfecting housing, vehicles and workers
 - factors affecting effectiveness of antimicrobial agents, e.g. frequency of cleaning and disinfection, impact of incorrect dilution rates.
- Sterilisation of equipment, including different methods and equipment, e.g. heat, chemical, high pressure.

C2 Theory and administration of basic treatments and health management

Reasons for, advantages, disadvantages, equipment, methods and legal implications of administering different treatments and routine health management practices.

- Non-medical routine health maintenance:
 - nutrition regulation and weight control
 - bathing and skincare
 - dental care
 - foot/hoof care.
- Types of treatment:
 - antibiotics
 - nutrition management
 - anthelmintics for parasitic infections (topical and internal)
 - vaccines.

- Routes of administration for livestock medications:
 - gastrointestinal, including oral (per os), gavage (tube or gavage needle) and rectal (per rectum)
 - parenteral, including subcutaneous (SC), intramuscular (IM), intradermal (ID) and intranasal
 - topical applications.
- Parasite treatment, to include:
 - oral (drenching, paste, tablets)
 - topical (spot on, spraying)
 - injection.
- Vector control, e.g. dipping, indoor housing, clipping.

C3 Health planning, assessment, recording and monitoring

Purpose, legal requirements, advantages and disadvantages of methods of keeping essential livestock health records as appropriate for cattle, deer, game birds, goats, pigs, sheep and poultry.

- Reasons for keeping records, e.g. passports, prevention of overdose/underdose, ease of tracking for others working with the livestock.
- Practical monitoring and recording, to include observation and physical examination/health checks.
- Herd or flock health plans.
- Key information and events to record:
 - births
 - identification of individuals, e.g. tagging, slap marking
 - movements
 - deaths and disposal of fallen stock.
- Key data to record and reasons for treatments administered, to include:
 - time, date
 - name, strength, amount and batch number of treatment
 - required frequency of treatment
 - withdrawal period, if applicable
 - person administering health records of animal before and after treatment and comments on change.
- Methods of record keeping, to include paper-based and electronic recording systems, e.g. treatment, monitoring and reporting forms.
- Production, monitoring and recording of health and hygiene plans:
 - management of environmental factors to prevent pathogen growth and disease transmission, to include best practice hygiene and isolation procedures
 - management practices, including grazing rotation, management of chemicals and waste
 - vaccination schedules
 - planning to manage disease outbreak, e.g. biosecurity measures, restriction of access, Control of Substances Hazardous to Health (COSHH) Regulations 2002, risk assessment.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Understand how pathogens and parasites impact on livestock health management		
<p>A.P1 Explain the structure, growth and reproduction of livestock pathogens and parasites.</p> <p>A.P2 Explain the routes of transmission and effects on animal health of bacteria, viruses, fungi and parasites.</p>	<p>A.M1 Analyse how the immune system of an animal species responds to the pathogenesis and transmission of organisms.</p>	<p>A.D1 Evaluate the effectiveness of the immune system of an animal in responding to the growth and reproduction of pathogens and parasites.</p>
Learning aim B: Undertake health assessments for effective management of livestock health and welfare		
<p>B.P3 Perform techniques to assess livestock health in straightforward situations.</p> <p>B.P4 Explain signs, treatments, prognosis and prevention of livestock diseases and disorders.</p>	<p>B.M2 Assess the health of livestock efficiently in complex situations, analysing appropriate use of indicators and treatment options.</p>	<p>B.D2 Evaluate the use of livestock health assessments to manage health in complex situations.</p>
Learning aim C: Explore livestock health management strategies to prevent and control ill health		
<p>C.P5 Carry out correct and safe routine recording and monitoring of interventions in livestock health management.</p> <p>C.P6 Explain monitoring and record keeping in livestock health management.</p>	<p>C.M3 Carry out efficient recording and monitoring of interventions in complex livestock health management situations, analysing ongoing monitoring regimes.</p>	<p>C.D3 Evaluate effectiveness of own and existing livestock health management strategies, making recommendations for improvement.</p>

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, CP.6, B.M2, C.M3, B.D2, C.D3).

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- antimicrobial agents
- disinfectants and antiseptics
- different livestock species.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will articulate arguments concisely and professionally to evaluate the growth and reproduction of two examples of each type of disease/parasite (bacterial, viral, fungal and parasite) and the responses of the immune system. They will show depth of understanding through detailed explanation of the structure and function of pathogens and parasites, evaluating the effect of the environment on the growth and reproduction of all the organisms mentioned. Learners will use detailed analysis and research to explain the immune response in detail (including the involvement and interaction of different cell types), demonstrating a thorough understanding of the role of the immune system. They will include an evaluation of how the animal immune system can affect the symptoms of a disease.

For merit standard, learners will reach reasoned, analytical judgements, considering how the immune system responds to the threat of infection. They will select and apply knowledge relating to pathogenesis and parasites of two examples of each type of disease/parasite (bacterial, viral, fungal and parasite), including route of transmission, where they reproduce and how they cause disease. Learners will explain the relationship between the immune system's structure and functions and how it responds to infection by pathogens and parasites.

For pass standard, learners will demonstrate knowledge and understanding of the transmission route and effects of two examples of each type of disease/parasite (bacterial, viral, fungal and parasite), clearly identifying key structures, functions and methods of reproduction. They will outline the different types of reproduction of each pathogen and parasite. Learners will describe the innate physical and chemical barriers to pathogens and parasites, outlining the meaning and responses of different types of immunity (natural active, artificial active, natural passive and artificial passive).

Learning aims B and C

For distinction standard, learners will safely carry out three detailed assessments of health in three livestock species, assessing all health indicators in the unit content. They will demonstrate proficient use of methods in assessing, recording and monitoring livestock health in more advanced situations. The practical assessments will be of similar complexity to those demonstrated at merit level.

Learners will demonstrate thorough research and analysis to rationalise planning of a range of appropriate livestock health management strategies, demonstrating a very good understanding of the advantages, disadvantages and legal implications of implementing plans to manage livestock health. They will consider the impact of clinical signs of two diseases or disorders and two infestations on the animal's health and welfare, explaining in detail how different treatments and preventative actions work in each case. Learners will draw together knowledge and understanding from across the learning aims to make valid judgements about the risks and limitations of each method of health assessment, treatment options and preventative actions in relation to the causative agents and desired outcomes. They will make appropriate recommendations for improvement to the planning and practical implementation of livestock health management strategies in terms of health, productivity and welfare.

For merit standard, learners will select and carry out appropriate methods to assess the health of three livestock species, modifying techniques to suit the context. They will select and use treatments and delivery methods appropriate to purpose, limitations and resource constraints and use suitable recording and monitoring methods, in an organised way that does not waste time or resources. Learners will competently address more complex situations, such as those where the number of animals is larger or where the amount of information that must be recorded as part of the monitoring is inherently greater.

Learners will demonstrate sound knowledge and understanding of the relationship between health and hygiene planning, livestock welfare and productivity. They will carefully consider clinical signs, treatments and prevention methods for two diseases or disorders and two infestations, reaching valid conclusions on the interventions and health management strategies which are likely to be most beneficial. They will reach reasoned, analytical judgements on the impact of clinical signs on the animal's health and welfare, explaining in detail how different treatments and preventions work in more complex situations, such as in a herd, flock or group situation. They will demonstrate good understanding of the purposes and practicalities of ongoing monitoring regimes, making salient judgements on decisions made in terms of health, productivity and welfare.

For pass standard, learners will work in a safe and appropriate manner to correctly assess the health of three livestock species and implement basic health management strategies. Learners will demonstrate knowledge of each of the health indicators listed in the content as appropriate, linking the clinical signs of disease, different treatment options and preventions available for two diseases or disorders, and two infestations.

Learners will outline the key information that must be captured as part of the requirements of managing the health of livestock species and why they must be recorded, making reference to those that are legal requirements in addition to those which are good practice. They will select and use appropriate recording and monitoring methods. Learners will demonstrate correct knowledge and understanding of livestock health management strategies and ways in which good livestock health, productivity and welfare can be achieved.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 7: Farm Livestock Husbandry
- Unit 9: Managing Environmental Activities in Agriculture.

Employer involvement

This unit would benefit from employer involvement in the form of:

- masterclasses
- technical workshops involving staff from local organisations
- contribution of ideas to unit assignment/project materials
- support from local farm staff, vets or inspectors as mentors.

Unit 12: Developing a Land-based Enterprise

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners develop the skills needed to prepare a business plan for a viable land-based enterprise, based on their own market research and financial feasibility study.

Unit introduction

Understanding the operation of any business is vital if it is to be successful. Employees need to have knowledge of the business environment and marketplace as well as good business management skills. The land-based sector is predominately made up of small and medium-sized businesses, and this provides many opportunities to set up your own business.

In this unit, you will learn about the features and resources, including human, physical and financial, and the processes that businesses operating in the land-based sector need. You will undertake a financial viability study, preparing cash flows, an income statement and a statement of financial position. You will undertake market research to identify a viable enterprise, leading to the production and presentation of a viable business start-up plan for a chosen land-based enterprise.

These activities will prepare you for employment in the land-based sector in roles such as unit manager, or for self-employment in the sector. This unit will also enable you to progress to higher education courses such as a degree in land-based business management or relevant vocational degrees such as horticulture or countryside management.

Learning aims

In this unit you will:

- A** Examine the features, resource requirements and processes of businesses operating in the land-based sector
- B** Carry out market research to identify a financially viable land-based enterprise
- C** Develop a business start-up plan for a viable land-based enterprise.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Examine the features, resource requirements and processes of businesses operating in the land-based sector	A1 Features of land-based businesses A2 Resource requirements of land-based businesses A3 Land-based business processes and procedures	A report that investigates the key features, resource requirements and processes of a profit and a not-for-profit business operating in the land-based sector.
B Carry out market research to identify a financially viable land-based enterprise	B1 Market research and analysis B2 Financial feasibility of a land-based enterprise	A business start-up plan for a chosen enterprise for presentation to potential stakeholders, supported by market research and a financial viability analysis.
C Develop a business start-up plan for a viable land-based enterprise	C1 Features of a business start-up plan C2 Presenting and evaluating the business plan	

Content

Learning aim A: Examine the features, resource requirements and processes of businesses operating in the land-based sector

A1 Features of land-based businesses

- Ownership and liability, to include sole trader, partnership, private and public limited company, franchises, public sector businesses, not-for-profit.
- Objectives associated with business type, e.g. supply of products or services, not-for-profit, profit making.
- Scope of business activities, to include local, national, international.
- Link between land-based and associated industries in the supply chain, e.g. production and manufacturing, leisure.
- Reasons for success and how they differ depending on ability to meet demand, use of technology, type of business, innovative products or systems.
- Importance of land-based industries to regional and local economies, including social and environmental impact, e.g. bringing employment, gross domestic product (GDP), changes in biodiversity, sustainability.

A2 Resource requirements of land-based businesses

- Physical resources, to include land, machinery, equipment, materials.
- Human resources, including skills and knowledge requirements, staff, structure.
- Financial resources, including internal (retained profit) and external sources (loans, hire purchase, grants).
- Educational resources, such as professional trade associations and trade bodies, government organisations, e.g. Department for Environment, Food and Rural Affairs (Defra), research organisations.

A3 Land-based business processes and procedures

Importance, legal aspects and management efficiency.

- Sourcing materials and services, e.g. timing, purchasing, ordering procedures, credit control, record keeping.
- Planning the production of products or services, e.g. forecasting supply and demand, methods of production (job, batch, lean, flow).
- Sales and marketing, e.g. pricing strategies, costs, internal and external communication, promotional activities (direct marketing, advertising).
- Legislative recording requirements, e.g. health and safety, Control of Substances Hazardous to Health (COSHH) Regulations 2002, food safety, plant and animal passports.
- Details and purpose of relevant registration schemes, e.g. Red Tractor Assurance, quality management schemes, land registry, Registration of Land-based Operatives (ROLO), Forest Stewardship Council (FSC).
- Monitoring business operations to improve performance, e.g. gross margin, production levels, financial efficiency, against targets, advantages, disadvantages.

Learning aim B: Carry out market research to identify a financially viable land-based enterprise

B1 Market research and analysis

Understanding the marketplace, customers and competitors.

- Target market, e.g. types of customer, age, location.
- Primary and secondary research, e.g. questionnaires, surveys, interviews.
- Analysis of the business environment, including Porter's five forces, PESTLE (political, economic, social, technological, legal, environmental) and SWOT (strengths, weaknesses, opportunities, threats).
- Competitor analysis, to include indirect and direct competitors, local, national, international, market share, reputation, pricing, customers.
- Barriers to setting up, e.g. viability, cash flow, finance, legislation, resources.

B2 Financial feasibility of a land-based enterprise

Financial feasibility study – assessment of financial aspects of starting up an enterprise.

- Amount of finance needed, including set-up costs, fixed and variable costs.
- Sources of capital, e.g. investors, own, grants, loans.
- Calculation of break-even forecast and margin of safety.
- Calculation of return on capital employed, net profit margins, current ratio.
- Preparation of financial accounts, to include:
 - income statement
 - statements of financial position
 - cash flow forecasts.

Learning aim C: Develop a business start-up plan for a viable land-based enterprise

C1 Features of a business start-up plan

Key areas that need to be included in a business plan.

- Nature of the enterprise, e.g. sales, service.
- Business aims and objectives, e.g. profit, survival, growth, long and short term.
- Legal structure and operation.
- Resource requirements.
- Promotion, including methods and costs.
- Financial forecasts, including opening and closing statement of financial position, capital to show investment needed, cash flow forecast.
- Summary of market analysis and competition.
- Measures of success, e.g. financial and non-financial key performance indicators.
- Risks and contingency plans.

C2 Presenting and evaluating the business plan

- Documentation, to include financial forecasts, summary of business, business plan.
- Presentation of the business plan to potential investors, e.g. stakeholders, bank, formal, informal, face to face, via submission of documentation.
- Evaluating the business plan, e.g. appropriate method of presentation, clearly set out, feedback from the potential investor, sufficient preparation, level of detail included, coverage of key areas, enable potential investor or stakeholder to make decisions based on the information.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Examine the features, resource requirements and processes of businesses operating in the land-based sector		
A.P1 Explain the features and resource requirements of two contrasting businesses in the land-based sector. A.P2 Explain the business processes and procedures for two contrasting businesses in the land-based sector.	A.M1 Analyse the impact of business features, resource requirements, features and processes on the operation of two contrasting businesses in the land-based sector.	A.D1 Evaluate the impact of key business features, resource requirements and processes on the performance of two contrasting businesses in the land-based sector.
Learning aim B: Carry out market research to identify a financially viable land-based enterprise		
B.P3 Carry out market research to identify a land-based business enterprise. B.P4 Carry out a financial feasibility study for a land-based enterprise.	B.M2 Analyse the results of own market research and financial feasibility study to develop a business start-up plan for a chosen land-based enterprise.	B.D2 Evaluate own market research and financial feasibility study, drawing out valid conclusions to produce a comprehensive business start-up plan for a chosen land-based enterprise.
Learning aim C: Develop a business start-up plan for a viable land-based enterprise		
C.P5 Produce a basic business start-up plan for a chosen land-based enterprise, based on own research. C.P6 Explain the business start-up plan to relevant stakeholders.	C.M3 Produce a detailed business start-up plan for a chosen land-based enterprise, based on own research to present to relevant stakeholders.	C.D3 Evaluate own business start-up plan, justifying conclusions.

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M2, C.M3, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- two business types, non-profit and profit, which will allow learners to gain information (one could be learners' work placement)
- business planning tools or information/support such as that provided by banks etc.

Essential information for assessment decisions

Learning aim A

The two business examples used must be in the land-based sector but could be from different industries in the sector, i.e. a charity in the animal sector and Dairy Crest in the agricultural sector.

For distinction standard, learners will show depth of understanding by evaluating how resource requirements, key business features, processes and procedures impact on the performance of two businesses operating in the land-based sector, with one being a for-profit business and the other a not-for-profit business. Learners will support their evaluation with well-chosen examples from their two businesses. They will review how decisions made in the supply chain impact on business performance and show, through their evaluation, the advantages and disadvantages of the processes and procedures used in the businesses, and how these processes impact on and improve business performance. Learners will justify their conclusions by linking the impact to key features, processes and procedures, and resource requirements, rather than just explaining these in general terms.

For merit standard, learners will demonstrate their understanding of how resource requirements, key business features, processes and procedures affect the effectiveness of two businesses operating in the land-based sector, selecting some examples to support their understanding. They will review the links between different land-based businesses in the supply chain and their relationship to each other. Learners will make reasoned, analytical judgements in relation to a number of advantages and disadvantages of the different processes and procedures used in the businesses, and how these processes can improve business performance, for example the advantage of sourcing raw materials locally reduces transport costs and time to market, improving business costs and readiness of products.

For pass standard, learners will recall knowledge to explain the key business features, resource requirements, processes and procedures required to operate a for-profit and a not-for-profit business in the land-based sector. Learners will explain the importance of links between different land-based businesses in the supply chain and how these relate to each other. They will use relevant research to show the resource requirements and the importance of these in operating a business effectively, using specific examples. Learners will demonstrate an understanding of the processes and procedures used in the businesses, and how these relate to business performance, for example registration with a quality assurance scheme gives customers confidence in the product and the company they are buying from, resulting in return purchasing.

Learning aims B and C

Learners should prepare their own business plan. Presentation of the business plan can take the form of a formal presentation, an informal meeting or discussion or submission of the written documentation, as appropriate.

For distinction standard, learners will use concise and professional arguments when reviewing their own research and financial feasibility study, giving reasons for all elements. They will demonstrate clearly how their market research and financial feasibility study will underpin the development of a comprehensive business start-up plan and support this with carefully chosen examples, such as their financial forecasts to show the predicted success of the chosen business. Based on their evaluation, they will give clear and detailed reasons for their conclusions.

Learners will present their business start-up plan individually, demonstrating a high standard of technical ability, attention to detail, and use of the correct business terminology and communication style. They will evaluate this plan, taking into account feedback, their preparation, method of presentation and level of detail. They need to demonstrate their understanding by justifying any conclusions made within their evaluation and recommendations.

For merit standard, learners will make reasoned, analytical judgements about their financial feasibility study and market research and how they relate to the development of the business start-up plan, supporting this with examples. They will produce their business start-up plan based on their own research that includes the type of business, its aims and objectives, resource requirements, methods of promotion, risks and contingency plans and financial forecasts. Learners will individually present this plan in a professional way, demonstrating attention to detail, use of appropriate business terminology and preparation before the final presentation. There will be some analysis of the feedback from the potential investors or stakeholders.

For pass standard, learners will undertake some market research using primary and secondary research, supported by an analysis of the market and potential competitors in identifying a suitable business. They will also identify the potential sources of finance and costs, and prepare a cash flow forecast and income statement that relate to their business start-up, supporting these with examples. Learners will individually prepare a basic business start-up plan from their research, including the outline of the business, its aims and objectives, methods of promotion, a cash flow forecast, and profit and loss statement. They will present this plan, showing some knowledge and understanding of business terminology and answering questions from the potential investors or stakeholders.

Links to other units

This unit links to *Unit 4: Work Experience in the Land-based Sectors*.

Employer involvement

This unit would benefit from employer involvement in the form of:

- masterclasses from industry
- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 13: Managing Activities for Agricultural Enterprises

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners select and apply the skills required to undertake the key vocational task of managing day-to-day operational activities in an agricultural enterprise.

Unit introduction

Understanding the day-to-day operation of an agricultural enterprise is vital for staff who may need to deputise for the unit manager, or take on some of the responsibilities of running the unit. To do this, employees must have a working knowledge of operational responsibilities, developing skills, and knowledge of the processes and procedures required for it, to run the enterprise successfully. They also need the appropriate skills to work with and manage others.

In this unit, you will explore the operation of an agricultural enterprise, its purpose and objectives. Building on learning from across the qualification, including land-based and farming practices, environment management, estates skills and contractor management, you will develop the skills required to be able to step up to the role of managing the operation. You will carry out an evaluation of the management processes and your management activities. You will use your evaluation to prepare recommendations for possible improvements to the management processes and to produce a personal development plan.

To be able to complete the assessment activity within this unit, you will select and apply knowledge and skills developed in your study of the mandatory content, and your wider learning from across the programme. Skills and knowledge used follow on from those developed in: *Unit 1: Professional Working Responsibilities*, *Unit 2: Plant and Soil Science*, *Unit 5: Estate Skills*, *Unit 8: Land-based Machinery Operations* and *Unit 9: Managing Environmental Activities in Agriculture*. You will use your experience of sector standards and practices that you gained in *Unit 4: Work Experience in the Land-based Sectors*.

This unit will prepare you for employment in the land-based sector in a role such as herdsman, stockperson, machinery operator or for self-employment in the sector. It will also enable you to progress to higher education courses such as degrees in agriculture or land-based business management.

Learning aims

In this unit you will:

- A** Investigate the operation of an agricultural enterprise in order to plan activities
- B** Plan operational activities for an agricultural enterprise
- C** Carry out the management of agricultural enterprise activities.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate the operation of an agricultural enterprise in order to plan activities	A1 Working environment of an agricultural enterprise A2 Agricultural enterprise operations and management skills	A report evaluating the working environment and skills required to operate a single agricultural enterprise.
B Plan operational activities for an agricultural enterprise	B1 Planning processes B2 Reviewing effectiveness of planning	Learners produce a plan setting out the activities for an agricultural enterprise.
C Carry out the management of agricultural enterprise activities	C1 Managing enterprise operational activities C2 Evaluating management performance	<p>Learners evaluate the effectiveness of the plan and their own performance, producing a personal development plan.</p> <p>Portfolio of evidence to show management of the enterprise's activities, including resources, skills, machinery, plants, soil and health and safety.</p> <p>Learners will be expected to select and apply learning from other mandatory units and optional units as appropriate.</p>

Content

Learning aim A: Investigate the operation of an agricultural enterprise in order to plan activities

A1 Working environment of an agricultural enterprise

- Purpose and objectives of the enterprise, e.g. storing cattle, breeding stock, milk production, potatoes for processing, grain for storage or milling.
- Regular operations of an agricultural enterprise, e.g. daily, weekly, monthly operations.
- Recording requirements for income and expenditure, e.g. staff and machinery costs, stock and seed purchases, sales of stock, milk, grain or other produce, other income sources.
- Where and when to seek specialist help, e.g. vets, agronomists, Department for Environment, Food and Rural Affairs (Defra), machinery dealers, the National Farmers' Union (NFU), the Health and Safety Executive (HSE), industry associations, local support groups.
- Security processes and procedures for the operation of an enterprise, including machinery, livestock, plant and soil biosecurity, grain stores, silos, lone working.
- Challenges associated with the operation of an agricultural enterprise, e.g. people, technology, land use and sustainability.

A2 Agricultural enterprise operations and management skills

- Maintaining and ordering supplies, e.g. feed, fertilisers, veterinary products, fuel, bedding, seed, tools and equipment.
- Receiving deliveries on the unit, including the processes and procedures required, e.g. livestock isolation, building preparation, checking of delivery against order, equipment and machinery preparation.
- Unit operational records, including monitoring animal welfare, crop health and growth, machinery and fuel usage, production outputs, conservation areas.
- Resources for the unit, e.g. animal feed, medicines, fertilisers, chemicals, staff, equipment and machinery.
- Monitoring of budgets, e.g. against targets, production levels, cost of production, against previous periods, weekly/monthly.
- Leadership and teamwork, including autocratic, democratic, laissez-faire, people-orientated, task-orientated, Belbin, Tuckman's stages of team development, motivation of self and others.
- Communication skills, including:
 - effective communication with a range of people
 - importance of communication.
- Processes and procedures for dealing with visitors, contractors, suppliers and others, including security, biosecurity, health and safety, briefing, maintaining hygiene, information and signs, supervision.

Learning aim B: Plan operational activities for an agricultural enterprise

In undertaking the key vocational task, planning and carrying out management activities for agricultural enterprises, learners must select and apply in an integrated way. Learning from: *Unit 1: Professional Working Responsibilities, Unit 2: Plant and Soil Science, Unit 4: Work Experience in the Land-based Sectors, Unit 5: Estate Skills, Unit 8: Land-based Machinery Operations and Unit 9: Managing Environmental Activities in Agriculture.*

B1 Planning processes

- Planning cycle for an agricultural enterprise, e.g. aims of the enterprise, preparing and monitoring plans, evaluation.
- Processes to aid planning of operations, including budgets, work schedules and flow charts.
- Planning tasks for regular activities to meet seasonal variations, e.g. scheduling of activities, equipment, materials, costs, health and safety considerations.
- Managing organic and non-organic waste in line with legislation.
- Resourcing to meet planned operations, including machinery, materials and additional skills, e.g. internal workforce, external contractors, seasonal staff.
- Communicating with others to ensure efficient planning, e.g. staff, machinery contractors, plant and livestock health specialists.
- Risk assessments and relevant health and safety considerations, including use of personal protective equipment (PPE), safe lifting, animal welfare, COSHH, emergency procedures.
- Contingency planning, e.g. setting and adjusting priorities, making decisions, reporting changes.
- Knowing the remit of own role and responsibilities, and when to escalate to others, or ask for help.

B2 Reviewing effectiveness of planning

- Collecting feedback on the plan, e.g. from colleagues, farm/unit manager.
- Reviewing feedback and drawing conclusions against the operational plan, including:
 - extent to which the aims of the operational activities are met
 - SWOT (strengths, weaknesses, opportunities, threats) analysis
 - workability of contingency plans
 - suggesting improvements and further development.

Learning aim C: Carry out the management of agricultural enterprise activities

C1 Managing enterprise operational activities

- Communicating the daily or weekly activities to others, including routine activities, health and safety procedures, emergency procedures, report for unit/farm manager.
- Ensuring the work is advancing according to expectations, including compliance with the plan, regulations and codes of practice and risk assessment, monitoring progress and quality of work.
- Using problem-solving skills to assess issues, examine alternatives, decide on a course of action, implement solutions and monitor outcomes.
- Emergencies, incidents and accidents, e.g. spillages, environmental, when and how to call for assistance, information required by the emergency services, e.g. access, postcode, directions.

C2 Evaluating management performance

Methods for reviewing management processes.

- Creating an evaluation framework to assess
 - effectiveness of processes against given criteria, e.g. aims, objectives
 - own management performance, including communication of work instructions, application of problem solving, dealing with contingencies, cooperation with others.
- Evaluating processes and performance against task completion, own skills and evaluation framework.
- Identifying areas for improvement in management processes, e.g. systems, efficiencies.
- Identifying areas for improvement and personal development, e.g. skills, training, timescales:
 - action plan to highlight how to address weaknesses and skills development
 - self-evaluation
 - use of feedback from relevant sources, e.g. peer observation, videos, teacher observation or witness sheets
 - suggestions on how to address any weaknesses in skill set.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate the operation of an agricultural enterprise in order to plan activities		A.D1 Evaluate the relationship between the working environment, daily activities, management skills, and the planning and operation of an agricultural enterprise.
A.P1 Explain the working environment and daily activities of an agricultural enterprise that influence activity planning. A.P2 Explain the skills required to manage regular operational activities for an agricultural enterprise.	A.M1 Analyse the importance of the working environment, daily activities and management skills required for the planning and operation of an agricultural enterprise.	
Learning aim B: Plan operational activities for an agricultural enterprise		B.D2 Produce a comprehensive plan for managing operational activities for an agricultural enterprise, including a detailed rationale and review of its effectiveness.
B.P3 Produce a plan for managing operational activities for an agricultural enterprise. B.P4 Explain the approach taken in relation to own operational requirements.	B.M2 Produce a detailed plan for managing operational activities for an agricultural enterprise. B.M3 Assess the effectiveness of own operational activities planning.	
Learning aim C: Carry out the management of agricultural enterprise activities		C.D3 Demonstrate, capable and effective management of complex activities in an agricultural enterprise, evaluating processes and own performance, producing a comprehensive management development plan.
C.P5 Perform the management of simple operational activities for an agricultural enterprise. C.P6 Explain the effectiveness of processes and own management of operational activities, producing a management development plan.	C.M4 Perform the management of routine operational activities for an agricultural enterprise. C.M5 Assess effectiveness of processes and own management of operational activities, producing a detailed management development plan.	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M2, B.M3, C.M4, C.M5, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- an agricultural enterprise (which could be the college farm or a local employer who works with the college) to provide relevant, up-to-date facilities
- a work-experience farm
- input from those working for an agricultural enterprise or a related field, such as a farm or unit manager, service engineer, environmental manager.

Essential information for assessment decisions

Learning aim A

Teachers should ensure that the agricultural enterprise chosen by learners provides sufficient scope for them to fully complete the assessment.

For distinction standard, learners will comprehensively investigate the daily activities and operation of an agricultural enterprise to show a complete understanding of the working environment. They will show breadth and depth of knowledge in relation to how the purpose and objectives of the enterprise, the issues and legislative requirements impact on the daily activities and operation. They will consistently show that they have accurately selected and applied knowledge and skills relating to contemporary issues, challenges, waste management and sustainability. Learners will offer consistently valid, well-chosen examples that support their views, and they will synthesise their in-depth knowledge and understanding of all the key aspects of the agricultural enterprise. They will consistently show that they have accurately selected and applied knowledge and skills relating to health and safety legislation and safe working practices.

Learners will demonstrate insight into how the manager's skills, such as communication and teamwork, impact on the planning and operation of the enterprise.

They will provide consistently valid judgements that link logically and specifically to their views. Learners will justify their conclusions by making specific, clear links regarding the relationship between the enterprise operation and the skills and planning required. Their evidence will make use of appropriate, accurate agricultural terminology throughout.

For merit standard, learners will give a clear, balanced analysis of the daily activities and operation of an agricultural enterprise to show a clear understanding of the working environment. They will demonstrate breadth and some depth of knowledge in considering the relationship between these activities and the planning required. They will provide relevant selection and application of knowledge in relation to contemporary issues, challenges, waste management and sustainability. They will offer mainly relevant examples to support their views, giving a detailed investigation of the key aspects of the agricultural organisation. They will show a clear and mostly relevant selection and application of knowledge and skills relating to professional responsibilities, health and safety legislation and safe working practices.

Learners will demonstrate a clear understanding of how the manager's skills influence the planning and operation of the enterprise. Their evidence will be detailed and supported by mostly relevant examples showing the relationship between the enterprise operation and the skills and planning required. The evidence will use appropriate agricultural terminology.

For pass standard, learners will recall basic knowledge to give a limited explanation of the daily activities and operation of an agricultural enterprise and how this relates to the planning of the enterprise activities. They will show a realistic understanding of the working environment. Learners will make basic, realistic links between the most obvious aspects of the agricultural enterprise, with some inaccuracies. They will show some understanding of the issues that impact on planning relating to contemporary issues, challenges, waste management and sustainability. They will give some appropriate, specific examples to support their views, although these are likely to be undeveloped.

Learners will consider the management skills required to operate an agricultural enterprise. Their explanation of the interconnections between management skills, the planning and operation of the enterprise will be mostly generalised or superficial in parts. Learners will show some understanding of the knowledge the management skills required for the operation of the agricultural enterprise. There may be some minor irrelevancies in the evidence, which will show some use of relevant agricultural terminology, but there may be omissions.

Learning aims B and C

In achieving learning aims B and C, learners must plan, manage and carry out operational activities for an agricultural enterprise evaluating the effectiveness of the management. In completing the assessment activities for these learning aims, learners must independently select and apply knowledge and skills from their learning across the mandatory content. They will be expected to make connections between their management activities and the assessments being completed for:

- *Unit 1: Professional Working Responsibilities*, in relation to health, safety and legislative requirements, waste management and record keeping
- *Unit 2: Plant and Soil Science*, in relation to plant and soil management
- *Unit 4: Work Experience in the Land-based Sectors*, in relation to sector standards, work behaviours, communication and the management skills required to undertake activities in an agricultural enterprise
- *Unit 5: Estate Skills*, in relation to agricultural environments, assessing their needs and planning operational activities and managing others, including contractors
- *Unit 8 Land-based Machinery Operations*, in relation to resourcing, using, and planning for the maintenance of land-based machinery required in agricultural enterprise operational activities
- *Unit 9: Managing Environmental Activities in Agriculture*, in relation to the management of agricultural environments including remedial action for unwanted impacts of agricultural activities.

For learners taking the Pearson BTEC Level 3 National Extended Diploma in Agriculture, the completion of the assessment tasks for learning aims B and C in this unit will underpin the completion of the assessment for learning aim C in *Unit 25: Agricultural Business Improvements*. Teachers should ensure that the agricultural enterprise chosen by learners for this unit provides sufficient scope for them to fully complete the assessment.

For distinction standard, learners will show a robust understanding of the processes and procedures, the need for effective resource, staff and contractor management that underpin the planning process for an agricultural enterprise.

Learners will produce a comprehensive, convincing management plan for the operational activities that will include an accurate, in-depth appraisal of the work required. They will show that they have comprehensively considered how their plans will be effective in terms of, for example, resources, maintaining records, completion of activities and identification of the impact of delays. They will review the effectiveness of their plan against a clear, valid evaluation framework. Learners will demonstrate a consistent and accurate selection and application of their knowledge of plant and soil management in planning operations for an agricultural enterprise. Learners will comprehensively consider the health, safety and legislative requirements, recording of work and estate maintenance in preparing their plans. Learners will carry out highly effective and comprehensive management of others, demonstrating clear and concise communication. They will manage complex activities that involve multiple factors or operations, demonstrating confidence and proficiency. Learners will show a high degree of initiative within the limits of their responsibility and will delegate responsibilities logically and appropriately, taking account of skill sets. They will monitor and assess activity progression, effectively using motivation and problem-solving skills.

Learners will draw up a valid and reliable evaluation framework to assess management processes and their management of activities. Their suggestions for improvements to management processes, where applicable, will be logical and well-thought through. Learners will use appropriate agricultural terminology consistently and accurately throughout.

For merit standard, learners will make clear, balanced judgements about the enterprise operation, processes and procedures, resources, and staff and contractor management which underpin the planning of activities for an agricultural enterprise.

Learners will produce a clear, detailed management plan of activities for an agricultural enterprise. There will be mostly relevant, logical consideration of the key requirements of the plan, including dealing with contractors, and maintaining records and resources. Learners will demonstrate a clear and mostly relevant selection and application of their knowledge of plant and soil management in planning operations. Learners will consider the health, safety and legislative requirements and recording of work and estate maintenance in preparing their plans for managing operational activities on an agricultural enterprise. Learners will demonstrate that they can communicate clearly and appropriately with others, such as colleagues and contractors. They will monitor and assess activities and demonstrate mostly effective problem-solving skills. They will review the effectiveness of their plan against a clear, valid evaluation framework. Learners will manage routine activities that involve some challenging or unforeseen factors, demonstrating mostly relevant application of knowledge and skills.

Learners will draw up a clear evaluation framework to assess management processes and their management activities. They will make logical suggestions, where applicable, for improvements to management processes.

For pass standard, learners will recall limited, appropriate knowledge to explain the planning of operational enterprise activities and the importance of processes and procedures, resources, and staff and contractor management on an agricultural enterprise. They will provide specific examples to support their views but these may be limited in scope or relevance.

Learners will produce a limited, realistic management plan of operational activities for an agricultural enterprise. They will demonstrate some relevant and competent planning skills, supported by the use of some relevant examples. They will demonstrate undeveloped but realistic knowledge of the key requirements of the plan and show limited evaluation of the effectiveness of their plan. Learners will demonstrate some application of their knowledge of plant and soil management in planning operations for an agricultural enterprise. Learners will consider the health, safety and legislative requirements, recording of work and estate maintenance in preparing their plans. Learners will demonstrate some relevant selection and application of their knowledge of health, safety and legislative requirements, recording of work and estate maintenance. Learners will demonstrate that they can issue instructions without any critical omissions or errors. They will carry out supervision of activities, checks on progress and identify obvious issues that may hinder task completion. Learners will make realistic suggestions where problems occur.

They will manage simple activities that involve mostly predictable factors and few unforeseen elements, demonstrating limited but appropriate application of knowledge and skills. They will carry out the practical tasks safely but show little initiative within the limits of their responsibility.

Learners will draw up a simple evaluation framework to assess management processes and their management skills. They will make simple suggestions, where applicable, for improvements to management processes.

Links to other units

This unit should be completed towards the end of the programme. In order to complete the synoptic assessment tasks in this unit, learners should select and apply relevant knowledge and skills from other areas of the mandatory content: safe working practices, risk assessment and waste management from *Unit 1: Professional Working Responsibilities*; the role of plant growth, soil and plant management from agricultural activities in *Unit 2: Plant and Soil Science*; the management of others carrying out activities on the agricultural enterprise from *Unit 5: Estate Skills*; working practically and safely with a wide range of machinery from *Unit 8: Land-based Machinery Operations*; managing the impact of agricultural activities on the environment from *Unit 9: Managing Environmental Activities in Agriculture*. Additionally, learners will have completed *Unit 4: Work Experience in the Land-based Sectors*, and will be able to apply their experience of and insight into real working practices in the sector.

This unit also links to:

- Unit 6: Crop Production
- Unit 7: Farm Livestock Husbandry.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 14: Root Crop and Field Vegetable Production

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners develop skills and knowledge in root crop and field vegetable production throughout the whole cycle, including requirements for processing produce for market.

Unit introduction

The production of root crops and field vegetables has become a specialist area of food production as not all areas of the UK are suitable for growing and producing top-quality root crops and field vegetables. Many crop types require sought-after, specific skills and knowledge in order to be managed effectively.

In this unit, you will develop the skills and knowledge required to produce commodities that are frequently destined for the human consumption market. As such, these crops and vegetables must meet the highest food quality standards as both quality and traceability are increasingly important matters of public interest. This unit will help you to develop a sound understanding of how crops enter the human food chain. You will investigate fundamental root crop production requirements, following the product from the field through to processing. You will also undertake husbandry tasks associated with the production of root crops and field vegetables.

This unit will help you to progress to employment in the sector in roles such as unit manager, crop technician or trials officer or to progress to higher education onto courses such as land management or agricultural management. The insight gained from this unit will help to prepare you for the future challenges and opportunities facing the agriculture industry in the 21st century in relation to food safety concerns.

Learning aims

In this unit you will:

- A** Investigate production and husbandry requirements for root crops and field vegetables
- B** Explore the processing and quality requirements for marketing root crops and field vegetables
- C** Carry out husbandry tasks related to root crops and field vegetables.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate production and husbandry requirements for root crops and field vegetables	A1 Key biological and physical requirements for production A2 Key husbandry requirements A3 The role of legislation and codes of practice	A report evaluating the production and husbandry requirements of producing root crops and field vegetables.
B Explore the processing and quality requirements for marketing root crops and field vegetables	B1 Processing requirements for root crops and field vegetables B2 Quality requirements for marketing root crops and field vegetables	A report or presentation on how root crops and field vegetables are moved from farms and processed and marketed. A practical portfolio relating to the completion of husbandry tasks for root crops and field vegetables.
C Carry out husbandry tasks related to root crops and field vegetables	C1 General husbandry tasks C2 Fertiliser application C3 Weed, pest and disease control	A practical portfolio relating to the completion of husbandry tasks for root crops and field vegetables.

Content

Learning aim A: Investigate production and husbandry requirements for root crops and field vegetables

A1 Key biological and physical requirements for production

- Climate in the UK, climatic regions and the effects of climate on root crops and field vegetables.
- Effects of topography and aspect.
- Effects of weather, e.g. rain, wind, sunshine, frost, snow.
- Relationship between soil type, soil pH, soil structure and crop growth.
- Soil indices.
- Environmental considerations relevant to root crop and field vegetable production.

A2 Key husbandry requirements

- Rotation considerations.
- Seedbed requirements and preparation, including beds and ridges.
- Seed and plant selection and varietal considerations.
- Other pre-planting requirements, including seed dressings, machinery selection for planting and drilling, plant spacing.
- Manure and fertiliser requirements, including health and safety considerations.
- Weed, pest and disease control.
- Environmental considerations in relation to control of weeds, pests and disease.
- Additional root crop and field vegetable requirements, including irrigation, plastic film, polytunnels, glasshouses.

A3 The role of legislation and codes of practice

- Health and Safety at Work etc. Act 1974.
- Nitrate Vulnerable Zones (NVZ), Local Environmental Risk Assessment Procedures (LERAPs), Control of Substances Hazardous to Health (COSHH) Regulations 2002, biosecurity, the Voluntary Initiative (VI), codes of practice, safe working practices.
- Operator certification requirements for use of equipment and materials relevant to root crop and field vegetable production.

Learning aim B: Explore the processing and quality requirements for marketing root crops and field vegetables

B1 Processing requirements for root crops and field vegetables

- Harvesting:
 - importance of timing, schedules and time management
 - signs of crop ripeness and maturity
 - crop size and quality
 - problems associated with overripe/underripe crops, tuber size and shape
 - machinery and labour organisation, including seasonal requirements for staff
 - crop yields, e.g. tonnes per hectare, monitoring output
 - minimising crop damage, e.g. cutting, bruising.
- Storage:
 - types of store, including temporary, permanent, clamp, cold store, on floor, box
 - climate control in store, including frost, ventilation, moisture, insulation
 - disease prevention and sprouting prevention methods
 - crop storage monitoring and recording of temperatures, ventilation and damage.

B2 Quality requirements for marketing root crops and field vegetables

- Market specifications, including size, shape, quality requirements, tenderness and texture.
- Contractual specifications:
 - supermarket, including impact on saleability, e.g. skin finish, blemishes, size and shape
 - processor, including impact on ability to use in processing, moisture content, human consumption end use, e.g. ready meals, dried food products
 - manufacturer, including impact on end use, e.g. roast, chipping, mashing, animal feed
 - seed, including impact on suitability for use, including variety, being free from disease, variety and germination test results
 - food standards and traceability, including the importance of being able to track the process from field to fork
 - quality assurance schemes, including grower confirmation that commodities have been produced according to required standards and are fit for sale at that point.
- Grading, including removing debris, foreign objects, soil, small immature crop samples.
- Using automatic grading machines.
- Sorting, including selecting for size and market.
- Using auto-selecting machinery for sorting.
- Transporting root crops and field vegetables from field to farm, farm to store, store to sale.
- Production targets:
 - inputs, including cost of seed, fertiliser, chemicals, levies and charges
 - outputs, including price per tonne, premiums, bonuses and deductions
 - gross margins.
- Biosecurity, including grower responsibility for appropriate waste disposal methods, e.g. for feed, small immature crop samples, plastic and bags.

Learning aim C: Carry out husbandry tasks related to root crops and field vegetables**C1 General husbandry tasks**

- Importance of timing, schedules and time management in carrying out husbandry activities.
- Soil and seedbed preparation and cultivation techniques.
- Date of drilling or planting and its effect on growth, yield and quality.
- Crop protection methods against extreme weather, e.g. flooding, high winds, extreme heat, extreme cold.
- Irrigation requirements, including timing, amount of irrigation needed by the crop, sources of irrigation supply, e.g. lagoon, borehole.
- Monitoring growth and development of root crops and field vegetables.
- Harvesting operations.
- Appropriate disposal of waste, e.g. seed, bags, chemicals.
- Consideration of biosecurity and sustainable waste disposal practices.

C2 Fertiliser application

- Sources of fertiliser available, including organic and inorganic types.
- Timing of fertiliser application.
- Importance of understanding root crop growth stages in relation to fertiliser application.
- Importance of understanding field vegetable growth stages in relation to fertiliser application.
- Importance of applying correct amount of fertiliser and the consequences of not applying correct amount.

- Methods of calculating fertiliser rates, yield mapping, N-Sensor data, variable rate application, Global Positioning System (GPS) mapping, computer programs, e.g. PLANET.
- Application methods, e.g. manure spreader, fertiliser spreader, liquid sprayer.
- Examples of solid fertiliser, including farmyard manure, granular fertiliser.
- Examples of liquid fertilisers, including:
 - straight liquid, e.g. nitrogen only
 - blended fertiliser, e.g. nitrogen and other suspensions.

C3 Weed, pest and disease control

- Identifying common weeds, pests and diseases of root crops.
- Recommending control measures to address weeds, pests and diseases.
- Advantages and disadvantages of control measures to address weeds, pests and disease.
- Specific health and safety measures associated with weed, pest and disease control, including:
 - Local Environmental Risk Assessment for Pesticides (LERAPs)
 - other aspects of risk assessments, e.g. use of personal protective equipment (PPE).
- Interpreting agronomist recommendations.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate production and husbandry requirements for root crops and field vegetables		
<p>A.P1 Explain the influence of biological and physical factors on the production of root crops and field vegetables.</p> <p>A.P2 Explain the key husbandry requirements for the production of root crops and field vegetables, including legal requirements.</p>	<p>A.M1 Assess the influence of biological and physical factors on the production of root crops and field vegetables.</p> <p>A.M2 Assess the key requirements for the production of root crops and field vegetables, including the role of legal requirements.</p>	
Learning aim B: Explore the processing and quality requirements for marketing root crops and field vegetables		
<p>B.P3 Explain the key aspects in processing root crops and field vegetables to meet quality requirements.</p> <p>B.P4 Explain the key marketing requirements of root crops and field vegetables, including production targets.</p>	<p>B.M3 Assess the importance of quality requirements and production targets in processing and marketing root crops and field vegetables.</p>	
Learning aim C: Carry out husbandry tasks related to root crops and field vegetables		
<p>C.P5 Competently carry out husbandry tasks to promote growth and development of root crops and field vegetables.</p> <p>C.P6 Competently carry out nutrient application and crop protection methods to meet given objectives for root crops and field vegetables.</p>	<p>C.M4 Efficiently carry out husbandry tasks to promote growth and development of root crops and field vegetables.</p> <p>C.M5 Efficiently carry out nutrient application and crop protection methods on root crops and field vegetables to meet given objectives.</p>	<p>A.D1 Evaluate the importance of biological and physical factors, husbandry and legal requirements for root crops and field vegetable production.</p> <p>B.D2 Evaluate the impact of quality requirements and production targets on the processing and marketing of root crops and field vegetables.</p> <p>C.D3 Carry out husbandry tasks with a high degree of accuracy to promote growth and development of root crops and field vegetables, including nutrient application and crop protection tasks.</p>

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.M2, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M3, C.M4, C.M5, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- a range of commercial root crops and field vegetables for regular inspection
- field records for root crops and field vegetables to determine input and outputs
- agronomy data for root crops and field vegetables.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will produce an in-depth investigation of the production requirements for one root crop and one field vegetable crop. They will make consistently valid, accurate connections between the key biological and physical requirements for root crops and field vegetable production, including the climate and soil preferences dictated by the crop. Learners will show insight in all aspects of production needs, which will include comprehensive understanding of the husbandry requirements in preparing for the establishment of the crop. They will also make specific, valid connections relating to the impact of legislation on root crop and field vegetable production. Learners' evidence will demonstrate breadth and depth of understanding in all areas, using specific agricultural terminology accurately and consistently throughout.

For merit standard, learners will make appropriate, clear judgements on the production requirements for one root crop and one field vegetable. They will make mainly relevant connections between the key biological and physical requirements for root crops and field vegetables, including mostly valid detail on the requirements of the climate and soil preferred by the crop. Learners will make clear, mostly logical justifications of the husbandry requirements in preparing for the establishment of the crops. They will demonstrate a breadth of understanding regarding the impact of legislation on root crop and field vegetable production. Learners' evidence will be technically correct and show use of correct agricultural terminology.

For pass standard, learners will provide a limited but realistic account of the production requirements of one root crop and one field vegetable. They will make some basic connections between the key biological and physical needs of the crops, demonstrating a basic understanding of the effects of climate and soil type on crop production. Learners will show a realistic awareness of the establishment needs of the crop, but the evidence may be limited in scope. They will provide a limited account of the impact of legislation on root crop and field vegetable production and may not provide examples or reasons for their views. Learners' evidence will show some use of agricultural terminology, though this may be limited and inaccurate in parts.

Learning aims B and C

In order to achieve learning aims B and C, learners are required to carry out husbandry tasks to demonstrate the practical skills of husbandry. Teachers should ensure that crops chosen by learners provide sufficient scope for them to fully complete the assessments.

For distinction standard, learners will give an in-depth evaluation of the processing of one root crop and one field vegetable. They will consider thoroughly all the relevant stages, from when the crops are marketed on the farm and through the relevant processing plant. Learners' evidence will be comprehensive and will include an accurate breakdown of the processing of root crops and field vegetables. They will include information on the harvesting, storing and processing of crops and make consistently valid, logical links between crop quality requirements and how these affect the end use of the product. Learners will give in-depth consideration to the importance of marketing, including insightful, accurate references to the role of specifications, finances and production targets. They will demonstrate the practical skills required to carry out husbandry tasks for root crops and field vegetables with a high degree of accuracy. Learners will carry out the tasks confidently, and show initiative in doing so, within the limits of their responsibility.

Learners will fully complete the required tasks. In doing so, they will comply at all times with health and safety requirements, assessing risks and minimising injury to self and others, selecting and using all equipment appropriately and with a high degree of accuracy, and reflecting best practice in the industry.

Learners will complete detailed and accurate records as appropriate to the work undertaken. They will demonstrate detailed knowledge of fertiliser application as well as weed, pest and disease identification and control, making consistently logical judgements that show they understand the importance of these husbandry tasks in relation to overall crop health. Learners' evidence will use specific agricultural terminology and will be accurate throughout.

For merit standard, learners will provide clear, mostly relevant judgements on the processing of one root crop and one field vegetable, from when the crops are marketed on the farm and through the relevant processing plant. They will show breadth and some depth of understanding, providing clear understanding of the harvesting, storing and processing of crops. They will make mostly valid justifications between crop quality requirements and how these affect the end use of the product. Learners will give a clear, detailed assessment of the role of marketing, including mostly relevant references to the role of specifications, finances and production targets.

Learners will efficiently carry out practical husbandry tasks for root crops and field vegetables, showing some initiative within the limits of their responsibility. They will complete these tasks appropriately, complying with health and safety requirements and assessing the risks. Learners will keep records, as appropriate to the tasks and with sufficient detail, so it is clear what has been carried out. They will demonstrate a clear understanding of fertiliser application as well as weed, pest and disease identification. Learners will make mostly logical judgements that show they understand the importance of these husbandry tasks in relation to overall crop health. Learners' evidence will show mostly accurate use of specific agricultural terminology.

For pass standard, learners will give a limited report on the processing of one root crop and one field vegetable, from when the crops are marketed on the farm and through the relevant processing plant. They will provide basic detail on crop harvesting, storing and processing of crops, highlighting the most obvious aspects of production and associated requirements. Learners will make basic, realistic links between crop quality requirements and how these affect the end use of the product but the evidence will be unsupported or superficial in parts. They will give a realistic, basic explanation of marketing, including some appropriate but undeveloped references to the role of specifications, finances and production targets.

Learners will carry out practical husbandry tasks for root crops and field vegetables with competence, completing them appropriately but showing little initiative within the limits of their responsibility. Learners will complete the required tasks safely and adhere to health and safety requirements but will show limited knowledge of associated risks and their controls. They will show an awareness of the need to keep appropriate records that provide the key information. Learners will show some breadth of understanding of fertiliser application as well as weed, pest and disease identification. They will make decisions that show a realistic but undeveloped understanding of the importance of these husbandry tasks in relation to overall crop health. Learners' evidence will show some use of agricultural terminology though there may be omissions.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 2: Plant and Soil Science
- Unit 4: Work Experience in the Land-based Sectors
- Unit 6: Crop Production
- Unit 9: Managing Environmental Activities in Agriculture
- Unit 10: Crop Handling, Storage and Quality Assurance.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 15: Combinable Crop Production and Processing

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners develop skills and knowledge in the production and processing of combinable crops throughout the whole cycle, including requirements for processing produce for market.

Unit introduction

The production and processing of combinable crops is an area that has been extensively developed by technology in recent years. Most areas of the UK are suitable for growing a range of combinable crops, with some areas producing high yields.

In this unit, you will develop the skills and knowledge required to produce combinable crops frequently destined for the human consumption market. As such, these commodities must be produced to the highest food quality standards as both quality and traceability are increasingly important matters of public interest. This unit will help you develop a broad understanding of how combinable crops are produced and processed. You will investigate combinable crop production requirements, following the crops from the field through to processing. You will also undertake husbandry tasks associated with the production of combinable crops.

This unit will help you to progress to employment in the sector in roles such as unit manager, crop technician or trials officer or to progress to higher education onto courses such as land management or agricultural management. The insight gained from this unit will help to inform and prepare you for the challenges and opportunities facing the agriculture industry in the 21st century in relation to food safety concerns.

Learning aims

In this unit you will:

- A** Investigate production requirements for combinable crops
- B** Explore the processing and quality requirements for marketing combinable crops
- C** Carry out preparation and cultivation tasks related to combinable crops.

Learning aim	Key content areas	Recommended assessment approach
A Investigate production requirements for combinable crops	A1 Production requirements A2 Crop choice and establishment techniques A3 The role of legislation and codes of practice	A report evaluating the production requirements for combinable crops, including legal requirements, varietal choices and use of establishment techniques.
B Explore the processing and quality requirements for marketing combinable crops	B1 Processing requirements for combinable crops B2 Quality requirements for marketing combinable crops	A report or presentation on the processing and marketing of combinable crops. A practical portfolio relating to the completion of preparation and cultivation tasks for combinable crop production.
C Carry out preparation and cultivation tasks related to combinable crops	C1 General husbandry tasks C2 Fertiliser application C3 Weed, pest and disease control	

Content

Learning aim A: Investigate production requirements for combinable crops

A1 Production requirements

- Role of location, climate, topography and place in rotation in choice of crop and crop types.
- Effects of weather, e.g. rain, wind, sunshine, frost, snow.
- Relationship between soil type, soil pH, soil structure and crop growth.
- Soil indices.
- Environmental considerations relevant to combinable crop production.
- Key husbandry requirements:
 - soil preparation, drainage requirements
 - cultivations, timings and techniques
 - prevention and rectification of soil management issues, e.g. erosion, compaction and soil pans
 - establishment techniques, including drilling and planting method.
- Key factors relating to use of seeds, including:
 - seed quality and vigour
 - seed treatments
 - certified seed
 - use of home-saved seed
 - seed rate calculations using thousand grain weight (TGW) or thousand seed rate (TSW)
 - seed spacing
 - autumn- and spring-sown crops
 - reasons for growing crops at different times of year.
- Potential end uses of crop:
 - cultivar choice and recommended list interpretation, including yield and resistance to disease
 - market specifications, including malting barley, milling wheat, distilling, animal feed
 - reasons for rejection, including moisture and damage, e.g. bruchid beetle in beans, mycotoxins in cereals, excessive admixture.

A2 Crop choice and establishment techniques

- Cereals, e.g. wheat, barley, oats, rye, oilseed rape, durum wheat, triticale.
- Pulses, e.g. peas, beans, linseed.
- Minor and alternative crops, e.g. sunflowers, lupins, borage, evening primrose oil, hemp.
- Seedbed requirements and preparation, including beds and ridges.
- Seed and plant selection, cultivar considerations.
- Other pre-planting requirements, including seed dressings, machinery selection for planting and drilling, plant spacing.
- Manure and fertiliser requirements, including health and safety considerations.
- Weed, pest and disease control.
- Environmental considerations in relation to the control of weeds, pests and disease.

A3 The role of legislation and codes of practice

- Health and Safety at Work etc. Act 1974.
- Nitrate Vulnerable Zones (NVZ), Local Environmental Risk Assessment Procedures (LERAPs), Control of Substances Hazardous to Health (COSHH) Regulations 2002, biosecurity, the Voluntary Initiative (VI), codes of practice, safe working practices.
- Operator certification requirements for use of equipment and materials relevant to combinable crop production.

Learning aim B: Explore the processing and quality requirements for marketing combinable crops

B1 Processing requirements for combinable crops

- Harvesting:
 - importance of timing, schedules and time management
 - signs of crop ripeness and maturity
 - crop size and quality
 - problems associated with overripe/underripe crops, grain or seed size and shape
 - machinery and labour organisation, including seasonal requirements for staff
 - crop yields, e.g. tonnes per hectare, monitoring output
 - minimising crop damage, e.g. warming, pest and vermin damage.
- Storage:
 - safe storage of combinable crops according to moisture content
 - cleaning and removal of weeds, seeds and debris
 - types of store, including temporary, permanent, on floor, bins, central stores
 - climate control in store, including ventilation, moisture
 - disease prevention, hot spots, grain- and seed- sprouting prevention methods
 - crop storage monitoring and recording of temperatures, ventilation, pest and vermin damage.
- End use of crops:
 - human consumption, animal feed, bird seed
 - food manufacturing, processed food, ready meals, malting, bread making and biscuits
 - pharmaceutical use and medicinal properties of crops
 - industrial use, e.g. liquids, inks and oils.

B2 Quality requirements for marketing combinable crops

- Market specifications, including grain or seed size, boldness, bushel weight, quality requirements.
- Contractual specifications:
 - processor, including impact on ability to use in processing, moisture content, nitrogen content, protein content, oil content, human consumption end use, e.g. ready meals, dried food products
 - manufacturer, including impact on end use and issues with rejected samples that do not meet quality requirements
 - seed, including impact on suitability for use, variety, being free from disease, using variety and germination test results
 - food standards and traceability, including the importance of being able to track the food production process
 - quality assurance schemes, including grower confirmation that commodities have been produced according to required standards and are fit for sale at that point.
- Using grading machines.
- Transporting combinable crops from field to farm, farm to store, store to sale.
- Production targets:
 - inputs, including cost of seed, fertiliser, chemicals, levies and charges
 - outputs, including price per tonne, premiums, bonuses and deductions
 - gross margins.
- Biosecurity, including grower responsibility for appropriate waste disposal methods, e.g. for feed, small grain or seed samples, plastic and bags.

Learning aim C: Carry out preparation and cultivation tasks related to combinable crops

C1 General husbandry tasks

- Importance of timing, schedules and time management in carrying out husbandry activities.
- Soil and seedbed preparation and cultivation techniques.
- Date of drilling or planting and its effect on growth, yield and quality.
- Crop protection methods against extreme weather, e.g. flooding, high winds, extreme heat, extreme cold.
- Monitoring growth and development of combinable crops.
- Harvesting operations.
- Appropriate disposal of waste, e.g. seed, bags, chemicals.
- Consideration of biosecurity and sustainable waste disposal practices.
- Cultivation equipment, including primary and secondary cultivations, minimum tillage, no-till methods.
- Cultivating settings, width of machine and depth of cultivation, including deep and shallow working depths.

C2 Fertiliser application

- Sources of fertiliser available, including organic and inorganic types.
- Timing of fertiliser application.
- Importance of understanding combinable crop growth stages in relation to fertiliser application.
- Importance of applying correct amount of fertiliser and the consequences of not applying correct amount.
- Methods of calculating fertiliser rates, yield mapping, N-Sensor data, variable rate application, Global Positioning System (GPS) mapping, computer programs, e.g. PLANET.
- Application methods, e.g. manure spreader, fertiliser spreader, liquid sprayer.
- Examples of solid fertiliser, including farmyard manure, granular fertiliser.
- Examples of liquid fertilisers, including:
 - straight liquid, e.g. nitrogen only
 - blended fertiliser, e.g. nitrogen and other suspensions.

C3 Weeds, pest and disease control

- Identifying common weeds, pests and diseases of combinable crops.
- Recommending control measures to address weeds, pests and diseases.
- Advantages and disadvantages of control measures to address weeds, pests and disease.
- Specific health and safety measures associated with weed, pest and disease control, including:
 - Local Environmental Risk Assessment for Pesticides (LERAPs)
 - other aspects of risk assessments, e.g. use of personal protective equipment (PPE).
- Interpreting agronomist recommendations.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate production requirements for combinable crops		A.D1 Evaluate the importance of production requirements, variety choices, techniques and legal requirements in establishing combinable crops.
<p>A.P1 Explain the key production requirements of combinable crops, including legal requirements.</p> <p>A.P2 Explain the role of variety choices and techniques in establishing combinable crops.</p>	<p>A.M1 Assess the impact of production requirements, including legal requirements, on combinable crop production.</p> <p>A.M2 Assess the significance of variety choices and techniques in establishing combinable crops.</p>	
Learning aim B: Explore the processing and quality requirements for marketing combinable crops		B.D2 Evaluate the impact of quality specifications on the processing and marketing of combinable crops.
<p>B.P3 Explain the processing requirements of common combinable crops.</p> <p>B.P4 Explain the key marketing requirements of common combinable crops.</p>	B.M3 Assess the quality specifications to be met in processing and marketing combinable crops.	
Learning aim C: Carry out preparation and cultivation tasks related to combinable crops		C.D3 Demonstrate, with a high degree of accuracy, husbandry techniques and cultivation methods to prepare sites for combinable crop production.
<p>C.P5 Competently demonstrate husbandry techniques to prepare sites for combinable crop production.</p> <p>C.P6 Competently demonstrate cultivation methods to prepare sites for combinable crop production.</p>	C.M4 Efficiently demonstrate husbandry techniques and cultivation methods to prepare sites for combinable crop production.	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.M2, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M3, C.M4, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- a range of growing combinable crops
- an appropriate range of safe and serviceable machinery used in preparing and cultivating sites
- farm records, in particular input costs.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will produce an in-depth, convincing investigation of production requirements for three combinable crops. They will make comprehensive and accurate connections between the fundamental requirements for successful combinable production, including the climate and soil type preferences dictated by the crop. Learners will provide a detailed account of all aspects of production requirements, including accurate understanding of the husbandry requirements in preparing for the establishment of the crop. They will show breadth and depth of understanding of crop choice and establishment techniques, giving consistently valid views on how these impact on overall crop production success. Learners will also give detailed, insightful consideration of the impact of legislation on combinable production. They will demonstrate breadth and depth of understanding in all areas, using specific agricultural terminology accurately throughout.

For merit standard, learners will make clear, appropriate judgements in their assessment of the production requirements for three combinable crops. They will make mainly relevant connections between the fundamental requirements for the successful production of combinable crops and include mostly valid detail regarding the requirements of the climate and soil type preferred by the crop. Learners will make valid justifications of the role of husbandry requirements in preparing for the establishment of the crops. They will show some breadth and depth of understanding of crop choice and establishment techniques, giving mostly relevant views on how these impact on overall crop production success. Learners will demonstrate a breadth of understanding regarding the impact of legislation on combinable production, providing mainly relevant reasons for their views. Learners will produce evidence that makes mainly accurate use of agricultural terminology.

For pass standard, learners will provide a limited but realistic account of the production requirements of three combinable crops. They will make some basic, relevant connections between the key factors required for combinable crop production and demonstrate a basic understanding of the effects of climate and soil type on crop production, with some irrelevancies. Learners will show a realistic awareness of the establishment needs of the crop but the evidence may be unbalanced or limited in scope. They will show limited understanding of crop choice and establishment techniques, giving some relevant but undeveloped explanations of how these impact on overall crop production success. Learners will provide a limited account of the impact of legislation on combinable production, showing a realistic understanding of most of the key aspects but lacking in examples or reasons that link logically to their views. Learners will make use of some relevant agricultural terminology, though this may be limited and inaccurate in parts.

Learning aims B and C

In order to achieve learning aims B and C, learners are required to carry out husbandry tasks to demonstrate the practical skills of husbandry. Teachers should ensure the crops chosen by learners provide sufficient scope for them to fully complete the assessments.

For distinction standard, learners will provide an in-depth evaluation of the processing of two combinable crops. They will consider thoroughly all the relevant stages, from when the crops are marketed on the farm and through the relevant processing plant. Learners' evidence will be comprehensive and include an accurate breakdown of the processing of combinable crops. They will also include information on the harvesting, storing and processing of crops and make consistently valid, logical links between crop quality requirements and how these affect the end use of the product. Learners will give in-depth consideration to the importance of marketing, including insightful, accurate references to the role of specifications, finances and production targets. They will link this logically to the financial impact when quality specifications are not met, along with costs associated with the production of combinable crops.

Learners will demonstrate husbandry techniques and cultivation methods for combinable crops with a high degree of accuracy. They will carry out the tasks confidently and show initiative in doing so, within the limits of their responsibility. Learners will fully complete the required tasks. In doing so, they will comply at all times with health and safety requirements, assessing risks and minimising injury to self and others, selecting and using all equipment appropriately and with a high degree of accuracy, reflecting best practice in industry. Learners will complete comprehensive and accurate records as appropriate to the work undertaken. They will demonstrate detailed knowledge of fertiliser application and crop protection methods as well as weed, pest and disease identification and control, making consistently logical judgements that show they understand the importance of these husbandry tasks in relation to overall crop health. Learners will use specific agricultural terminology and be accurate throughout.

For merit standard, learners will provide clear, mostly relevant judgements on the processing of two combinable crops, from when the crops are marketed on the farm and through the relevant processing plant. They will show breadth and some depth of understanding, providing clear understanding of the harvesting, storing and processing of crops and making mostly valid justifications between crop quality requirements and how these affect the end use of the product. Learners will give a clear, detailed assessment of marketing, including mostly relevant references to the role of finances, specifications and production targets. They will make some relevant references to the financial implications of not meeting quality specifications.

Learners will efficiently carry out husbandry techniques and cultivation methods for combinable crops, showing some initiative within the limits of their responsibility. They will complete these tasks appropriately, complying with health and safety requirements and assessing the risks. Learners will keep records, as appropriate to the tasks and with sufficient detail, so it is clear what has been carried out. They will demonstrate a clear understanding of fertiliser application and crop protection methods as well as weed, pest and disease identification. Learners will make mostly logical judgements that show they understand the importance of these husbandry tasks in relation to overall crop health. Learners' evidence will show mostly accurate use of specific agricultural terminology.

For pass standard, learners will provide a limited explanation of the processing of two combinable crops, from when the crops are marketed on the farm and through the relevant processing plant. They will provide basic detail on crop harvesting, storing and processing of crops, highlighting the most obvious aspects of combinable crop production and associated requirements. Learners will make basic, realistic links between crop quality requirements and how these affect the end use of the product but the evidence will be unsupported or superficial in parts. Learners will give a realistic, basic explanation of marketing, including some appropriate but undeveloped references to the role of specifications, finances and production targets.

Learners will carry out practical husbandry tasks for combinable crops, completing them appropriately but showing little initiative within the limits of their responsibility. They will complete the required tasks safely and adhere to health and safety requirements but show limited knowledge of associated risks and their controls. Learners will show some breadth of understanding of fertiliser application and crop protection methods as well as weed, pest and disease identification. They will make decisions that show a realistic but undeveloped understanding of the importance of these husbandry tasks in relation to overall crop health. They will show an appropriate awareness of the need to keep the appropriate records, providing the key information. Learners' evidence will show some use of agricultural terminology though there may be omissions.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 2: Plant and Soil Science
- Unit 4: Work Experience in the Land-based Sectors
- Unit 6: Crop Production
- Unit 9: Managing Environmental Activities in Agriculture
- Unit 10: Crop Handling, Storage and Quality Assurance.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- visits to end-user premises
- support from local land-based organisation staff as mentors.

Unit 16: Grass and Forage Crop Production

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners investigate the production of commercially produced forage crops, carry out forage crop grazing management tasks, and examine life cycles and conservation of forage crops.

Unit introduction

The cultivation of grass and forage crops can make an important contribution to livestock feeding in many land-based situations. The use of grass and forage crops can also benefit other enterprises as part of a rotation, for example fixing nitrogen and allowing spring cultivations.

In this unit, you will investigate in detail crops of local importance as well as the wide range of grass and forage crops produced across the UK. You will investigate the husbandry requirements of a range of forage crops, their botanical and agronomic characteristics, harvesting and storage, together with their nutritional value. You will consider wider agronomic and environmental issues, such as the use of grazing animals for habitat management. You will also consider the husbandry of forage crops, and study their establishment, use and management. This unit will give you the opportunity to undertake practical grazing management tasks and to make relevant recommendations for a forage crop. You will research the harvesting, storage and utilisation of forage crops by a range of livestock species, developing a sound understanding of yield and nutritive content as methods of evaluating the potential feed value of forage crops for feeding livestock.

This unit will help you to progress to employment in the sector in roles such as unit manager, crop technician or trials officer or to progress to higher education onto courses such as land management or agricultural management. The insight gained from this unit will help to inform and prepare you for the challenges and opportunities facing the agriculture industry in the 21st century as food security becomes increasingly important both nationally and globally.

Learning aims

In this unit you will:

- A** Investigate requirements for the growth and development of commercially produced forage crops
- B** Undertake tasks to maintain healthy forage crops for grazing
- C** Investigate the conservation of forage crops for animal feed.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate requirements for the growth and development of commercially produced forage crops	<p>A1 Key biological and physical factors in the growth and development of forage crops</p> <p>A2 Establishing forage crops</p> <p>A3 The digestibility and nutrient value of grazed forage crops</p>	An illustrated report or presentation examining forage crop production and relating this to plant growth and development.
B Undertake tasks to maintain healthy forage crops for grazing	<p>B1 Maintaining healthy forage crop production throughout the grazing season</p> <p>B2 Key procedures and issues associated with managing forage crops during the grazing season</p> <p>B3 Legislation and codes of practice</p>	A report and/or presentation examining the production of forage crops for grazing and conservation, supported by a portfolio of evidence relating to the management of forage crops during the grazing season.
C Investigate the conservation of forage crops for animal feed	<p>C1 Common systems for forage crop conservation</p> <p>C2 The digestibility and nutrient value of conserved forage crops</p> <p>C3 Processes for harvesting and storing conserved forage crops</p>	

Content

Learning aim A: Investigate requirements for the growth and development of commercially produced forage crops

A1 Key biological and physical factors in the growth and development of forage crops

- Key terminology associated with forage crop growth and development, e.g. rough grassland, permanent grassland, pasture, meadow, ley, sward, turf, tillering, catch crops.
- Life cycles of forage crops, including annual, biennial and perennial, annual grass growth curve.
- Plant growth and development, including the differences between vegetative and reproductive growth.
- The relationship between photosynthesis and carbohydrate production.
- Effect of environmental factors on forage crops, including day length, daylight, temperature and rainfall.
- Effect of physical factors on the growth of forage crops, e.g. slope, aspect, rainfall, soil type, soil structure, pH.
- Agronomic factors influencing the growth and development of key forage crop species.

A2 Establishing forage crops

- Site preparation and seedbed requirements for different types of forage crops, e.g. cultivations.
- Crop species, cultivars and seed mixtures for different purposes, including grazing and conservation.
- Germination and emergence in different types of forage crops, e.g. annual, biennial, perennial.
- Establishment techniques in different types of forage crops, e.g. annual, biennial, perennial, e.g. drilling, broadcasting, slot seeding, overseeding, undersowing.
- Weed, pest and disease problems in newly established crops.
- Key considerations when planning a rotation, including forage crops.

A3 The digestibility and nutrient value of grazed forage crops

- Nutrient value of forage crops, including differences between species and changes throughout the grazing season.
- Palatability of forage for grazing livestock.

Learning aim B: Undertake tasks to maintain healthy forage crops for grazing

B1 Maintaining healthy forage crop production throughout the grazing season

- Nutrition requirements, e.g. macronutrients (nitrogen, phosphate, potassium), minor nutrients (molybdenum, magnesium etc.) and pH.
- Nutrient requirements, timing and application.
- Maintenance and improvement operations, e.g. rolling, harrowing, topping, drainage, aeration, reseeding.
- Repairing damaged swards and minimising poaching.
- Identifying weeds, pests and diseases of forage crops.
- Recommending control measures to address weed, pest and disease.
- Equipment used for applying plant protection products and fertiliser.
- Specific health and safety measures associated with grazing management, e.g. use of personal protective equipment (PPE).
- Importance of schedules and time management when managing crop maintenance activities.

B2 Key procedures and issues associated with managing forage crops during the grazing season

- Avoiding undergrazing, overgrazing and scrub development.
- Grazing regimes and procedures, e.g. rotational grazing.
- Fencing, including temporary fencing.
- Monitoring grazed forage crops.
- The management of grazing animals for nature conservation purposes, including sustainable practices.
- Complying with requirements of conservation management plans.
- Animal welfare requirements, e.g. nutrient application, timings, poisonous plants, biosecurity.
- Public access and livestock worrying.
- PPE and health and safety issues.

B3 Legislation and codes of practice

- Legislation, relevant codes of practice and environmental considerations, e.g. Nitrate Vulnerable Zones (NVZs), Local Environment Risk Assessment for Pesticides (LERAPs), biosecurity.
- Specific health and safety requirements associated with forage crop production.
- Operator certification requirements for use of equipment and materials relevant to forage crop production.
- Quality assurance, e.g. Red Tractor, contract specifications.

Learning aim C: Investigate the conservation of forage crops for animal feed

C1 Common systems for forage crop conservation

- Silage, e.g. clamped, wrapped.
- Haylage.
- Hay.
- Dehydration, e.g. dried grass nuts.
- Factors that influence silage and haylage production:
 - sugar concentration
 - pH adjustment
 - additives
 - wilting.

C2 The digestibility and nutrient value of conserved forage crops

- Sampling methods.
- Assessment of conserved forage, e.g. colour, texture, taste, smell.
- Importance of dry matter.
- Recognising the quality of dry matter.
- Interpreting results of routine laboratory analysis, e.g. ammonia (% total N), D value, metabolisable energy (ME), ash, protein, nitrogen fractions, lactic acid, acetic acid, butyric acid, ethanol.
- The potential effects of poisonous plants, e.g. ragwort.
- Suitability of forage for specific classes of livestock.

C3 Processes for harvesting and storing conserved forage crops

The techniques required for the safe handling of conserved forage crops during loading, within store and feeding livestock.

- Silage production:
 - cutting regimes, e.g. 1st, 2nd and 3rd cuts
 - methods, e.g. clamps, wrapping
 - measures to control deterioration, e.g. excluding oxygen, preventing contamination
 - the length that the crop is chopped
 - single or mixed crop storage
 - health and safety, e.g. falls, and appropriate PPE
 - the importance of pest and disease control, e.g. rodent damage allowing air ingress.
- Hay production.
- Drying methods:
 - preventing pest and disease ingress
 - additional treatments, e.g. steaming and soaking
 - health and safety, e.g. inhaling fungal spores
 - maintaining dry storage.
- Other forage crops:
 - clamps for root crops, e.g. fodder beet
 - other locally important crops.
- Machinery used for harvesting forage crops.
- Machinery operation, e.g. mowers, foragers, balers, wrappers.
- Loading and unloading machinery and equipment for handling forage crops:
 - adaptations to trailers and wagons for forage crops
 - material handlers, including attachments used specifically for handling forage
 - grabs
 - elevators and conveyors
 - chopper blowers
 - other specialist forage crop machinery, e.g. for handling root crops produced for animal feed.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate requirements for the growth and development of commercially produced forage crops		
<p>A.P1 Contrast the life cycles of annual, biennial and perennial crops.</p> <p>A.P2 Explain the biological and physical factors influencing the growth and development of contrasting forage crops.</p>	<p>A.M1 Assess the growth and development characteristics of contrasting forage crops.</p>	<p>A.D1 Evaluate how biological and physical factors influence forage crop growth and development.</p>
Learning aim B: Undertake tasks to maintain healthy forage crops for grazing		
<p>B.P3 Explain possible remedial actions to maintain crop health for contrasting forage crops throughout the grazing season.</p> <p>B.P4 Competently carry out grazing management tasks to meet objectives and legislative requirements.</p>	<p>B.M2 Recommend remedial actions to maintain crop health for contrasting forage crops throughout the grazing season.</p> <p>B.M3 Efficiently carry out grazing management tasks to meet objectives and legislative requirements.</p>	<p>B.D2 Carry out grazing management tasks with a high degree of accuracy, including justification of remedial actions to maintain the health of contrasting forage crops.</p>
Learning aim C: Investigate the conservation of forage crops for animal feed		
<p>C.P5 Compare contrasting methods of conserving forage crops used to meet quality requirements.</p> <p>C.P6 Explain possible actions arising from the results of laboratory analysis of conserved forage crops.</p>	<p>C.M4 Assess the effect of contrasting conservation methods on forage crop quality.</p> <p>C.M5 Assess the implications of the results of laboratory analysis of conserved forage crops.</p>	<p>C.D3 Evaluate the results of the analysis of contrasting conserved forage types, relating the results to the conservation methods used.</p>

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M2, B.M3, C.M4, C.M5, B.D2, C.D3).

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- growing forage crops and forage crop storage facilities
- a suitable range of equipment and machinery used for forage crop production
- stored forage and appropriate laboratory analysis for the stored forage
- suitable software used commercially to support crop production and forage analysis, available for demonstration to learners.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will produce a convincing, in-depth evaluation that fully considers the forage crop production cycle for three contrasting forage crops. The evaluation will accurately identify how life cycle, establishment, climate, topography and soil type influence the growth and development of three contrasting forage crops, with no irrelevancies. Learners will demonstrate depth and breadth of understanding to thoroughly investigate quality parameters, including digestibility. They will show an in-depth understanding of any other relevant factors, such as the selection of cultivars and species, and the restrictions (if any) imposed by crop rotations. Learners' evaluations will be relevant at a local and regional level, and will be supported by reasoned, valid judgements that link logically and specifically to their views. The evidence will make use of appropriate, accurate agricultural terminology throughout.

For merit standard, learners will produce a clear, balanced assessment of the factors that affect forage crop production. Learners will draw on their breadth of understanding of life cycle, establishment, climate, topography and soil type relating to the growth and development of three contrasting forage crops. They will demonstrate clear understanding that certain cultivars and seed mixtures have been developed for specific end uses. Learners will make mostly valid references to digestibility and other quality parameters and the restrictions (if any) imposed by crop rotations. The evidence will be detailed and supported by mostly relevant examples. It will be structured and use appropriate agricultural terminology.

For pass standard, learners will recognise a range of forage crops within each definition. As a minimum, learners will be required to identify accurately three annual, three biennial and three perennial forage crop species and make basic, realistic comparisons between them. Learners will give a basic description of the techniques required to establish forage crops. They will provide a realistic but limited explanation of growth and development for three contrasting forage crops. They will select different physical and biological factors, explaining the interconnections in a mostly generalised way. Their explanation of the effect of climate, topography and soil type will be realistic but limited, and may be unbalanced in parts. Learners will make basic, undeveloped references to the importance of digestibility. They will make some appropriate references to other quality parameters and the restrictions (if any) imposed by crop rotations. There may be some minor irrelevancies in the evidence that will show some use of relevant terminology but there may be omissions.

Learning aims B and C

For distinction standard, learners will produce a convincing, in-depth justification of the effectiveness of the remedial actions required to maintain the health of two contrasting forage crops throughout the grazing season. The evidence will be clearly focused on the parameters used commercially to graze forage crops safely, with no irrelevancies. Learners will demonstrate a detailed knowledge of the nutrients and plant protection required to maintain forage crops. Learners will draw on breadth and depth of knowledge to show a robust understanding of the restrictions imposed on forage crop production by legislation, animal health and welfare (including grass staggers), health and safety, environmental protection and operator certification requirements. Learners' justifications will be relevant at a local and regional level, robustly supported by reasoned, valid judgements.

Learners will carry out grazing management tasks with a very high degree of accuracy to fully meet the objectives of a given brief. The grazing management tasks will include monitoring the forage crops to determine, with a high degree of accuracy, the suitability for grazing at the time of the assessment, and detailed, insightful recommendations for any present or future remedial action. The evidence could take the form of, and be of an equivalent standard to, an agronomist's report. Learners will carry out the practical tasks confidently, and show a high degree of initiative within the limits of their responsibility. Learners will complete comprehensive and accurate records as appropriate to the work undertaken.

Learners will provide an in-depth, convincing interpretation of the results of forage analysis. The evidence will draw on breadth and depth of knowledge to show a high degree of accuracy in the interpretation of the data analysis and possible actions that would result from the analysis. Learners will show a robust understanding of how two contrasting forage conservation methods can influence the quality of forage, and how this is reflected in the analysis. They will use specific, accurate agricultural terminology throughout, and consistently provide specific, valid reasons that link logically to their views.

For merit standard, learners will provide clear, balanced recommendations for the suitability of any remedial actions required to maintain the health of two contrasting forage crops throughout the grazing season. Learners will draw on their breadth of understanding regarding the parameters used to safely graze forage crops commercially. Learners will demonstrate mostly accurate knowledge of the nutrients and plant protection required to maintain forage crops. Learners will show breadth of understanding of the restrictions imposed on forage crop production by legislation, animal health and welfare (including grass staggers), health and safety, environmental protection and operator certification requirements. Learners' recommendations will be relevant at a local and regional level, supported by mostly valid judgements.

Learners will efficiently carry out grazing management tasks to meet given objectives. They will demonstrate mostly relevant and accurate knowledge and skills. The grazing management tasks will include monitoring the forage crops to determine the suitability for grazing at the time of the assessment, and mostly relevant recommendations for any present or future remedial action. The evidence could take the form of a basic agronomist's report. Learners will carry out the practical tasks competently, and show some initiative within the limits of their responsibility. Learners will keep records as appropriate to the tasks, with sufficient detail so it is clear what has been carried out.

Learners will give a balanced, clear assessment of the potential impact of contrasting conservation methods on forage crop quality. They will explain clearly the machinery and equipment required to conserve crops using two contrasting methods. Learners will assess how the effect of the machinery and conservation methods used can influence the quality of the forage produced. Learners will provide a detailed, mostly valid interpretation of forage quality, indicating its suitability as part of a ration for specific classes of livestock, and consider how the example(s) given compares with other forages. However, learners will not be able to make the connection between the method used to harvest and store the crop, and its quality. Learners will provide a clear and mostly accurate assessment of the implications of the feed value from the results of laboratory analysis of conserved forage crops and make some valid suggestions for actions following on from the analysis,

for example for which class of livestock would the forage be suitable. They will use specific, accurate agricultural terminology and provide mostly valid reasons, which link logically to their views.

For pass standard, learners will provide realistic but limited suggestions for the remedial actions required to maintain the health of two contrasting forage crops throughout the grazing season. The contrast between the crops could be related to the characteristics of the soil type, drainage and machinery required. Learners' explanations will be appropriate but lack the depth required to show specific links between related factors. Learners will safely carry out two given grazing management tasks. These tasks will be undertaken with an appropriate degree of accuracy. The grazing management tasks will include monitoring the forage crops to determine broadly the suitability for grazing at the time of the assessment, and basic recommendations for any present or future remedial action. The evidence could take the form of a verbal or written report. Learners will carry out the practical tasks safely, but show little initiative within the limits of their responsibility. They will demonstrate basic knowledge of the nutrients and plant protection required to maintain forage crops, and the evidence will be generic, or limited in scope. Learners will show that they can carry out tasks with appropriate regard for health and safety and legislative requirements. They will show an appropriate awareness of the need to keep the appropriate records, providing the key information.

Learners will explain two contrasting methods of conserving forage crops. They will give a realistic, but limited, explanation of the key quality requirements for the crops conserved by these methods and any differences between them. Learners will demonstrate a basic knowledge of the equipment and machinery required to conserve two contrasting forage crops.

Learners will give realistic, but limited, suggestions for possible actions arising from the results of laboratory analysis of conserved forage crops, such as the suitability of the forage as part of a ration for different classes of livestock. Learners' evidence will use some specific, accurate agricultural terminology, and provide some valid reasons that link appropriately to their views. There may be some minor irrelevancies in the evidence, and some agricultural terminology may be omitted.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 2: Plant and Soil Science
- Unit 4: Work Experience in the Land-based Sectors
- Unit 6: Crop Production
- Unit 9: Managing Environmental Activities in Agriculture
- Unit 10: Crop Handling, Storage and Quality Assurance.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 17: Poultry Production

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners develop the skills and knowledge needed to carry out feeding and husbandry practices to raise poultry successfully in poultry production systems.

Unit introduction

The poultry production industry in the UK involves mainly three species: chickens, ducks and turkeys. It also involves a wide variety of housing and husbandry methods. Workers in the industry might be specialists, working with one stage of the life cycle of the bird and caring for hundreds of thousands of birds at one time, or they might work with poultry as part of a larger, more diverse enterprise.

In this unit, you will investigate different commercial poultry systems, including the range of housing systems associated with each type of production system, and select appropriate accommodation, taking into account any animal welfare issues. You will carry out routine husbandry and feeding tasks for one or more classes of commercial poultry, which might include broiler production, commercial layers (used to produce eggs for consumption), ducks and turkeys. You will find out how production affects animal welfare and develop skills in meeting the nutritional requirements of poultry at different stages in the production cycle, including feed ingredients and ration formulation. You will develop a clear understanding of the legal, economic and environmental factors that contribute to decision making in poultry production. This will allow you to make informed decisions in relation to future poultry production.

This unit will help you to progress to employment in poultry production units, or to higher education courses in areas such as animal science, agricultural business or agriculture.

Learning aims

In this unit you will:

- A** Investigate poultry production systems used in the UK
- B** Carry out diet management and feeding practices during the production cycle to maintain health and production targets
- C** Carry out routine husbandry of poultry during the production cycle to meet current welfare and husbandry standards.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate poultry production systems used in the UK	A1 Poultry production systems A2 Housing requirements A3 Selection of animals for market and the role of performance indicators	A written report on a selected poultry production system and the production cycle.
B Carry out diet management and feeding practices during the production cycle to maintain health and production targets	B1 Nutritional requirements B2 Diet management and feeding practices B3 Nutritional problems	A portfolio of evidence, to include: <ul style="list-style-type: none"> • planning documents • evidence of carrying out routine poultry husbandry and feeding tasks safely to meet current standards and health and production targets.
C Carry out routine husbandry of poultry during the production cycle to meet current welfare and husbandry standards	C1 Routine husbandry C2 Breeding poultry C3 Assessing health and welfare	

Content

Learning aim A: Investigate poultry production systems used in the UK

A1 Poultry production systems

Common production systems (chickens, ducks and turkeys) in the UK and associated considerations and processes for each.

- Current conditions in the poultry industry, including current poultry numbers and range of poultry products, current rearing in the UK, current consumer trends in the UK and globally.
- Poultry production systems:
 - intensive systems, including cages, barns, deep litter
 - free range and organic systems
 - extensive systems of rearing.
- Factors affecting choice of system, including financial, economic, marketing, availability of services, current farming practices, environmental factors and current legislative requirements.
- Class of poultry, including broilers, breeders, commercial layers, turkey breeders, turkey growers, duck breeders, growing ducklings, growers and layers, day-old and young birds, point-of-lay birds, breeders, commercial layers.
- Domestic and commercial poultry breeds, including suitability for different production systems.
- Biosecurity measures in poultry production, including disinfectant foot dips, lorry wheel wash.
- Environmental impact and pollution control.
- Other factors associated with health and safety, including biosecurity levels, movement and transport of poultry, pest and vermin control, feeding, water and bedding, people, equipment.
- Legislation and welfare standards in key aspects of poultry production, including:
 - culling
 - husbandry
 - sustainability
 - welfare, including beak trimming, transport, slaughter, overcrowding, physiological and psychological stress.

A2 Housing requirements

Variety of housing and associated equipment used in production systems.

- Consideration of poultry housing in UK production systems:
 - considerations, including insulation, lighting, feeding, drinking and nesting equipment
 - cage systems, including conventional cages, enriched cages
 - egg collection systems, including automatic cage systems, automatic and manual nesting systems, manual systems, slats
 - egg storage until sale
 - waste management, including bedding, faeces, feed, eggs
 - current relevant legislation and restrictions for all stages of the production cycle
 - adjustments and adaptations (equipment, lighting, ventilation) to maximise profit
 - impact, including on animal health and welfare, on the environment, on building design.
- Equipment, including fans, vents, heaters, controls, alarms, failsafe generators, natural and fan-assisted.
- Measuring equipment, including thermometers, hygrometers, digital measuring equipment, airspeed meters.

- Environment assessment in hot and cold weather conditions, including lighting and lighting patterns, temperature.
- Ventilation, including air quality, airflow, minimum ventilation rates, ventilation control.
- Evaporative cooling systems.

A3 Selection of animals for market and the role of performance indicators

- Measurement: sampling, including random sample, representative sample, coefficient of variation (CV%), automatic, feed, water, medication, temperature, ventilation, consumption.
- Performance targets:
 - breed standards
 - commercial targets, including weight for age.
- Current relevant regulations regarding preparation of animals for market/slaughter, including those governing the transport of livestock, completion of movement records, health and safety, animal welfare.
- Records, including computers, graphs and charts, storage, veterinary, deaths and disposal, husbandry.
- Performance indicators, including body weight, variation, egg numbers, egg weight, egg mass, egg quality, mortality, food conversion rate (FCR), fertility, hatchability, hen-housed.

Learning aim B: Carry out diet management and feeding practices during the production cycle to maintain health and production targets

B1 Nutritional requirements

- Nutritional requirements of the flock at the different stages of growth:
 - nutritional requirements of chicks, pullets
 - energy requirements and feed intake
 - body weight and fat deposition in relation to egg laying
 - formulation of rations for poultry to meet target growth and production rates.
- Types of feed, including pellets, crumbles, mash, starter feed, grower feed, layer feed.

B2 Diet management and feeding practices

- Feeding strategies, including ad libitum, restricted.
- Types of diets available: starter, broiler, growth-to-finishing diets for chickens, turkeys and ducks.
- Types of feeding and watering equipment, including feed pans, self-feeders, automatic feeders, nipple drinkers, round drinkers, water delivery systems.
- Cleaning and maintenance of feeding and watering equipment.
- Assessment of basic feed quality for suitability.
- Recording systems, including feed boards, databases and online recording systems.
- Facilities for feed storage to maintain quality.
- Weight gain and maintenance at each life stage.

B3 Nutritional problems

- Common nutritional health issues, including rickets, caged layer fatigue (CLF), other specific micronutrient deficiencies.
- Causes, treatments and prevention of common nutrition deficiencies, excesses and disorders.

Learning aim C: Carry out routine husbandry of poultry during the production cycle to meet current welfare and husbandry standards

C1 Routine husbandry

Routine husbandry for commercial poultry flocks to maintain health and ensure high levels of animal welfare.

- Routine husbandry:
 - preparation of housing and environment
 - cleaning of housing and equipment using approved products
 - bedding, including type, frequency of change, disposal
 - maintaining environment, including ventilation, temperature, lighting, basic litter management
 - equipment, including feeders, drinkers, heaters, fans, ventilation control systems
 - establishment and maintenance of biosecurity measures, including strict hygiene and disinfection procedures, use of approved disinfectants, use of personal protective equipment (PPE)
 - feeding and watering
 - routine checks of health and welfare
 - role of veterinary medicines in treating and controlling disease
 - responsible use of veterinary medicines under the regulations set out by the Veterinary Medicines Directorate (VMD) to prevent or control exposure to disease, reading the label and data sheets, engineered controls, competence and training requirements
 - record keeping, including veterinary medicines book, record of births and deaths and husbandry records
 - legislative requirements, codes of practice
 - daily routine practices, including feather clipping, tagging, external parasite control
 - bird handling and restraint techniques.
- Issues associated with large-scale poultry production systems, including design, purpose, work routines, allocation and roles of staff, flock cycles, challenges.

C2 Breeding poultry

Factors to consider for successful poultry breeding and rearing:

- anatomy of the egg, formation and structure
- assessment of egg quality for incubation and to enter the food chain
- factors affecting growth and reproduction
- breeding stages, including incubation, egg hatching, brooding
- administering medication via water and feed supply
- reasons for administering medication
- environmental controls, temperature, humidity, lighting, ventilation, density of birds.

C3 Assessing health and welfare

- Routine inspections, including process and frequency for mature birds and chicks, leg health.
- Health checking using indicators of good health, including clear, bright eyes, alertness, good posture, vigorous movements if unduly disturbed, active feeding and drinking, singing and vocalisation, satisfactory egg production and clean and healthy skin, shanks and feet.
- Poor welfare indicators, including feather loss, leg burns, excessive gapping, stocking densities, poor handling techniques.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate poultry production systems used in the UK		A.D1 Demonstrate proficient selection of animals for market and end of use, evaluating the impact of a poultry production and housing system and accurate selection on overall performance and production outcomes.
<p>A.P1 Explain a poultry production and housing system, including the impact on animal health and welfare.</p> <p>A.P2 Demonstrate competent selection of animals for market and end of use.</p>	<p>A.M1 Analyse the impact of a poultry production and housing system and accurate stock selection on overall performance and production outcomes.</p> <p>A.M2 Demonstrate effective selection of animals for market and end of use.</p>	
Learning aim B: Carry out diet management and feeding practices during the production cycle to maintain health and production targets		B.D2 Demonstrate, with a high degree of accuracy, feeding and diet management of poultry to maintain health and production targets, evaluating the impact of nutrition and own feeding and diet management tasks.
<p>B.P3 Explain the importance of diet management and feeding practices throughout the poultry production cycle.</p> <p>B.P4 Demonstrate competent feeding and diet management of poultry to maintain and health and production targets.</p>	<p>B.M3 Analyse the impact that nutrition, diet management and feeding have on health and production targets.</p> <p>B.M4 Demonstrate efficient feeding and diet management of poultry to maintain health and production targets.</p>	
Learning aim C: Carry out routine husbandry of poultry during the production cycle to meet current welfare and husbandry standards		C.D3 Demonstrate, with a high degree of accuracy, routine husbandry and assessment of health and welfare of poultry in a commercial system to maintain health and production objectives.
<p>C.P5 Demonstrate competent routine husbandry of poultry to meet health and production targets.</p> <p>C.P6 Demonstrate competent assessment of poultry health and welfare in a commercial system.</p>	<p>C.M5 Demonstrate efficient routine husbandry and assessment of health and welfare of poultry in a commercial system to meet health and production targets.</p>	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.M2, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M3, B.M4, C.M5, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- commercial poultry of different species, including chickens, ducks, turkeys
- poultry at the centre
- routinely used equipment.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will give an in-depth review of one poultry production and housing system for a specified poultry species, thoroughly considering breed suitability and how accurate selection affects overall production outcomes. They will make comprehensive, accurate connections between key factors within the production system and the requirements to select the most suitable breed to meet production targets. Learners will carry out a comprehensive review of secondary information on the selected production method, with robust evaluation of the advantages and disadvantages, and logical justifications regarding the most suitable breeds. They will show depth of understanding to correctly identify those animals ready for sale at market or end of use, giving valid, well-reasoned justifications for their views. Learners will show breadth and depth of understanding of the importance of performance indicators as a measure of success and the implications on health and welfare, using specific terminology accurately throughout. Learners will recommend relevant, insightful strategies consistently, to improve animal welfare in the production cycle.

For merit standard, learners will make relevant, analytical judgements on one poultry production and housing system for a specified species, breed suitability and their impact on managing the suitability and saleability of poultry, and on overall production outcomes. They will make mainly relevant connections between the different aspects of the production system and the requirements to select the most suitable breed or species to meet production targets. Learners will provide a clear review of secondary information on the selected production method and housing system, with a clear analysis of the advantages and disadvantages. They will give mostly valid justifications for the choice of suitable breeds. Learners will show breadth and some depth of understanding when identifying those animals ready for sale at market or end of use, giving mostly valid justifications for their views. They will show breadth and some depth of understanding of performance indicators as a measure of success and the implications on health and welfare. The evidence will use specific, accurate terminology. Learners will, at all times, show relevant and realistic consideration of animal welfare in the production cycle, making mostly relevant recommendations for improvements.

For pass standard, learners will give a limited, realistic account of one poultry production and housing system for a specified poultry species and breed suitability, showing basic understanding of how accurate selection affects overall production outcomes. They will make basic connections between the key factors within the production and housing system and the requirements for selecting the most suitable breed to meet production targets. Learners will use some secondary information on the chosen production method to identify the advantages and disadvantages, giving basic explanations for their choice of the most suitable breeds. They will recall knowledge to identify those animals ready for sale at market or end of use but will not provide justifications for their views. Learners will show limited breadth and depth of understanding of performance indicators as a measure of success and the implications for health and welfare, using some relevant terminology. Learners will, at all times, consider animal welfare in the production cycle, identifying basic changes that could be made.

Learning aims B and C

In order to achieve learning aims B and C, learners must demonstrate the required knowledge and skills within the context of a chosen poultry production system. Teachers should ensure that the poultry production system selected by learners provides sufficient scope for them to fully complete the assessments.

For distinction standard, learners will demonstrate the practical skills required to care for a production flock and individual animals in a poultry system to a standard that reflects best practice in the workplace. They will carry out all the practical tasks confidently, showing a high degree of initiative within the limits of their responsibility.

Learners will evidence insightful strategies to minimise risks, demonstrating proficient safe working practices throughout. They will select the correct equipment, using it safely and accurately. They will ensure that animal welfare is maintained effectively and disruption to the animals is minimised. Learners will demonstrate proficiency in complying with biosecurity policies and procedures. They will show depth of understanding of the activities affected by biosecurity, how to take action to prevent non-compliance, and the consequences of biosecurity breaches. Learners will keep detailed and accurate records as appropriate to the tasks being carried out.

Learners will carry out feeding and diet management with a high degree of accuracy, ensuring the required foodstuffs are available and prepared, and informing others if there are problems. They will show depth of understanding of the importance of diet management within a poultry production system through a detailed review of nutritional requirements, feeding practices and common nutritional problems, with well-reasoned recommendations for improvement.

Learners will carry out routine husbandry activities with one poultry species, including feeding, watering, cleaning, assessing the environment, bird inspection and managing overall health. They will demonstrate a robust understanding of the practices used to care for the animals. Learners will make convincing connections between good husbandry and healthy birds. They will show in-depth understanding of the importance of animal welfare and the need to review and maintain it as part of normal operation. Learners will show clear understanding that recognising and dealing with ill health in poultry is part of routine husbandry, demonstrating this when carrying out their activities. They will review their approaches to carrying out routine husbandry activities and feeding and diet management in terms of their effectiveness in maintaining good health and hygiene of livestock. Learners will explore thoroughly where they were successful and where approaches could be improved or carried out differently.

Learners' evidence will use specific, accurate terminology throughout.

For merit standard, learners will demonstrate the practical skills required to care efficiently and safely for a production flock and individual animals in a poultry system. They will carry out the practical tasks competently and show some initiative within the limits of their responsibility. Learners will show efficient use of time and resources, and meet key requirements for animal welfare. They will assess the risks and hazards, using the required equipment safely and competently. Learners will demonstrate competency in complying with biosecurity policies and procedures. They will show clear understanding of most of the activities that are affected by biosecurity and how to take action to prevent non-compliance. Learners will keep records, as appropriate to the tasks and with sufficient detail, so it is clear what has been carried out.

Learners will carry out feeding and diet management correctly, making efficient use of resources, and with some preparation of foodstuffs. They will show a clear understanding of the importance of diet management systems through providing details of the nutritional requirements, feeding and diet practices and nutritional problems commonly seen in commercial poultry production, making mostly valid recommendations for improvement.

Learners will carry out competently routine husbandry activities with one poultry species, including feeding, watering, cleaning, assessing the environment, bird inspection and managing overall health. They will demonstrate a sound understanding of the practices used to care for the animals, making relevant connections between good husbandry and healthy poultry. Learners will demonstrate a clear understanding of the importance of animal welfare and the need to maintain it as part of normal operation. They will understand that recognising and dealing with ill health in poultry is part of routine husbandry, demonstrating this when carrying out some of their activities, but there may be minor omissions. Learners will reflect on the approaches they used and make clear connections to their impact on the good health and hygiene of livestock, with mainly relevant recommendations for improvement.

Learners' evidence will show use of specific, appropriate technical terminology.

For pass standard, learners will demonstrate the practical skills required to care safely and competently for a production flock and individual animals within a poultry production system. They will carry out the practical tasks appropriately, showing little initiative within the limits of their responsibility.

Learners will work safely, with a realistic, limited awareness of the risks and potential issues arising when carrying out routine feeding and husbandry in a poultry production system. They will use the appropriate equipment and leave the area clean and tidy on completion. Learners will show a realistic awareness of the importance of complying with biosecurity policies and procedures. They will recall knowledge of most activities that are affected by biosecurity and outline actions to prevent non-compliance. Learners will show an awareness of the need to keep appropriate records, providing the key information.

Learners will carry out feeding and diet management safely and competently, demonstrating a realistic, limited awareness of the importance of minimising wastage of resources. They will show basic understanding of the significance of the role of feeding and diet management in the production cycle. Learners will recall basic knowledge to explain the nutritional requirements, feeding and diet practices, and nutritional problems commonly seen in a commercial poultry production system.

Learners will carry out routine husbandry activities with one poultry species, including feeding, watering, cleaning, assessing the environment, bird inspection and managing overall health. They will demonstrate some relevant understanding of the practices used to care for the animals. Learners will carry out basic routine care and identify tasks to be completed in a generally appropriate order. They will make basic, realistic links between good husbandry and healthy poultry. Learners will show an appropriate awareness of how to maintain the welfare of animals as part of normal operation and the need to maintain it at all times. They will show realistic awareness that recognising and dealing with ill health in poultry is part of routine husbandry, demonstrating this when carrying out some of their activities, but this will be limited. Learners will demonstrate a realistic but undeveloped understanding of how the approaches they used link to the good health and hygiene of livestock.

Learners' evidence will use some relevant terminology, but there may be omissions.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 2: Plant and Soil Science
- Unit 4: Work Experience in the Land-based Sectors
- Unit 7: Farm Livestock Husbandry
- Unit 9: Managing Environmental Activities in Agriculture
- Unit 11: Livestock Health and Diseases
- Unit 22: Livestock Nutrition.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 18: Pig Production

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners develop the skills and knowledge needed to carry out routine feeding and husbandry practices to raise pigs successfully in pig production systems.

Unit introduction

Pig production is a large global industry. Successful pig producers have a thorough understanding of the factors affecting both the domestic pig industry and the global market, developing and adapting their husbandry skills in an environment where the market price for pig products is constantly changing.

In this unit, you will investigate different pig production systems for indoor and outdoor pigs, weaner production, rearing and fattening, and the associated pig accommodation. You will carry out routine feeding and husbandry tasks throughout the production cycle as part of management of the breeding and the growing pig. You will find out how production affects animal welfare and develop skills in meeting the nutritional requirements of pigs at different stages in the production cycle, including feed ingredients and ration formulation. You will develop a clear understanding of the legal, economic and environmental factors that contribute to decision making in pig production. This will allow you to make informed decisions in relation to future pig production.

This unit will help you to progress to employment in small- or large-scale pig production units and to general farm work, or to higher education courses in areas such as animal science, agriculture or agricultural business.

Learning aims

In this unit you will:

- A** Investigate pig production systems used in the UK
- B** Carry out diet management and feeding practices during the production cycle to maintain health and production targets
- C** Carry out routine husbandry of pigs during the production cycle to meet current welfare and husbandry standards.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate pig production systems used in the UK	A1 Pig production systems A2 Preparation for breeding A3 Selecting animals for market, end of use and role of performance indicators	A report on a selected pig production system and the production cycle.
B Carry out diet management and feeding practices during the production cycle to maintain health and production targets	B1 Nutritional requirements B2 Diet management and feeding practices B3 Nutritional problems	A portfolio of evidence, to include: <ul style="list-style-type: none"> • planning documents • evidence of carrying out routine pig feeding and husbandry tasks to meet current standards and health and production targets.
C Carry out routine husbandry of pigs during the production cycle to meet current welfare and husbandry standards	C1 Routine husbandry C2 Preparations for pre-farrowing and farrowing	

Content

Learning aim A: Investigate pig production systems used in the UK

A1 Pig production systems

Common production systems in the UK and associated considerations and processes for each.

- Current conditions in the pig industry, including current pig numbers and range of pig products, current rearing trends in the UK, current consumer trends in the UK and globally.
- Pig production systems:
 - indoor and outdoor systems for breeding, including intensive, semi-intensive, extensive
 - rearing systems and methods
 - housing systems for breeding
 - growing and finishing stock for indoor and outdoor systems.
- Factors affecting choice of production system, including financial, economic, marketing, availability of services, current farming practices, environmental factors and current legislative requirements.
- Liveweight and deadweight selling.
- Carcass classification and grading, e.g. for use in processed products.
- Pig breeds, hybrids, genotype and genetics and their suitability in different production systems.
- Site requirements for outdoor pig units, including climate, soil type, topography.
- Biosecurity measures in pig production, including disinfectant foot dips, lorry wheel wash.
- Environmental impact and pollution control.
- Other factors associated with biosecurity measures, including health and safety, biosecurity levels, movement and transport of pigs, pest and vermin control, feeding, water and bedding, people, equipment.
- Legislation and welfare standards in key aspects of pig production, including:
 - culling
 - husbandry
 - sustainability.
- Welfare requirements associated with:
 - farrowing crates
 - group pens
 - indoor pig rearing
 - slatted floors
 - tooth clipping
 - castration
 - physiological and psychological stress.

A2 Preparation for breeding

Suitable selection of animals to meet production aims and welfare standards.

- Selection of suitable stock for breeding in line with breeding policy:
 - breeding stock selection of boars, sows and gilts
 - interpretation of secondary breeding data
 - use of selection programmes in livestock improvement.
- Use of reproductive technologies, including artificial insemination, sexed semen.

- Preparation for breeding in line with breeding policy, including:
 - assessment and evaluation of the boar, sow and gilt
 - health checking of individual animals
 - body condition scoring/mobility scoring
 - behavioural assessment of groups and individual animals
 - identification of ovulation, including oestrus cycle and role of hormones, heat observation, optimum time for service
 - andrology and sperm analysis, principles and application
 - artificial manipulation of the oestrus cycle
 - pregnancy diagnosis, including visual methods, use of technology
 - complying with health and safety and welfare requirements during preparation for breeding.

A3 Selecting animals for market, end of use and role of performance indicators

- Selection of stock for sale, including:
 - grading of finished animals
 - saleability factors
 - selection factors and preparation of animals for market or slaughter
 - current, relevant regulations regarding preparation of animals for market or slaughter, including those governing the transport of livestock, completion of movement records, health and safety, animal welfare.
- Performance indicators, including calculation of relevant performance indicators (piglet percentage, mortality rates, financial indicators, productivity).

Learning aim B: Carry out diet management and feeding practices during the production cycle to maintain health and production targets

B1 Nutritional requirements

- Nutritional requirements for breeding animals at the various stages of the production cycle, including pre-service, mid and late pregnancy, farrowing, lactation.
- Formulation of rations for pregnant sows/gilts to meet target growth rates.
- Importance of protein and lysine in pig diets.
- Nutritional requirements of newborn piglets through to finishing.
- Types of feed, including concentrates, grains and supplemental feeding of root crops.

B2 Diet management and feeding practices

- Feeding systems, including wet and dry feed systems.
- Types of feeding and watering equipment, including nipple feeder, bottles, creep feeders, water delivery systems.
- Cleaning and maintenance of feeding and watering equipment.
- Assessment of basic feed quality for suitability, including adverse effects of inadequate and prohibited feed ingredients and toxins.
- Facilities for feed storage to maintain quality.
- Recording systems, including feed boards, databases and online recording systems.
- Weight gain and maintenance at each life stage.

B3 Nutritional problems

- Possible signs of a nutritional problem, including poor appetite, reduced growth and lethargy.
- Common nutritional health issues, including specific nutrient deficiencies, excesses, parasitism and disorders.
- Causes, treatment and prevention of nutritional problems.

Learning aim C: Carry out routine husbandry of pigs during the production cycle to meet current welfare and husbandry standards

C1 Routine husbandry

- Routine husbandry to maintain health:
 - feeding and watering
 - routine checks of health, disease diagnoses, heat detection
 - unit hygiene, including cleanliness, tidiness, disinfectant use
 - maintenance of housing, including cleaning out, bedding down
 - signs of normal and abnormal health, including health checking, actions to prevent decline of health status and when to seek veterinary assistance
 - role of veterinary medicines in treating and controlling disease
 - responsible use of veterinary medicines under the regulations set out by the Veterinary Medicines Directorate (VMD), including measures to prevent or control exposure, reading the label and data sheets, engineered controls, competence and training requirements
 - record keeping, including veterinary medicines book, record of births and deaths and husbandry records
 - isolation of replacement stock
 - government requirements for movement documentation and standstill
 - health and safety and risk assessments, use of personal protective equipment (PPE).
- Routine husbandry associated with breeding pigs:
 - assisting at farrowing
 - serving animals
 - administering of veterinary and medical products
 - animal health planning and monitoring.
- Routine husbandry associated with growing pigs:
 - teeth clipping, tail docking, injecting and weighing
 - data recording and assessment, including physical, financial, movement licences, veterinary and medical, herd performance, sales invoices
 - reasons for records, including legal, operational, managerial.

C2 Preparations for pre-farrowing and farrowing

Preparations for pre-farrowing and farrowing:

- stages of pre-farrowing, including approximate timings
- indicators for farrowing and inducing labour
- feeding programme planning, including planned weight gains and quantities
- common bacterial, viral and parasitic diseases, including erysipelas, scour
- disease diagnoses, prevention and treatment in breeding pigs
- movement of animals into farrowing pen/crate
- assessment of animal's health and welfare, including good and poor health indicators
- farrowing problems, including large litters, rotation in womb, failure of cervix to open, dead piglets in womb, sow illness
- care of the newborn piglets.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate pig production systems used in the UK		A.D1 Demonstrate proficient selection of animals for market and end of use, evaluating the impact of a pig production system and accurate selection on overall production outcomes.
<p>A.P1 Explain a production system for breeding pigs in the UK.</p> <p>A.P2 Demonstrate competent selection of animals for market and end of use, using performance indicators.</p>	<p>A.M1 Analyse the impact of pig production and accurate selection on overall performance and production outcomes.</p> <p>A.M2 Demonstrate effective selection of animals for market and end of use, using performance indicators.</p>	
Learning aim B: Carry out diet management and feeding practices during the production cycle to maintain health and production targets		B.D2 Demonstrate, with a high degree of accuracy, diet management and feeding of pigs to maintain health and production targets, evaluating the impact of nutrition and own feeding and diet management tasks.
<p>B.P3 Explain the importance of diet management and feeding practices throughout the pig production cycle.</p> <p>B.P4 Demonstrate competent feeding and diet management of pigs to maintain health and production targets.</p>	<p>B.M3 Analyse the impact that nutrition, diet management and feeding practices have on health and production targets.</p> <p>B.M4 Demonstrate efficient feeding and diet management of pigs to maintain health and production targets.</p>	
Learning aim C: Carry out routine husbandry of pigs during the production cycle to meet current welfare and husbandry standards		C.D3 Demonstrate, with a high degree of accuracy, routine husbandry of pigs to maintain health and production targets and meet requirements during pre-farrowing and farrowing.
<p>C.P5 Demonstrate competent routine husbandry of pigs to meet health and production targets.</p> <p>C.P6 Demonstrate competent routine husbandry required during pre-farrowing and farrowing.</p>	<p>C.M5 Demonstrate efficient routine husbandry of pigs to maintain health and production targets and meet requirements during pre-farrowing and farrowing.</p>	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.M2, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M3, B.M4, C.M5, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- commercial pig production units
- pigs at the centre
- specific equipment used in handling, restraints and routine husbandry
- markets/abattoirs to visit.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will give an in-depth review of one pig production system with specific breeds, thoroughly considering breed suitability and how accurate selection of stock affects overall production outcomes. They will make comprehensive, accurate connections between key factors within the production system and the requirements to select the most suitable breed to meet production targets. Learners will comprehensively review secondary information on the selected production method, with a robust evaluation of the advantages and disadvantages, and logical justifications regarding the most suitable breeds. They will show depth of understanding to identify accurately those animals ready for market and end of use, giving valid, well-reasoned justifications for their views. Learners will show breadth and depth of understanding of performance indicators as a measure of success and the implications for health and welfare, using specific agricultural terminology accurately throughout. Learners will consistently recommend relevant, insightful strategies to improve animal welfare in the production cycle.

For merit standard, learners will make relevant, analytical judgements on one pig production system with specific breeds, breed suitability and their impact on managing the suitability and saleability of pigs, and on overall production outcomes. They will make mainly relevant connections between the different aspects of the production system and the requirements to select the most suitable breed to meet production targets. Learners will provide a clear review of secondary information on the selected production method, with a clear analysis of the advantages and disadvantages. They will give mostly valid justifications for their choice of the most suitable breeds. They will show breadth and some depth of understanding when identifying those animals ready for market and end of use, giving mostly valid justifications for their views. Learners will show breadth and some depth of understanding of performance indicators as a measure of success and the implications for health and welfare. The evidence will use specific, accurate terminology. Learners will, at all times, show relevant and realistic consideration of animal welfare in the production cycle, making mostly relevant recommendations for improvements.

For pass standard, learners will give a limited, realistic account of one pig production system with specific breeds and the most obvious factors that affect the selection of pigs for market and end of use. They will show a basic understanding of how correct selection affects overall production targets, making basic connections between the key factors within the production system and the requirements for selecting the most suitable breed to meet production targets. Learners will use some secondary information on the chosen production method to identify the advantages and disadvantages, giving basic explanations for their choice of the most suitable breeds. They will recall knowledge to identify those animals ready for market and end of use but will not provide justifications for their views. Learners will show limited breadth and depth of understanding of performance indicators as a measure of success and the implications for health and welfare, using some relevant terminology. Learners will, at all times, consider animal welfare in the production cycle, identifying basic changes that could be made.

Learning aims B and C

In order to achieve learning aims B and C, learners must demonstrate the required knowledge and skills within the context of a chosen pig production system. Teachers should ensure that the pig production system selected by learners provides sufficient scope for them to fully complete the assessments.

For distinction standard, learners will demonstrate the practical skills required to care for a production herd and individual animals during pre-farrowing and farrowing to a standard that reflects best practice in the workplace. They will carry out all the practical tasks confidently, showing a high degree of initiative within the limits of their responsibility.

Learners will evidence insightful strategies to minimise risks, demonstrating proficient safe working practices throughout. They will select the correct equipment, using it safely and accurately. They will ensure that animal welfare is maintained effectively and disruption to the animals is minimised. Learners will demonstrate proficiency in complying with biosecurity policies and procedures. They will show depth of understanding of the activities affected by biosecurity, how to take action to prevent non-compliance, and the consequences of biosecurity breaches. They will keep detailed and accurate records as appropriate to the tasks being carried out.

Learners will carry out feeding and diet management with a high degree of accuracy, ensuring the required foodstuffs are available and prepared, and informing others if there are problems. They will show depth of understanding of the importance of diet management within a pig production system through a detailed review of nutritional requirements, feeding practices and common nutritional problems (causes, treatments and prevention), with well-reasoned recommendations for improvement.

Learners will carry out routine husbandry activities with boars, sows, gilts and piglets, demonstrating a robust understanding of the practices used to care for the animals. They will make convincing connections between good husbandry and healthy pigs. Learners will show in-depth understanding of the importance of animal welfare and the need to review and maintain it as part of normal operation. They will show clear understanding that recognising and dealing with ill health in livestock is part of routine husbandry, demonstrating this when carrying out their activities. Learners will recognise the common signs of ill health in pigs, showing accurate knowledge of how to treat common diseases and disorders. They will review their approaches to carrying out routine husbandry activities, feeding and diet management in terms of their effectiveness in maintaining good health and hygiene of livestock. Learners will explore thoroughly where they were successful and where approaches could be improved or carried out differently.

Learners' evidence will use specific, accurate terminology throughout.

For merit standard, learners will demonstrate the practical skills required to care efficiently and safely for a production herd and individual animals during pre-farrowing and farrowing. They will carry out the practical tasks competently and show some initiative within the limits of their responsibility. Learners will show efficient use of time and resources, and meet the key requirements for animal welfare. They will assess the risks and hazards, using the required equipment safely and competently. Learners will demonstrate competency in complying with biosecurity policies and procedures. They will show clear understanding of most of the activities that are affected by biosecurity and how to take action to prevent non-compliance. Learners will keep records, as appropriate to the tasks and with sufficient detail, so it is clear what has been carried out.

Learners will carry out feeding and diet management correctly, making efficient use of resources, and with some preparation of foodstuffs. They will show a clear understanding of the importance of diet management within a pig production system through providing details of nutritional requirements, feeding practices and common nutritional problems (causes, treatments and prevention), making mostly valid recommendations for improvement.

Learners will competently carry out routine husbandry activities with boars, sows, gilts and piglets, demonstrating sound understanding of the practices used to care for the animals and making relevant connections between good husbandry and healthy pigs. They will demonstrate a clear understanding of the importance of animal welfare and the need to maintain it as part of normal operation. Learners will show understanding that recognising and dealing with ill health in livestock is part of routine husbandry and will demonstrate this when carrying out some of their activities, but there may be some minor omissions. They will recognise the common signs of ill health in pigs and show some knowledge of how to treat common diseases and disorders. Learners will reflect on the approaches they used, making clear connections to their impact on the good health and hygiene of livestock, with mainly relevant recommendations for improvement.

Learners' evidence will use specific, appropriate technical terminology.

For pass standard, learners will demonstrate the practical skills required to care for a production herd and individual animals during pre-farrowing and farrowing safely and competently. They will carry out the practical tasks appropriately, showing little initiative within the limits of their responsibility.

Learners will work safely, with a realistic, limited awareness of the risks and potential issues arising when carrying out routine feeding and husbandry in a pig production system. They will use the appropriate equipment and leave the area clean and tidy on completion. Learners will show a realistic awareness of the importance of complying with biosecurity policies and procedures. They will recall knowledge of most activities that are affected by biosecurity and outline actions to prevent non-compliance. Learners will show an awareness of the need to keep appropriate records, providing the key information.

Learners will carry out feeding and diet management safely and competently, demonstrating a realistic, limited awareness of the importance of minimising wastage of resources. They will show basic understanding of the significance of the role of feeding and diet management in the production cycle. Learners will recall basic knowledge to explain the nutritional requirements, feeding practices and common nutritional problems (causes, treatments and prevention) for a pig production system.

Learners will carry out routine husbandry activities with boars, sows, gilts and piglets, demonstrating some relevant understanding of the practices used to care for the animals. They will carry out routine care and identify tasks to be completed in a generally appropriate order. Learners will make basic, realistic links between good husbandry and healthy pigs. They will show an appropriate awareness of how to maintain the welfare of animals as part of normal operation and the need to maintain it at all times. Learners will show a realistic awareness that recognising and dealing with ill health in livestock is part of routine husbandry, demonstrating this when carrying out some of their activities, but this will be limited. They will identify the common signs of ill health in pigs and show limited knowledge of how to treat common diseases and disorders. Learners will demonstrate a realistic but undeveloped understanding of how the approaches they used link to the good health and hygiene of livestock.

Learners' evidence will use some relevant terminology but there may be omissions.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 2: Plant and Soil Science
- Unit 4: Work Experience in the Land-based Sectors
- Unit 7: Farm Livestock Husbandry
- Unit 9: Managing Environmental Activities in Agriculture
- Unit 11: Livestock Health and Diseases
- Unit 22: Livestock Nutrition.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 19: Sheep Production

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners will develop the skills and knowledge needed to carry out feeding and husbandry practices to raise sheep successfully in sheep production systems.

Unit introduction

Sheep production takes place in most regions of the UK using many different breeds. Sheep farming takes place under extensive systems in the uplands and plays an important role in managing the environment and supporting the rural economy. In lowland areas, sheep are farmed more intensively, producing finished lamb for the market and breeding stock. Successful sheep producers have a thorough understanding of the factors affecting both the domestic sheep industry and the global market, developing and adapting their husbandry skills in an environment where the market price for sheep products is constantly changing.

In this unit, you will investigate different sheep production systems for hill, upland and lowland sheep, the regulations governing the transportation of livestock, and the need to record medicine usage and all tasks and treatments carried out. You will carry out routine feeding and husbandry tasks throughout the production cycle as part of the management of breeding lambs and newborn lambs, including making up a flock and preparations for tugging, and managing a flock through to lambing. You will find out how production affects animal welfare and develop skills in meeting the nutritional requirements of sheep at different stages in the production cycle, including feed ingredients and ration formulation. You will develop a clear understanding of the legal, economic and environmental factors that contribute to decision making in sheep production. This will allow you to make informed decision in relation to future sheep production.

This unit will help you to progress to employment in the sector at peak times of the year, such as in the lambing seasons, and to higher education courses in agriculture, agricultural business or animal science.

Learning aims

In this unit you will:

- A** Investigate sheep production systems used in the UK
- B** Carry out diet management and feeding practices during the production cycle to maintain health and production targets
- C** Carry out routine husbandry of sheep during the production cycle to meet current welfare and husbandry standards.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate sheep production systems used in the UK	A1 Sheep production systems A2 Preparation for breeding A3 Selecting animals for market and the role of performance indicators	A report on a selected sheep production system and the production cycle.
B Carry out diet management and feeding practices during the production cycle to maintain health and production targets	B1 Nutritional requirements B2 Diet management and feeding practices B3 Grazing B4 Nutritional problems	A portfolio of evidence, to include: <ul style="list-style-type: none"> • planning documents • evidence of carrying out routine sheep feeding and husbandry tasks to meet current standards and health and production targets.
C Carry out routine husbandry of sheep during the production cycle to meet current welfare and husbandry standards	C1 Routine husbandry C2 Preparations for pre-lambing and lambing C3 Care of the newborn lamb	

Content

Learning aim A: Investigate sheep production systems used in the UK

A1 Sheep production systems

Common production systems in the UK and associated considerations and processes for each.

- Current conditions in the sheep industry, including current sheep numbers and range of sheep products, current rearing in the UK, current consumer trends in the UK and globally.
- Sheep production systems:
 - stratification of the sheep industry in the UK, including hill, upland and lowland
 - extensive production systems.
- Factors affecting choice of production system, including financial, economic, marketing, availability of services, current farming practices, environmental factors and current legislative requirements.
- Liveweight and deadweight selling.
- Carcass classification and grading, e.g. for use in processed products.
- Sheep breeds, hybrids, genotype and genetics and their suitability in different production systems.
- Suitability of a field for sheep, including fencing, grazing availability and access.
- Biosecurity measures in sheep production, including disinfectant foot dips, lorry wheel wash.
- Environmental impact and pollution control.
- Other factors associated with biosecurity measures, including health and safety, biosecurity levels, movement and transport of sheep, pest and vermin control, feeding, water and bedding, people, equipment.
- Legislation and welfare standards in key aspects of sheep production including:
 - culling
 - husbandry
 - sustainability
 - transport.
- Welfare requirements associated with:
 - castration
 - tail docking
 - mulesing
 - lambing stress on ewes
 - environmental stresses and transportation.

A2 Preparation for breeding

Suitable selection of animals to meet production aims and welfare standards.

- Selection of suitable stock for breeding in line with breeding policy:
 - breeding stock selection of rams and ewes
 - interpretation of secondary breeding data
 - use of selection programmes in flock improvement
 - breed comparisons for use in different production systems
 - hill, upland and lowland breeds and the environmental adaptations.
- Preparation for breeding in line with breeding policy, including:
 - assessment and evaluation of the ram and ewe
 - health checking of flock and individual animals
 - body condition scoring
 - behavioural assessment of flock and individual animals
 - identification of ovulation, including oestrus cycle and role of hormones, heat observation, optimum time for service

- pregnancy diagnosis, including visual methods, use of technology
- andrology and sperm analysis, principles and application
- complying with health and safety and welfare requirements during preparation for breeding.

A3 Selecting animals for market and the role of performance indicators

- Selection of stock for sale, including:
 - assessment of animals, including grading of finished animals, weight and body condition scores
 - saleability factors, including fat coverage
 - selection factors and preparation of animals for market or slaughter
 - current, relevant regulations, including those governing the transport of livestock, completion of movement records, health and safety, animal welfare.
- Performance indicators, including calculation of relevant performance indicators (lambing percentage, lamb mortality, financial indicators).

Learning aim B: Carry out diet management and feeding practices during the production cycle to maintain health and production targets

B1 Nutritional requirements

- Nutritional requirements of the flock at the various stages of the production cycle, including pre-tupping, tupping, mid and late pregnancy, lambing, lactation.
- Nutritional requirements of newborn lambs through to finishing.
- Types of feed, including forages, concentrates and supplemental feeding of root crops.
- Weaning to breeding of ewes for increased twinning rates, including daily gains, rate of gain.
- Rations for pregnant ewes up to six weeks before lambing and for finisher lambs to meet target growth rates.

B2 Diet management and feeding practices

- Types of feeding and watering equipment, including nipple feeder, bottles, creep feeders, hay feeding devices, water delivery systems.
- Cleaning and maintenance of feeding and watering equipment.
- Feeding lambs on milk replacers.
- Assessment of basic forage quality for suitability as feed, using standard criteria.
- Diet plans for individuals and flock.
- Recording systems, including feed boards, databases and online recording systems.
- Facilities for feed storage to maintain quality.
- Weight gain and maintenance at each life stage.

B3 Grazing

- Assessment of grazing suitability for sheep, including continuous and rotational systems.
- Grazing preferences in sheep and impact on species diversity.
- Differences in grazing habits of hill, upland and lowland sheep.

B4 Nutritional problems

- Possible signs of a nutritional problem, including poor appetite, reduced growth and lethargy.
- Common nutritional health issues, including specific nutrient deficiencies, excesses, parasitism and disorders.
- Causes, treatment and prevention of nutritional problems.

Learning aim C: Carry out routine husbandry of sheep during the production cycle to meet current welfare and husbandry standards

C1 Routine husbandry

Routine husbandry to maintain a healthy flock and ensure high levels of animal welfare.

- Routine husbandry:
 - feeding and watering
 - routine health and welfare checks and audits, including:
 - checking and trimming feet, including hoof structure
 - treating lameness, including foot dips, medicated sprays and internal treatments
 - dagging ewes and lambs
 - ear tagging ewes or lambs
 - vaccinating sheep
 - maintenance of housing, including cleaning out, bedding down
 - unit hygiene, including cleanliness, tidiness, appropriate disinfectant use
 - specific signs of normal and abnormal health, including health checking, actions to prevent decline of health status and when to seek veterinary assistance
 - role of veterinary medicines in treating and controlling disease
 - the need for responsible use of veterinary medicines under the regulations set out by the Veterinary Medicines Directorate (VMD), including measures to prevent or control exposure, reading the label and data sheets, engineered controls, competence and training requirements
 - record keeping, including veterinary medicines book, record of births and deaths and husbandry records
 - isolation of replacement stock
 - government requirements for movement documentation and standstill
 - health and safety and risk assessments, use of personal protective equipment (PPE).

C2 Preparations for pre-lambing and lambing

Preparations for pre-lambing and lambing, including:

- feeding programme planning, including planned weight gains and quantities
- feeding methods for a flock of in-lamb ewes
- methods of preventing abortion and dealing with aborting ewes
- identifying ewes that need assistance
- identifying and preventing metabolic problems in ewes
- scanning and marking
- assessment of animal health and welfare, including indicators of good and bad health.

C3 Care of the newborn lamb

Maintaining high levels of animal welfare in accordance with legislative requirements and best practice.

- Care of the newborn lamb to ensure high welfare and maximise survival:
 - importance of adequate colostrum
 - navel treatments to prevent infection
 - use of probiotics and prebiotics in newborns
 - tail docking, including correct procedure, elastrator and reasons for not docking
 - methods of non-surgical castration of lambs
 - feeding lambs using a stomach tube to improve survival
 - taking the temperature of lambs correctly
 - fostering lambs and techniques for dealing with rejection by the ewe.

- Common problems, treatments and prevention, including lethargy, unwillingness to search for the teat and suck, profuse salivation, increasing abdominal distension and retained meconium (watery mouth), rejection of the lamb by the ewe, hypothermia and umbilical infection.
- Disease prevention in lambs during the first few weeks of life, including good hygiene practices across the farm.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate sheep production systems used in the UK		A.D1 Demonstrate proficient selection of animals for market and end of use, evaluating the impact of a sheep production system and accurate selection on overall production outcomes.
<p>A.P1 Explain a production system for sheep in the UK.</p> <p>A.P2 Demonstrate competent selection of animals for different markets and end of use, using performance indicators.</p>	<p>A.M1 Analyse the impact of a sheep production system and accurate selection on overall performance and production outcomes.</p> <p>A.M2 Demonstrate effective selection of animals for different markets and end of use.</p>	
Learning aim B: Carry out diet management and feeding practices during the production cycle to maintain health and production targets		B.D2 Demonstrate, with a high degree of accuracy, diet and grazing management of sheep to maintain health and production targets, evaluating the impact of nutrition and diet and grazing management tasks.
<p>B.P3 Explain the importance of diet management and feeding practices throughout the sheep production cycle.</p> <p>B.P4 Demonstrate competent diet and grazing management of sheep to maintain health and production targets.</p>	<p>B.M3 Analyse the impact that nutrition, diet and feeding management have on health and production targets.</p> <p>B.M4 Demonstrate efficient diet and grazing management of sheep to maintain health and production targets.</p>	
Learning aim C: Carry out routine husbandry of sheep during the production cycle to meet current welfare and husbandry standards		C.D3 Demonstrate, with a high degree of accuracy, routine husbandry of sheep to maintain health and production objectives and meet requirements during pre-lambing and lambing.
<p>C.P5 Demonstrate competent routine husbandry of sheep to meet health and production targets.</p> <p>C.P6 Carry out competent routine husbandry required for pre-lambing and lambing.</p>	<p>C.M5 Demonstrate efficient routine husbandry of sheep to maintain health and production targets and meet requirements during pre-lambing and lambing.</p>	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.M2, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M3, B.M4, C.M5, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- commercial sheep production farms
- relevant husbandry equipment
- sheep at the centre
- markets/abattoirs to visit.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will give an in-depth review of one common sheep production system with specific breeds, thoroughly considering breed suitability and how accurate selection for at least three different markets, such as breeding stock, fat lambs and store lambs, affects overall production outcomes. They will make comprehensive, accurate connections between key factors within the production system and the requirements to select the most suitable breed to meet production targets. Learners will comprehensively review secondary information on the selected production method, with a robust evaluation of the advantages and disadvantages, and logical justifications regarding the most suitable breeds. They will show depth of understanding to correctly identify those animals ready for market and end of use, giving valid, well-reasoned justifications for their views. Learners will show breadth and depth of understanding of performance indicators as a measure of success and the implications for health and welfare, using specific terminology appropriately throughout. Learners will consistently recommend relevant, insightful strategies to improve animal welfare in the production cycle.

For merit standard, learners will make relevant, analytical judgements on one sheep production system, breed suitability and their impact on managing the suitability and saleability of sheep, and on overall production outcomes. They will make mainly relevant connections between the different aspects of the production system and the requirements to select the most suitable breed to meet production targets. Learners will provide a clear review of secondary information on the selected production method, with a clear analysis of the advantages and disadvantages, and giving mostly relevant justifications for their choice of the most suitable breeds. They will show breadth and some depth of understanding when identifying those animals ready for market and end of use, giving mostly valid justifications for their views. Learners will show breadth and some depth of knowledge and understanding of performance indicators as a measure of success and the implications for health and welfare. The evidence will use specific, accurate terminology. Learners will, at all times, show relevant and realistic consideration of animal welfare in the production cycle, making mostly relevant recommendations for improvements.

For pass standard, learners will give a limited, realistic account of one sheep production system and the most obvious factors that affect the selection of sheep for market. They will show a basic understanding of how correct selection affects overall production targets, making basic connections between the key factors within the production systems and the requirements for selecting the most suitable breed to meet production targets. Learners will use some secondary information on the chosen production method to identify some relevant advantages and disadvantages, giving basic explanations for their choice of the most suitable breeds. They will recall knowledge to identify those animals ready for market and end of use but will not provide justifications for their views. Learners will show limited breadth and depth of understanding of performance indicators as a measure of success and the implications for health and welfare, using some relevant terminology. Learners will, at all times, consider animal welfare in the production cycle, identifying basic changes that could be made.

Learning aims B and C

In order to achieve learning aims B and C, learners must demonstrate the required knowledge and skills within the context of a chosen sheep production system. Teachers should ensure that the sheep production system selected by learners provides sufficient scope for them to fully complete the assessments.

For distinction standard, learners will demonstrate the practical skills required to care for a production flock to a standard that reflects best practice in the workplace. They will carry out all the practical tasks confidently, showing a high degree of initiative within the limits of their responsibility.

Learners will evidence insightful strategies used to minimise risks, demonstrating proficient safe working practices throughout. They will select the correct equipment, using it safely and accurately. They will ensure that animal welfare is maintained effectively and disruption to the animals is minimised. Learners will demonstrate proficiency in complying with biosecurity policies and procedures. They will show depth of understanding of the activities affected by biosecurity, how to take action to prevent non-compliance, and the consequences of biosecurity breaches. They will keep detailed and accurate records as appropriate to the tasks being carried out.

Learners will carry out feeding and diet management with a high degree of accuracy, ensuring the required foodstuffs are available and prepared, and informing others if there are problems. They will demonstrate depth of understanding of the importance of diet management within a sheep production system through a detailed review of feeding and diet plans and the need for grazing management for the flock at different life stages, with well-reasoned recommendations for improvement.

Learners will carry out routine husbandry activities with the flock, from carrying out preparations required for pre-lambing and lambing in a production system through to caring for young stock. They will demonstrate a robust understanding of the practices used to care for the animals. Learners will make convincing connections between good husbandry and healthy sheep. They will show in-depth understanding of the importance of animal welfare and the need to review and maintain it as part of normal operation. They will show clear understanding that recognising and dealing with ill health in livestock is part of routine husbandry and will demonstrate this when carrying out their activities. Learners will recognise the common signs of ill health in sheep, showing accurate knowledge of how to treat common diseases and disorders. They will review their approaches to carrying out routine husbandry activities and feeding and diet management in terms of their effectiveness in maintaining good health and hygiene of livestock. Learners will explore thoroughly where they were successful and where approaches could be improved or carried out differently.

Learners' evidence will use specific, accurate terminology throughout.

For merit standard, learners will demonstrate the practical skills required to care efficiently and safely for a production flock. They will carry out the practical tasks competently and show some initiative within the limits of their responsibility. Learners will show efficient use of time and resources, and meet the key requirements for animal welfare. They will assess the risks and hazards, using the required equipment safely and competently. Learners will demonstrate competency in complying with biosecurity policies and procedures. They will show clear understanding of most activities that are affected by biosecurity and how to take action to prevent non-compliance. Learners will keep records, as appropriate to the tasks and with sufficient detail, so it is clear what has been carried out.

Learners will carry out feeding and diet management correctly, making efficient use of resources, and with some preparation of foodstuffs. They will show a clear understanding of the importance of diet management within a sheep production system through providing details of feeding and diet plans and the need for grazing management for the flock at different life stages, making mostly valid recommendations for improvement.

Learners will competently carry out routine husbandry activities with the flock, from carrying out preparations required for pre-lambing and lambing in a production system through to caring for young stock. They will demonstrate sound understanding of the practices used to care for the animals and make relevant connections between good husbandry and healthy sheep. Learners will demonstrate a clear understanding of the importance of animal welfare and the need to maintain it as part of normal operation. They will understand that recognising and dealing with ill health in livestock is part of routine husbandry and will demonstrate this when carrying out some of their activities, but there may be some minor omissions. Learners will recognise the common signs of ill health in sheep and show some knowledge of how to treat common diseases and disorders. Learners will reflect on the approaches they used, making clear connections to their impact on the good health and hygiene of livestock, with mainly relevant recommendations for improvement. Learners will use specific, appropriate technical terminology.

For pass standard, learners will demonstrate the practical skills required to care for a production flock safely and competently. They will carry out the practical tasks appropriately, showing little initiative within the limits of their responsibility.

Learners will work safely, with a realistic but limited awareness of the risks and potential issues arising when carrying out routine feeding and husbandry in a sheep production system. They will use the appropriate equipment and leave the area clean and tidy on completion. Learners will show a realistic awareness of the importance of complying with biosecurity policies and procedures. They will recall knowledge of most activities that are affected by biosecurity and outline actions to prevent non-compliance. Learners will show an awareness of the need to keep appropriate records, providing the key information.

Learners will carry out feeding and diet management safely and competently, demonstrating a realistic, limited awareness of the need to ensure minimal wastage of resources. They will show basic understanding of the significance of the role of feeding and diet management in the production cycle. Learners will recall basic knowledge to explain the nutritional requirements, feeding practices and grazing management for the flock at different life stages for a sheep production system.

Learners will carry out routine husbandry activities, from basic preparations required for pre-lambing and lambing in a production system through to caring for young stock. They will demonstrate some relevant understanding of the practices used to care for the animals. Learners will carry out routine care, with some supervision, and identify tasks to be completed in a generally appropriate order. They will make basic, realistic links between good husbandry and healthy sheep. Learners will show an appropriate awareness of the importance of animal welfare as part of normal operation and the need to maintain it at all times. They will show a realistic awareness that recognising and dealing with ill health in livestock is part of routine husbandry, demonstrating this when carrying out some of their activities, but this will be limited. Learners will identify the common signs of ill health in sheep and show limited knowledge of how to treat common diseases and disorders. Learners will demonstrate a realistic but undeveloped understanding of how the approaches they used link to the good health and hygiene of livestock.

Learners' evidence will use relevant terminology but there may be omissions.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 2: Plant and Soil Science
- Unit 4: Work Experience in the Land-based Sectors
- Unit 7: Farm Livestock Husbandry
- Unit 9: Managing Environmental Activities in Agriculture
- Unit 11: Livestock Health and Diseases
- Unit 22: Livestock Nutrition.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 20: Beef Production

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners develop the skills and knowledge needed to carry out feeding and husbandry practices to raise cattle successfully in beef production systems.

Unit introduction

The beef industry in the UK derives its product from both the suckler herds and the dairy herds, all bred in specific production systems. Most beef systems usually require a significant amount of working capital and, therefore, attention to all management aspects is a prerequisite for generation of profits. Successful beef producers have a thorough understanding of the factors affecting both the domestic beef industry and the global market, developing and adapting their husbandry skills in an environment where the market price for beef products is constantly changing.

In this unit, you will investigate the types of production system used across the UK, and the process of breeding and rearing animals for beef and associated products. You will explore the different breeds and their production characteristics, and the importance of selecting suitable breeds. You will carry out routine feeding and husbandry tasks throughout the production cycle as part of the management of calves and adult animals. You will find out how production affects animal welfare and develop skills in meeting the nutritional requirements of cattle at different stages in the production cycle, including feed ingredients and ration formulation. You will develop a clear understanding of the legal, economic and environmental factors, health and safety and welfare legislation that contribute to decision making in beef production. This will allow you to make informed decisions in relation to future beef production.

This unit will help you to progress to employment in small- or large-scale beef production units and to general farm work, or to higher education courses in areas such as animal science, agriculture or agricultural business.

Learning aims

In this unit you will:

- A** Investigate beef production systems used in the UK
- B** Carry out diet management and feeding practices during the production cycle to maintain health and production targets
- C** Carry out routine husbandry of cattle during the production cycle to meet current welfare and husbandry standards.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate beef production systems used in the UK	A1 Beef production systems A2 Preparation for breeding A3 Selecting animals for sale, end of use and the role of performance indicators	A report on a selected beef production system and the production cycle.
B Carry out diet management and feeding practices during the production cycle to maintain health and production targets	B1 Nutritional requirements B2 Diet management and feeding practices B3 Grazing B4 Nutritional problems	A portfolio of evidence, to include: <ul style="list-style-type: none"> • planning documents • evidence of carrying out routine beef cattle feeding and husbandry tasks to meet current standards and health and production targets.
C Carry out routine husbandry of cattle during the production cycle to meet current welfare and husbandry standards	C1 Routine husbandry C2 Care of calves	

Content

Learning aim A: Investigate beef production systems used in the UK

A1 Beef production systems

Common production systems in the UK and associated considerations and processes for each.

- Current conditions in the beef industry, including current beef cattle numbers and range of beef products, current rearing in the UK, current consumer trends in the UK and globally.
- Beef production systems:
 - intensive, including cereal beef
 - semi-intensive, including silage beef, 18–24 month, store systems
 - extensive, including suckler beef.
- Targets for systems, including growth rates, daily liveweight gain (DLWG), finishing weight, food conversion.
- Factors affecting choice of production system, including financial, economic, marketing, availability of services, current farming practices, environmental factors, current legislative requirements and market requirements.
- Liveweight and deadweight selling.
- Carcass classification and grading, e.g. for use in processed products.
- Beef breeds and characteristics:
 - native and continental breeds
 - beef terminology, including entire, steer, store, conformation, hybrid, polled, killing-out percentage (KO%)%, marbling
 - early and late maturity
 - characteristics of growth, including effect of sex
 - meat cuts in the animal.
- Biosecurity measures in beef production, including disinfectant foot dips, lorry wheel wash.
- Environmental impact and pollution control.
- Other factors associated with biosecurity measures, including health and safety, biosecurity levels, movement and transport of cattle, pest and vermin control, feeding, water and bedding, people, equipment, tuberculosis, notifiable diseases, e.g. foot and mouth.
- Legislation and welfare standards in key aspects of beef production, including:
 - housing and handling systems
 - culling
 - husbandry
 - sustainability.
- Welfare requirements associated with:
 - fully-slatted floors
 - lighting and ventilation
 - space
 - poor hygiene
 - nutrition
 - lack of pain management
 - physiological and psychological stress
 - health problems associated with beef systems.

A2 Preparation for breeding

- Suitable selection of animals to meet production aims and welfare standards.
- Selection of suitable stock for breeding in line with breeding policy:
 - breeding stock selection of bulls and cows, including scrotal circumference and use of Estimated Breeding Values (EBVs)
 - interpretation of breeding data
 - use of selection programmes in herd improvement.
- Use of reproductive technologies, including artificial insemination, sexed semen.
- Preparation for breeding in line with breeding policy, including:
 - assessment and evaluation of the bull and cow
 - health checking of herd and individual animals
 - body condition scoring and mobility scoring of individual animals
 - behavioural assessment of individual animals
 - identification of ovulation, including oestrus cycle and role of hormones
 - pregnancy diagnosis, including visual methods, use of technology
 - andrology and sperm analysis, principles and application
 - pregnancy diagnosis, including heat detection
 - compact calving and artificial manipulation of the oestrus cycle
 - complying with health and safety and welfare requirements during preparation for breeding.

A3 Selecting animals for sale, end of use and the role of performance indicators

- Selection of stock for sale, including:
 - assessment of animals, including grading of finished animals, weight and body condition scores
 - saleability factors, including fat coverage
 - selection factors and preparation of animals for market or slaughter
 - current, relevant regulations, including those governing the transport of livestock, completion of movement records, health and safety, animal welfare.
- Performance indicators, including calculation of relevant performance indicators (calving percentage, mortality rates, financial indicators, productivity).

Learning aim B: Carry out diet management and feeding practices during the production cycle to maintain health and production targets**B1 Nutritional requirements**

- Nutritional requirements for breeding animals at the various stages of the production cycle, including pre-service, mid and late pregnancy, calving, lactation.
- Nutritional requirements of newborn calves through to finishing.
- Types of feed, including forages, concentrates and supplemental feeding of root crops.
- Formulate rations for pregnant cows and rations to meet target growth rates for calves.

B2 Diet management and feeding practices

- Feeding techniques, including restricted feeding, ad libitum, creep feeding.
- Types of feeding and watering equipment, including nipple feeder, bottles, creep feeders, racks, mangers, water delivery systems, mixer wagons.
- Cleaning and maintenance of feeding and watering equipment.
- Assessment of basic forage quality for suitability as feed.
- Recording systems, including feed boards, databases and online recording systems.
- Facilities for feed storage to maintain quality.
- Weight gain and maintenance at each life stage.

B3 Grazing

- Grazing, including methods, grass height, stocking rates, feed intake.
- Continuous and rotational grazing systems.
- Assessment and establishment of grazing systems to lower farm carbon footprint and improve herd health.
- Grazing and stocking rates:
 - checking fences, gates and frequently used tracks to grazing
 - maintenance of water troughs and ensuring adequate access for herd number
 - toxic weed management
 - inspection and assessment of grazing suitability.

B4 Nutritional problems

- Possible signs of a nutritional problem, including poor appetite, reduced growth and lethargy.
- Common nutritional health issues, including specific nutrient deficiencies, excesses, parasitism and disorders.
- Causes, treatment and prevention of nutritional problems.

Learning aim C: Carry out routine husbandry of cattle during the production cycle to meet current welfare and husbandry standards**C1 Routine husbandry**

Routine husbandry to maintain a healthy herd and ensure high levels of animal welfare.

- Routine husbandry:
 - treatments and prevention of disease, including external and internal parasite treatments (drench and dose), vaccinations, nutrition
 - feeding and watering procedures and routines
 - maintenance of housing, including cleaning out, bedding down, repairs
 - routine animal health and welfare checks
 - unit hygiene, including cleanliness, tidiness, disinfectant use
 - role of veterinary medicines in treating and controlling disease
 - responsible use of medicines under the regulations set out by the Veterinary Medicines Directorate (VMD), including measures to prevent or control exposure, reading the label and data sheets, engineered controls, competence and training requirements
 - specific signs of normal and abnormal health, including health checking, actions to prevent decline of health status and when to seek veterinary assistance
 - record keeping, including veterinary medicines book, record of births and deaths and husbandry records
 - isolation of replacement stock
 - government requirements for movement documentation and standstill
 - health and safety and risk assessments, use of personal protective equipment (PPE).
- Routine calf husbandry:
 - handling and restraint of calves, including handling, temperature
 - disbudding
 - removal of supernumerary teats
 - attaching ear tags
 - castration.
- Routine husbandry for adults:
 - handling and restraint of adults, including handling, temperature, halter, grooming, transport, inspection, marking and clipping
 - body condition scoring (BCS)
 - identifying lameness.

C2 Care of calves

Maintaining high levels of animal welfare in accordance with legislative requirements and best practice guidelines.

- Preparations for pre-calving and calving, e.g.:
 - feeding programme planning, including planned weight gains and quantities
 - feeding methods for a herd of in-calf cows
 - methods of preventing abortion and dealing with aborting cows
 - identifying cows that need assistance, including dystocia, oversized calf and incorrect presentations
 - importance of the calf–cow bond
 - identifying and preventing metabolic problems in cows
 - scanning and marking
 - assessment of animal health and welfare, including indicators of good and bad health.
- Care of the newborn calf or young stock to ensure high welfare and maximise survival:
 - importance of adequate colostrum and colostrum quality, including use of hygrometers
 - navel treatments
 - use of probiotics and prebiotics
 - feeding calves using a stomach tube
 - common problems, treatments and prevention, including lethargy, scouring, dehydration, acidosis and pneumonia
 - disease prevention in calves during the first few months of life
 - taking the temperature of calves correctly
 - artificial rearing of rejected calves.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate beef production systems used in the UK		A.D1 Demonstrate proficient selection of animals for market and end of use, evaluating the impact of a beef cattle production system and accurate selection on overall production outcomes.
<p>A.P1 Explain a production system for beef cattle in the UK.</p> <p>A.P2 Demonstrate competent selection of animals for market and end of use, using performance indicators.</p>	<p>A.M1 Analyse the impact of a beef cattle production system and accurate selection of stock on overall performance and production outcomes.</p> <p>A.M2 Demonstrate effective selection of animals for market and end of use.</p>	
Learning aim B: Carry out diet management and feeding practices during the production cycle to maintain health and production targets		B.D2 Demonstrate, with a high degree of accuracy, the feeding and grazing management of beef cattle to maintain health and production targets, evaluating the impact of nutrition and feeding and diet management tasks.
<p>B.P3 Explain the importance of diet management and feeding practices throughout the beef production cycle.</p> <p>B.P4 Demonstrate competent diet and grazing management of beef cattle to maintain health and production targets.</p>	<p>B.M3 Analyse the impact that nutrition, diet management and feeding have on health and production targets.</p> <p>B.M4 Demonstrate efficient diet and grazing management of beef cattle to maintain health and production targets.</p>	
Learning aim C: Carry out routine husbandry of cattle during the production cycle to meet current welfare and husbandry standards		C.D3 Demonstrate, with a high degree of accuracy, routine husbandry of beef cattle to maintain health and production objectives and meet requirements for care of young stock.
<p>C.P5 Demonstrate competent routine husbandry of beef cattle to meet health and production targets.</p> <p>C.P6 Demonstrate competent routine husbandry tasks required for care of young stock.</p>	<p>C.M5 Demonstrate efficient routine husbandry of beef cattle to maintain health and production targets and meet requirements for care of young stock.</p>	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.M2, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M3, B.M4, C.M5, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- commercial beef production units
- relevant husbandry equipment
- beef cattle at the centre
- markets/abattoirs to visit.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will provide an in-depth review of one beef production system with specific breeds, thoroughly considering breed suitability and how accurate selection of stock affects overall production outcomes. They will make comprehensive, accurate connections between key factors within the production system and the requirements to select the most suitable breed to meet production targets. Learners will comprehensively review secondary information on the selected production method, with a robust evaluation of the advantages and disadvantages, and logical justifications regarding the most suitable breeds. They will show depth of understanding to identify accurately those animals ready for market and end of use, giving valid, well-reasoned justifications for their views. Learners will show breadth and depth of knowledge and understanding of performance indicators as a measure of success and the implications for health and welfare, using specific technical language appropriately throughout. Learners will consistently recommend relevant, insightful strategies to improve animal welfare in the production cycle.

For merit standard, learners will make relevant, analytical judgements on one beef production system with specific breeds, breed suitability and their impact on managing the suitability and saleability of beef cattle, and on overall production outcomes. They will make mainly relevant connections between the different aspects of the production system and the requirements to select the most suitable breed to meet production targets. Learners will provide a clear review of secondary information on the selected production method, with a clear analysis of the advantages and disadvantages. They will show breadth and some depth of understanding when identifying those animals ready for market and end of use, giving mostly valid justifications for their views. Learners will show breadth and some depth of understanding of performance indicators as a measure of success and the implications on health and welfare. The evidence will use specific, accurate terminology. Learners will, at all times, show relevant and realistic consideration of animal welfare in the production cycle, making mostly relevant recommendations for improvements.

For pass standard, learners will give a limited, realistic account of one beef production system with specific breeds and breed suitability, and the most obvious factors that affect the selection of cattle for market. They will show a basic understanding of how correct selection affects overall production targets, making basic connections between the key factors within the production system and the requirements for selecting the most suitable breed to meet production targets. Learners will use some secondary information on the chosen production method to identify some relevant advantages and disadvantages, giving basic explanations for their choice of the most suitable breeds. They will recall knowledge to identify those animals ready for market and end of use, but will not provide justifications for their views. Learners will show limited breadth and depth of understanding of performance indicators as a measure of success and the implications for health and welfare, using some relevant terminology. Learners will, at all times, consider animal welfare in the production cycle, identifying basic changes that could be made.

Learning aims B and C

In order to achieve learning aims B and C, learners must demonstrate the required knowledge and skills within the context of a chosen beef production system. Teachers should ensure that the beef production system selected by learners provides sufficient scope for them to fully complete the assessments.

In achieving learning aims B and C, where learners present evidence of caring for young animals, 'young' is defined as being between newborn and nine months of age.

For distinction standard, learners will demonstrate the practical skills required to care for a production herd and individual adult and young animals to a standard that reflects best practice in the workplace. They will carry out all the practical tasks confidently, showing a high degree of initiative within the limits of their responsibility.

Learners will evidence insightful strategies to minimise risks, demonstrating proficient safe working practices throughout. They will select the correct equipment, using it safely and accurately. They will ensure that animal welfare is maintained effectively and disruption to the animals is minimised. Learners will demonstrate proficiency in complying with biosecurity policies and procedures. They will show depth of understanding of the activities affected by biosecurity, how to take action to prevent non-compliance, and the consequences of biosecurity breaches. Learners will keep detailed and accurate records as appropriate to the tasks being carried out.

Learners will carry out feeding and diet management with a high degree of accuracy, ensuring the required foodstuffs are available and prepared, and informing others if there are problems. They will show depth of understanding of the importance of diet management within a beef production system and its potential impact through a detailed review of nutritional requirements, feeding practices and common nutritional problems (causes, treatments and prevention), with well-reasoned recommendations for improvement.

Learners will carry out routine husbandry activities with relevant animals such as calves, cows, bulls, steers and heifers, demonstrating a robust understanding of the practices used to care for the animals. They will make convincing connections between good husbandry and healthy cattle. They will show in-depth understanding of the importance of animal welfare and the need to review and maintain it as part of normal operation. They will show clear understanding that recognising and dealing with ill health in livestock is part of routine husbandry, demonstrating this when carrying out their activities. Learners will recognise the common signs of ill health in cattle, showing accurate knowledge of how to treat common diseases and disorders. They will review their approaches to carrying out routine husbandry activities and feeding and diet management in terms of their effectiveness in maintaining good health and hygiene of livestock. Learners will explore thoroughly where they were successful and where approaches could be improved or carried out differently.

Learners' evidence will use specific, accurate terminology throughout.

For merit standard, learners will demonstrate the practical skills required to care efficiently and safely for a production herd and individual adult and young animals. They will carry out the practical tasks competently and show some initiative within the limits of their responsibility. Learners will show efficient use of time and resources, and meet the key requirements for animal welfare. They will assess the risks and hazards, using the required equipment safely and competently. Learners will demonstrate competency in complying with biosecurity policies and procedures. They will show clear understanding of most activities that are affected by biosecurity and how to take action to prevent non-compliance. Learners will keep records, as appropriate to the tasks and with sufficient detail, so it is clear what has been carried out.

Learners will carry out feeding and diet management correctly, making efficient use of resources, and with some preparation of foodstuffs. They will show clear understanding of the importance of diet management within a beef production system and its potential impact, through providing details of nutritional requirements, feeding practices and grazing management, making mostly valid recommendations for improvement.

Learners will competently carry out routine husbandry activities with relevant animals such as calves, cows, bulls, steers and heifers, demonstrating sound understanding of the practices used to care for the animals and making relevant connections between good husbandry and healthy cattle. They will demonstrate a clear understanding of the importance of animal welfare and the need to maintain it as part of normal operation. Learners will show understanding that recognising and dealing with ill health in livestock is part of routine husbandry, demonstrating this when carrying out some of their activities, but there may be some minor omissions. They will recognise the common signs of ill health in cattle and show some knowledge of how to treat common diseases and disorders. Learners will reflect on the approaches they used, making clear connections to their impact on the good health and hygiene of livestock, with mainly relevant recommendations for improvement.

Learners' evidence will use specific, appropriate technical terminology.

For pass standard, learners will demonstrate the practical skills required to care for a production herd and individual adults and young animals safely and competently. They will carry out the practical tasks appropriately, showing little initiative within the limits of their responsibility.

Learners will work safely, with a realistic, limited awareness of the risks and potential issues arising when carrying out routine feeding and husbandry in a beef production system. They will use the appropriate equipment and leave the area clean and tidy on completion. Learners will show a realistic awareness of the importance of complying with biosecurity policies and procedures. They will recall knowledge of most activities that are affected by biosecurity and outline actions to prevent non-compliance. Learners will show an awareness of the need to keep appropriate records, providing the key information.

Learners will carry out feeding and diet management safely and competently, demonstrating a realistic, limited awareness of the importance of minimising the wastage of resources. They will recall basic knowledge to explain the nutritional requirements, feeding practices and grazing management for a beef production system.

Learners will carry out routine husbandry activities with care of relevant animals such as calves, cows, bulls, steers and heifers, demonstrating some relevant understanding of the practices used to care for the animals. They will carry out basic routine care and identify tasks to be completed in a generally appropriate order. Learners will make basic, realistic links between good husbandry and healthy cattle. They will show an appropriate awareness of how to maintain the welfare of animals as part of normal operation and the need to maintain it at all times. Learners will show a realistic awareness that recognising and dealing with ill health in livestock is part of routine husbandry, demonstrating this when carrying out some of their activities, but this will be limited. They will identify the common signs of ill health in cattle and show limited knowledge of how to treat common diseases and disorders. Learners will demonstrate a realistic but undeveloped understanding of how the approaches they used link to the good health and hygiene of livestock. Learners' evidence will use some relevant terminology but there may be omissions.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 2: Plant and Soil Science
- Unit 4: Work Experience in the Land-based Sectors
- Unit 7: Farm Livestock Husbandry
- Unit 9: Managing Environmental Activities in Agriculture
- Unit 11: Livestock Health and Diseases
- Unit 22: Livestock Nutrition.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 21: Dairy Production

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners develop the knowledge and skills needed to carry out feeding and husbandry practices to raise dairy cows successfully in dairy production systems.

Unit introduction

The UK dairy industry is part of a significant food chain and stakeholders need to work together to overcome the environmental challenges of food production and sustainability. This unit focuses on the need to maintain a sustainable level of dairy production while considering at all times the need for high standards of care and welfare for the animals concerned.

In this unit, you will investigate different dairy production systems such as housed systems, the grass-based system, the extensively grazed system and the associated cow and calf accommodation. You will carry out routine feeding and husbandry tasks throughout the production cycle as part of the management of breeding cows and newborn calves. You will find out how production affects animal welfare and develop skills in meeting the nutritional requirements of cows at different stages in the production cycle, including feed ingredients and ration formulation. You will develop a clear understanding of the legal, economic and environmental factors that contribute to decision making in dairy production. This will allow you to make informed decisions in relation to future dairy production.

This unit will help you to progress to employment, working within dairy enterprises in roles such as stockperson or dairy operative, or to higher education courses in areas such as animal science, agriculture or agricultural business.

Learning aims

In this unit you will:

- A** Investigate dairy production systems and dairy cow welfare in the UK
- B** Carry out diet management and feeding practices during the production cycle to maintain health and production targets
- C** Carry out routine husbandry of dairy cows during the production cycle to meet current welfare and husbandry standards.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate dairy production systems and dairy cow welfare in the UK	A1 Dairy production systems A2 Dairy cow welfare A3 Dairy cow reproduction	A report on a selected dairy production system and the production cycle.
B Carry out diet management and feeding practices during the production cycle to maintain health and production targets	B1 Nutritional requirements B2 Diet management and feeding practices B3 Grazing B4 Nutritional problems	A portfolio of evidence, to include: <ul style="list-style-type: none"> • planning documents • evidence of carrying out routine dairy cow feeding and husbandry tasks safely to meet current standards and health and production targets.
C Carry out routine husbandry of dairy cows during the production cycle to meet current welfare and husbandry standards	C1 Milk hygiene C2 Routine husbandry C3 Health and disease	

Content

Learning aim A: Investigate dairy production systems and dairy cow welfare in the UK

A1 Dairy production systems

- Current conditions in the dairy industry, including current dairy cow numbers and range of products, current rearing in the UK, current consumer trends in the UK and globally.
- Dairy production systems:
 - housed systems, including zero-grazing system, cubicle and loose-housing systems
 - grass-based system
 - extensive grazed system.
- Factors affecting choice of production system, including financial, economic, marketing, availability of services, current farming practices, environmental factors, current legislative requirements and sustainable production techniques.
- Housing and rearing systems for calves, including buckets, group pens, automatic feeders, hutches, ventilation and draught, bedding, pen dimensions.
- Biosecurity measures in dairy production, including disinfectant foot dips, lorry wheel wash.
- Environmental impact and pollution control.
- Other factors associated with biosecurity, including health and safety, biosecurity levels, movement and transport of cows, pest and vermin control, feeding, water and bedding, people, equipment.
- Nitrate Vulnerable Zones (NVZs).

A2 Dairy cow welfare

- Factors affecting welfare, including housing, milk yield, culling of adults and bull calves, large-scale dairy farming, medicines/hormone usage, animal handling and on-farm milking/handling systems, nutrition and the five animal needs (RSPCA).
- Organisations involved in the welfare of dairy cows, including the Farm Animal Welfare Committee (FAWC), the Department for Environment, Food & Rural Affairs (Defra), animal welfare charities, industry bodies.
- Impact of milk production on the cow and calf, including physiological and psychological stress.
- Legal obligations, codes of practice and welfare improvement schemes.

A3 Dairy cow reproduction

- Oestrus and pregnancy:
 - oestrus cycle
 - heat detection, including signs, aids, frequency, relevance to calving interval and herd calving index
 - devices and techniques used to identify ovulation
 - use of artificial aids to conception, including heatmount detectors, hormonal injection, intra-vaginal devices
 - methods and techniques for pregnancy diagnosis.
- Reproductive technologies, including:
 - artificial insemination (AI)
 - hormone therapy
 - embryo transfer
 - sexed semen.
- Problems in rebreeding, including:
 - disease
 - timing of AI
 - body condition
 - deterioration of animal's welfare.

- Breeding records, including:
 - computer based
 - breeding boards
 - veterinary records.
- Select replacements:
 - breeding requirements, including linear assessment, bull selection
 - culling rate
 - numbers of heifers needed.

Learning aim B: Carry out diet management and feeding practices during the production cycle to maintain health and production targets

B1 Nutritional requirements

- Nutritional requirements of the herd at the various stages of the production cycle, including mid- and late pregnancy, calving, lactation, new borns.
- Types of feed, including forages, concentrates and supplemental feeding of root crops.
- Importance of energy, including energy levels in feeds, dry matter, metabolisable energy, energy levels in rations to match targets.
- Importance of protein, including crude protein, protein levels in rations.
- Dry cow and transition diets.

B2 Diet management and feeding practices

- Types of feeding and watering equipment, including automated equipment, hay feeders, creep feeders, feeding bins, trough feeders, water delivery systems.
- Cleaning and maintenance of feeding and watering equipment.
- Assessment of basic forage quality for suitability as feed.
- Maintenance of feeding hygiene practices.
- Storage and management of feeds, including reducing contamination and spoiling.
- Formulation of rations for each stage of the production cycle.
- Feeding behaviour of herds and individuals.
- Recording systems, including feed boards, databases and online recording systems.
- Facilities for feed storage to maintain quality.
- Weight gain and maintenance at each life stage.

B3 Grazing

- Assessment of grazing suitability, including methods, grass height, stocking rates, feed intake.
- Continuous and rotational grazing systems.
- Grazing systems to lower farm carbon footprint and improve herd health.

B4 Nutritional problems

- Possible signs of a nutritional problem, including poor appetite, reduced growth and lethargy.
- Common nutritional health issues, including specific nutrient deficiencies, excesses, parasitism and disorders.
- Causes, treatment and prevention of nutritional problems.

Learning aim C: Carry out routine husbandry of dairy cows during the production cycle to meet current welfare and husbandry standards

C1 Milk hygiene

- Clean milk production, including constituents of milk, the mammary gland, milk let-down and operator hygiene.
- Parlour preparation and milking routines, including machine milk cows, circulation cleaning, milking-machine maintenance.
- Current hygiene standards, including contamination by bacteria, faeces from soiled animals, foreign bodies, failure to detect abnormal milk, chemicals, metals and organics.
- Monitoring of milk hygiene, including Bactoscan, somatic cell count (SCC), antibiotics, taint and extraneous water.
- Mastitis and its control, including contagious and environmental pathogens, causes, treatment, prevention, five-point plans.

C2 Routine husbandry

- Routine husbandry:
 - feeding and watering
 - routine checks of health, disease diagnoses, heat detection
 - unit hygiene, including cleanliness, tidiness, disinfectant use
 - maintenance of housing, including cleaning out, bedding down
 - role of veterinary medicines in treating and controlling disease
 - the need for responsible use of veterinary medicines under the regulations set out by the Veterinary Medicines Directorate (VMD), including measures to prevent or control exposure, reading the label and data sheets, engineered controls, competence and training requirements
 - record keeping, including veterinary medicines book, record of births and deaths and husbandry records
 - isolation of replacement stock
 - government requirements for movement documentation and standstill
 - health and safety and risk assessments, use of personal protective equipment (PPE).
- Care of the calf, including:
 - calving, including preparation of calving area, signs, equipment, calf revival
 - rearing
 - colostrum and its importance
 - navel care to prevent infection
 - nutrition, including milk powder, whole milk, oesophageal groove, feed amounts, roughage, concentrates, water
 - weaning, including age, weight
 - specific calf-related tasks, handling and haltering, temperature, ear tags, including passports and legislation, disbudding, stomach tube, dehydration and electrolytes, vaccination.
- Care of the heifer, including:
 - rearing
 - lactation, including lactation curve and milk yields, drying off
 - home rearing
 - numbers required, including link to cow culling rate
 - growth targets
 - stocking rates
 - specific tasks, including handling, haltering.

C3 Health and disease

- Signs of normal and abnormal health, including health checking, actions to prevent decline of health status and when to seek veterinary assistance.
- Health and disease prevention in calves, including joint ill, pneumonia, scours, bloat, ringworm, brucellosis.
- Health and disease prevention in heifers, including Bovine Viral Diarrhoea (BVD), Infectious Bovine Rhinotracheitis (IBR), Rhino Syncytial Virus (RSV), Leptospirosis, internal and external parasites, Johne's, tuberculosis (TB); heat synchronisation.
- Metabolic diseases, including hypocalcaemia, hypomagnesaemia, acidosis and link to concentrate level.
- Foot problems, including treatment, foot trimming, prevention.
- Disposal of dead stock.
- Body condition scoring and foot and mobility scoring, including how these are indicators for welfare, husbandry standards and optimum performance.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate dairy production systems and dairy cow welfare in the UK		A.D1 Evaluate a dairy cow reproduction and production system and the implications for animal welfare and productivity.
A.P1 Explain reproduction in the dairy cow. A.P2 Explain a dairy production system and the impact on animal welfare and productivity.	A.M1 Analyse a dairy cow reproduction and production system and their impact on animal welfare and productivity.	
Learning aim B: Carry out diet management and feeding practices during the production cycle to maintain health and production targets		B.D2 Demonstrate, with a high degree of accuracy, diet management and feeding of dairy cows to maintain health and production targets, evaluating the impact of nutrition and own feeding and diet management tasks.
B.P3 Explain the importance of diet management and feeding practices throughout the dairy production cycle. B.P4 Demonstrate competent feeding and diet management of dairy cows to maintain health and production targets.	B.M2 Analyse the impact that nutrition, diet and feeding management have on health and production targets. B.M3 Demonstrate efficient feeding and diet management of dairy cows to maintain health and production targets.	
Learning aim C: Carry out routine husbandry of dairy cows during the production cycle to meet current welfare and husbandry standards		C.D3 Demonstrate, with a high degree of accuracy, routine husbandry practices to maintain health, production and milk hygiene targets, evaluating the impact of health and disease problems on production.
C.P5 Demonstrate competent routine husbandry practices in dairy production to meet health, production and milk hygiene targets. C.P6 Explain common health and disease problems in dairy cows and their relevance to dairy production.	C.M4 Demonstrate efficient routine husbandry practices in dairy production to maintain health, production and milk hygiene and targets. C.M5 Analyse common health and disease problems in dairy cows and the impact on production.	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M2, B.M3, C.M4, C.M5, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- a commercial dairy farm
- dairy cows at the centre
- relevant handling and restraining equipment
- a laboratory for milk microbiology assessment
- markets/abattoirs to visit.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will give an in-depth review of one dairy production system. They will make comprehensive, accurate connections between key factors within the production system and the requirements for maintaining productivity at desirable, realistic levels. Learners will comprehensively review secondary information on the selected production system, with robust evaluation of the advantages and disadvantages in relation to productivity. They will demonstrate in-depth understanding of dairy cow reproduction, including reproductive technologies and the associated breeding and rebreeding problems commonly encountered, making robust, detailed links to the cow's biological processes. Learners will demonstrate breadth and depth of understanding of the impact of the production system on dairy cow welfare and sustainable milk production, using specific terminology accurately throughout. Learners will consistently recommend relevant, insightful strategies to improve animal welfare in the production cycle.

For merit standard, learners will make relevant, analytical judgements on one dairy production system. They will make mainly relevant connections between the different aspects of the production system and the requirements for maintaining productivity at desirable, realistic levels. Learners will provide a clear review of secondary information on the selected production system, with a clear analysis of the advantages and disadvantages in relation to productivity. They will give mostly valid justifications for the use of the production system. Learners will demonstrate breadth of understanding of dairy cow reproduction, reproductive technologies and the associated breeding and rebreeding problems commonly encountered, making clear links to the cow's biological processes. Learners will demonstrate breadth and some depth of understanding of the impact of the production process on dairy cow welfare and sustainable milk production. The evidence will use specific, accurate terminology. Learners will, at all times, show relevant and realistic consideration of animal welfare in the production cycle, making mostly relevant recommendations for improvements.

For pass standard, learners will give a limited, realistic account of a dairy production system. They will make basic connections between the most obvious factors within the production system and the requirements for maintaining productivity at desirable, realistic levels. Learners will use some secondary information on the selected production method to identify the advantages and disadvantages, giving a basic explanation for their choice. They will show a basic understanding of dairy cow reproduction, including reproductive technologies and the associated breeding and rebreeding problems commonly encountered, making some relevant links to the cow's biological processes. Learners will show a realistic awareness of the impact of the production process on dairy cow welfare and sustainable milk production, but the evidence will be limited in scope or unbalanced in parts. Learners will use some relevant terminology. They will, at all times, consider how to improve animal welfare in the production cycle, identifying basic changes that could be made.

Learning aims B and C

In order to achieve learning aims B and C, learners must demonstrate the required knowledge and skills within the context of a chosen dairy production system. Teachers should ensure that the dairy production system selected by learners provides sufficient scope to ensure they can fully complete the assessments.

For distinction standard, learners will demonstrate the practical skills required to care for a production herd and individual animals to a standard that reflects best practice in the workplace. Learners will carry out all the practical tasks confidently, showing a high degree of initiative within the limits of their responsibility.

Learners will evidence insightful strategies to minimise risks, demonstrating proficient safe working practices throughout. They will select the correct equipment, using it safely and accurately. They will ensure that animal welfare is maintained effectively and disruption to the animals is minimised. Learners will demonstrate proficiency in complying with biosecurity policies and procedures. They will show depth of understanding of the activities affected by biosecurity, how to take action to prevent non-compliance, and the consequences of biosecurity breaches. Learners will keep detailed and accurate records as appropriate to the tasks being carried out.

Learners will carry out feeding and diet management with a high degree of accuracy, ensuring the required foodstuffs are available and prepared, and informing others if there are problems. They will show depth of understanding of the importance of diet management within a dairy production system through a detailed review of nutritional requirements, feeding practices and grazing management, with well-reasoned recommendations for improvement.

Learners will carry out routine husbandry activities with calves and heifers, demonstrating a robust understanding of the practices used to care for the animals. They will make convincing connections between good husbandry and healthy cows. Learners will show in-depth understanding of the importance of animal welfare and the need to review and maintain it as part of normal operation. They will demonstrate an in-depth understanding of common health and disease problems in dairy production and their impact on animal health, along with treatments and prevention strategies. Learners will review their approaches to carrying out routine husbandry activities, feeding and diet management in terms of their effectiveness in maintaining good health and hygiene of livestock. They will explore thoroughly where they were successful and where approaches could be improved or carried out differently.

Learners' evidence will use specific, accurate terminology throughout.

For merit standard, learners will demonstrate the practical skills required to care efficiently for a production herd and individual animals. They will carry out the practical tasks competently and show some initiative within the limits of their responsibility. Learners will show efficient use of time and resources, and meet the key requirements for animal welfare. They will assess the risks and hazards, using the required equipment safely and competently. Learners will demonstrate competency in complying with biosecurity policies and procedures. They will show clear understanding of most activities that are affected by biosecurity and how to take action to prevent non-compliance. Learners will keep records, as appropriate to the tasks and with sufficient detail, so it is clear what has been carried out.

Learners will carry out feeding and diet management correctly, making efficient use of resources, and with some preparation of foodstuffs. They will show a clear understanding of the importance of diet management within a dairy production system through providing details of nutritional requirements, feeding practices and grazing management, making mostly valid recommendations for improvement.

Learners will competently carry out routine husbandry activities with calves and heifers, demonstrating a clear understanding of the practices used to care for the animals and maintain milk hygiene and making relevant connections between good husbandry and healthy cows. They will demonstrate a clear understanding of the importance of animal welfare and the need to maintain it as part of normal operation.

Through their evidence, learners will show an understanding of common health and disease problems in dairy production along with some understanding of treatments and prevention strategies. They will demonstrate a clear understanding of how health and disease problems impact on production and provide mostly relevant reasons for their views. Learners will reflect on the approaches they used and make clear connections to their impact on the good health and hygiene of livestock, with mainly relevant recommendations for improvement.

Learners' evidence will use specific, appropriate technical terminology.

For pass standard, learners will demonstrate the practical skills required to care for a production herd and individual animals safely and competently. They will carry out the practical tasks appropriately, showing little initiative within the limits of their responsibility.

Learners will work safely, with a realistic, limited awareness of the risks and potential issues arising when carrying out routine feeding and husbandry in a dairy production system. They will use the appropriate equipment and leave the area clean and tidy on completion. Learners will show a realistic awareness of the importance of complying with biosecurity policies and procedures. They will recall knowledge of most activities that are affected by biosecurity and outline actions to prevent non-compliance. Learners will show an awareness of the need to keep appropriate records, providing the key information.

Learners will carry out feeding and diet management safely and competently, demonstrating a realistic, limited awareness of the need to ensure minimal wastage of resources. They will show basic understanding of the significance of the role of feeding and diet management in the production cycle. Learners will recall basic knowledge to explain the nutritional requirements, feeding practices and grazing management for a dairy production system.

Learners will carry out routine husbandry activities with calves and heifers, demonstrating some relevant understanding of the practices used to care for the animals and maintain milk hygiene. They will carry out basic routine care, making realistic links between good husbandry and healthy cows. Learners will show an appropriate awareness of how to maintain the welfare of animals as part of normal operation and the need to maintain it at all times.

Learners will show some breadth of understanding of common health and disease problems in dairy production, along with a limited understanding of treatments and prevention strategies. They will show realistic, limited understanding of the most obvious ways in which common health and disease problems affect dairy production, giving some relevant reasons or examples of these implications. Learners will show a realistic awareness that recognising and dealing with ill health in livestock is part of routine husbandry, demonstrating this when carrying out some of their activities, but this will be limited. Learners will demonstrate a realistic but undeveloped understanding of how the approaches they used link to the good health and hygiene of livestock. Learners' evidence will use some relevant terminology but there may be omissions.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 2: Plant and Soil Science
- Unit 4: Work Experience in the Land-based Sectors
- Unit 7: Farm Livestock Husbandry
- Unit 9: Managing Environmental Activities in Agriculture
- Unit 11: Livestock Health and Diseases
- Unit 22: Livestock Nutrition.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 22: Livestock Nutrition

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners study the essential biological molecules and practical management of livestock nutrition.

Unit introduction

An understanding of animal nutrition is a fundamental part of livestock husbandry. A balanced diet is vital to the maintenance of animal health, welfare and production in farm livestock species. Understanding the function of each feed component allows you to give livestock appropriate feeds in the correct quantities for their species, breed, production level and age.

In this unit, you will learn how biological molecules are taken in, broken down and used by the animal. You will develop the skills needed to assess the nutritional value of feedstuffs and formulate the correct diet for maximum wellbeing and production of the livestock species in your care.

This unit will prepare you for work in an introductory role preparing feeds and rations for livestock species in a farming enterprise. It will also help you progress to a higher education course in the field of agricultural science.

Learning aims

In this unit you will:

- A** Investigate the structure of biological molecules and their significance in livestock nutrition
- B** Examine the digestive systems of livestock species to allow appropriate nutrition
- C** Plan livestock diets to meet nutritional requirements.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate the structure of biological molecules and their significance in livestock nutrition	A1 Standard representation of biological molecules A2 Biochemical concepts A3 Macronutrients A4 Micronutrients	A portfolio of evidence, including: <ul style="list-style-type: none"> • a report on the nutritional requirements of livestock species in relation to the nutritional importance of biological molecules.
B Examine the digestive systems of livestock species to allow appropriate nutrition	B1 Digestive systems B2 Feeding issues	
C Plan livestock diets to meet nutritional requirements	C1 Nutrient analysis of feeds C2 Practical considerations for feeding livestock	A portfolio of evidence, including: <ul style="list-style-type: none"> • analytical reports on the nutritional labelling of foodstuffs • fully annotated diet plans to highlight the importance of biological molecules in the diet • assessments of dietary plans, taking into account deficiencies, excesses and toxicities.

Content

Learning aim A: Investigate the structure of biological molecules and their significance in livestock nutrition

A1 Standard representation of biological molecules

Written and drawn representations of biological molecules:

- formulae and projections of common nutritional compounds
- common functional groups, to include -COOH , -OH and the use of R to represent groups of atoms in molecules.

A2 Biochemical concepts

Considerations of the components of food and their contribution to the biochemical makeup of animals.

- Proportions of biological molecules in different animals.
- Differences in structure and function of organic (those containing carbon and hydrogen) and inorganic compounds.
- Energy changes associated with making and breaking bonds.
- Structural isomerism and relevance to animal nutrition.

A3 Macronutrients

Sources, structures, features, digestion processes and functions of macronutrients in the diets of monogastric, ruminant and poultry livestock species.

- Carbohydrates:
 - monosaccharides, including glucose, galactose, fructose
 - condensation reactions between monosaccharides to form disaccharides and polysaccharides containing glycosidic bonds
 - hydrolysis reactions
 - disaccharides, including lactose, maltose and sucrose
 - polysaccharides, including amylose and amylopectin.
- Role of carbohydrates in animals, e.g. as energy sources, in formation with other molecules (glycolipids, glycoproteins, nucleotides) and in the formation of polysaccharides.
- Dietary fibre (non-starch polysaccharides), e.g. cellulose, pectin, lignin, guar and xanthan:
 - role of insoluble fibre in digestive transit
 - role of soluble fibre in regulating blood sugar.
- Lipids:
 - structure and formation, including triglycerides and phospholipids
 - physical properties of circulated and uncirculated fatty acids
 - lipid breakdown and absorption, including absorption in the rumen.
- Role of lipids in animals, e.g. energy storage, in cell membranes, insulation, organ protection and waterproofing.
- Essential and non-essential amino acids:
 - importance of functional groups and formation of zwitterions
 - condensation reaction to form dipeptides and polypeptides
 - hydrolysis reactions to break down peptide bonds.
- Proteins:
 - primary, secondary (α helices and β pleated sheets), tertiary and quaternary structures of globular and fibrous proteins
 - the importance of hydrogen bonds, disulfide bridges, hydrophobic–hydrophilic interactions and ionic bonds in maintaining specific structure.

- Role of proteins in animals, e.g. as antibodies and enzymes, filaments in connective tissue, hormones, gas transport (haemoglobin), muscles and nutrient transporters (casein in milk, ovalbumin in eggs).
- Water:
 - polar nature, hydrogen bonding.
- Role of water in animals, including:
 - its importance in allowing the movement of substances around the body
 - providing a medium for chemical reactions to take place
 - maintaining body temperature
 - as a metabolite
 - osmotic influence on cell structure and blood pressure.

A4 Micronutrients

Structures, features, digestion processes and functions of micronutrients in the diets of monogastric, ruminant and poultry livestock species.

- Comparison of storage and requirement for fat- and water-soluble vitamins.
- Micronutrient absorption in the digestive system.
- Role of vitamins and minerals in the body, including retinol, ascorbic acid, cholecalciferol, folic acid, iron, calcium, phosphorous, magnesium, copper and zinc.

Learning aim B: Examine the digestive systems of livestock species to allow appropriate nutrition

B1 Digestive systems

Digestive system adaptations, location, structure and processes involved for digestion in monogastric, ruminant and avian livestock species.

- Oral cavity, dental formulae.
- Stomach chambers.
- Stages of feed movement through the digestive system.
- Location and action of microflora and microfauna in the digestive system.
- Digestion and absorption of macro- and micronutrients from feeds.
- Role of the pancreas and liver in digestion.
- Impact of factors such as stress and disease on effective nutrient absorption.

B2 Feeding issues

Causes, symptoms, and corrective measures of issues arising from nutritional imbalances and digestive system disorders in monogastric, ruminant and avian livestock species, including consequences if left untreated.

- Nutrient deficiencies, e.g. hypomagnesaemia, hypocalcaemia.
- Nutrient excesses, e.g. obesity, lactic acidosis.
- Ingestion of foreign bodies.
- Ruminant bloat.

Learning aim C: Plan livestock diets to meet nutritional requirements

C1 Nutrient analysis of feeds

Terminology and techniques used in methods of nutritional analysis and interpretation of results.

- Additional nutritional terminology: acid detergent fibre (ADF), additive, blending, bypass protein, cake, colostrum, crude protein, digestibility, dry matter, malnutrition, mash, metabolisable protein, metabolisable energy, neutral detergent fibre (NDF), non-protein nitrogen (NPN), protein equivalent, premix, supplement, undegradable protein.
- Quantitative and qualitative methods of analysing feedstuffs, including:
 - dry matter determination
 - testing for starch using iodine
 - Benedict's test for reducing sugars
 - biuret test for proteins
 - emulsion test for fats or oils
 - calorimetry.
- Nutritional values of macronutrients and of micronutrients in formulated and naturally occurring animal feedstuffs.

C2 Practical considerations for feeding livestock

Considerations and practical decision making for planning, preparing, storing, and presenting feedstuffs to livestock species.

- Planning and preparation of dietary plans for monogastric, ruminant and avian livestock species:
 - nutritional requirements considering life stage, production requirements and health status, e.g. maintenance, activity, growth and pregnancy
 - appropriate frequency and form of feedstuffs.
- Dietary calculations using manual and computerised methods for poultry, sheep, cattle and pigs, including:
 - ration design
 - ration formulation techniques including the Pearson square, algebraic calculations and computer software
 - balancing rations (meeting requirements by balancing energy and protein content of feeds)
 - forage analysis, including dry matter (DM%), fibre, digestibility, metabolisable energy (ME; MJ/kg DM) and crude protein (CP%).
- Suitability, advantages and disadvantages of different types of feed, including:
 - raw, fermented, cooked, live and dried feedstuffs
 - additives, substitutes and impurities
 - availability, ease and cost of formulation/purchase and storage
 - concentrates
 - differences between grass, hay, straw and silage and variations within
 - digestibility, including calculations
 - voluntary feed intake, e.g. ad libitum versus controlled diet.
- Importance of correct storage of feedstuffs, e.g. good hygiene and security to prevent spoiling, contamination and/or pest damage.
- Presentation of feedstuffs:
 - palatability (taste/texture/smell)
 - use of feed as environmental enrichment
 - creep feeding.
- Other factors including awareness of how nutrition and safety are regulated in pre-prepared animal feedstuffs.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate the structure of biological molecules and their significance in livestock nutrition		
A.P1 Explain the structure and features of biological molecules in livestock nutrition.	A.M1 Assess the structure and functions of biological molecules in livestock nutrition.	
A.P2 Discuss the role and sources of biological molecules in livestock nutrition.		
Learning aim B: Examine the digestive systems of livestock species to allow appropriate nutrition		
B.P3 Explain the digestion and absorption of biological molecules.	B.M2 Compare the digestion and absorption of biological molecules in the digestive systems of livestock species.	A.D1 Review the nutritional importance of biological molecules for maintaining normal function in livestock.
B.P4 Explain the structures of digestive systems in livestock species and common feeding issues.		B.D2 Evaluate digestive system adaptations and common feeding issues in livestock species.
Learning aim C: Plan livestock diets to meet nutritional requirements		C.D3 Plan complex diet formulations for different livestock species to meet nutritional, practical and production demands.
C.P5 Explain the nutritional content of livestock feeds.	C.M3 Analyse the nutritional content of livestock feeds.	
C.P6 Plan simple diet formulations for livestock species.	C.M4 Plan complex diet formulations for livestock species.	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aims: A and B (A.P1, A.P2, B.P3, B.P4, A.M1, B.M2, A.D1, B.D2)

Learning aim: C (C.P5, C.P6, C.M3, C.M4, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- varied feedstuffs for different animals
- relevant equipment to carry out common food tests in the laboratory, such as:
 - iodine
 - Benedict's solution
 - ethanol
 - filter paper and funnels
 - glass beakers
 - spotting tiles
 - test tubes and racks
 - water baths/Bunsen burners, tripods, gauze, heat-proof mats.

Essential information for assessment decisions

Learning aims A and B

For distinction standard, learners will produce comprehensive and detailed work that is accurate throughout. They will demonstrate a robust, accurate understanding of the links between the structure of biological molecules, their sources and the functions within the body of each selected species. Learners will give an in-depth account of the structure and adaptations of the digestive system of each animal, with specific reference to where and how biological molecules are digested and absorbed. They will make valid, logical connections between the nutritional needs of the animal and the causes, symptoms and treatments of common feeding issues that can occur.

For merit standard, learners will provide clear, balanced ideas that show an appropriate level of detail and coherence, using images and diagrams in a suitable way to illustrate the key points they make. Learners will show breadth of understanding of the principles relating to the digestion, absorption and functions of biological molecules, identifying both the differences and similarities between the structure and functions of the digestive systems of the selected livestock species. They will give a mostly valid account of the common feeding issues that may occur in each species and the features of the biological molecules to which they relate.

For pass standard, learners will demonstrate realistic but limited understanding of the sources and role of biological molecules that are important to each species of livestock. They will select and organise information, showing some breadth of understanding of the structure and functions of the digestive system of each livestock species, in addition to the location and processes of the digestion and absorption of each type of biological molecule considered. Learners will outline the key common feeding issues that may occur in each of the species, along with basic references as to why they occur and how they may be rectified. Learners' work will be correct throughout but will be limited in scope or unbalanced in parts.

Learning aim C

For distinction standard, learners will produce a highly accurate and thorough plan for each livestock species. Learners will evaluate thoroughly the suitability of the diet, feed storage and feed preparation, making suitable justifications for recommendations. They will show breadth and depth of understanding by showing how the diet formulations will contribute to the animals' nutrition and production levels, relating this to detailed analysis and research to make specific, valid recommendations. Learners will draw on their knowledge and understanding from across the learning aims to justify the diet formulations planned for different animals, showing how the diets will provide animals with the appropriate biological molecules. They will demonstrate a robust grasp of the need to balance practical considerations with nutritional requirements, and how this may be achieved. The evidence will make use of appropriate, accurate terminology throughout.

For merit standard, learners will produce a clear, nutritionally balanced plan for each livestock species that incorporates calculations for how this can be achieved with the combined use of appropriate feeds. The plan will be easily understood and interpreted. Learners will make reasoned judgements on the nutritional content of proposed feeds and the suitability of the diet. They will identify mostly relevant practical issues that may arise during the implementation of the feeding plan and diet formulation, highlighting how these may be overcome. The evidence will be detailed and supported by mostly relevant examples. The diet formulation and feed preparation will be clearly linked to the nutritional demands and the statuses of the selected animals, and no key factors will be omitted. The evidence will contain mostly appropriate, accurate use of terminology.

For pass standard, learners will give a limited plan that meets the basic nutritional requirements of the selected animals. The plan will be realistic but may be lacking in detail or reasoning. Learners will recall and relate knowledge to discuss the nutritional content of animal feeds. They will consider how the feeds relate to the nutrition of the animal and the extent to which the nutritional content in the feeds is important, but a conclusion is not required. Learners must use relevant research and select and organise information in their plan, making suitable judgements and providing feasible solutions to identified problems. There may be some minor irrelevancies in the evidence, which will show some use of relevant terminology.

Links to other units

This unit links to:

- Unit 4: Work Experience in the Land-based Sectors
- Unit 7: Farm Livestock Husbandry
- Unit 11: Livestock Health and Diseases
- Unit 17: Poultry Production
- Unit 18: Pig Production
- Unit 19: Sheep Production
- Unit 20: Beef Production
- Unit 21: Dairy Production.

Employer involvement

This unit would benefit from employer involvement in the form of:

- masterclasses
- technical workshops involving staff from local organisations
- contribution of designs/ideas to unit assignment/scenario/case study/project materials, including own organisation materials as exemplars where appropriate
- feedback from staff from local organisations on plans/designs/items developed
- opportunities for observation of organisational application during work experience
- support from local organisation staff as mentors.

Unit 23: Organic Agricultural Production

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners develop an understanding of organic agriculture for livestock and crops, and skills in the management of biological and ecological cycles on organic farms.

Unit introduction

Organic farming is an alternative agricultural system that originated early in the 20th century and continues to be developed by various organisations today. This growing industry is heavily regulated and encompasses much more than the use of organic fertilisers such as compost, manure, green manure and bone meal. It also places emphasis on techniques such as crop rotation, companion planting and sustainable grazing of livestock.

In this unit, you will examine the values and principles that form the basis of organic farming. You will investigate the practices that farmers adopt to adhere to an organic agricultural system. The term 'organic' is used generically in the context of this unit, so that complementary philosophies such as biodynamic agriculture can be considered. Throughout the unit, you will have opportunities to experience organic farm enterprises practically, as you observe and reflect on how organic farming methods affect the health of the soil, crops, animals and the environment, and how they differ from non-organic farming practices and management.

On completion of this unit, you will be able to apply the values, principles and methods of organic production within an organic farm enterprise. This unit will help you progress to working on an organic farm as a farm hand or technician, or to progress to higher education having developed a sound understanding of organic agriculture.

Learning aims

In this unit you will:

- A** Investigate the core principles of organic agricultural production and its ecological impact
- B** Explore organic crop production methods in the UK in order to plan crop rotation
- C** Explore organic livestock production methods in the UK in order to plan livestock management.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate the core principles of organic agricultural production and its ecological impact	A1 Organic principles A2 Soil processes A3 Soil fertility A4 Sustainable agro-ecosystems in an organic environment	A report or presentation evaluating the principles of organic production and the impact that soil processes and fertility can have on agro-ecosystems.
B Explore organic crop production methods in the UK in order to plan crop rotation	B1 Soil management B2 Crop rotation B3 Potential problems with crop systems	A three-year crop rotational plan for two crop species and an animal management plan for one species of livestock.
C Explore organic livestock production methods in the UK in order to plan livestock management	C1 Key principles of livestock management C2 Potential challenges in livestock management C3 Organic feeding	

Content

Learning aim A: Investigate the core principles of organic agricultural production and its ecological impact

A1 Organic principles

Origins of the organic movement and the increasing popularity of the consumption and use of organic foods.

- The organic farming movement, including:
 - historical background of food production before the Industrial Revolution
 - farming after the Industrial Revolution, e.g. Enclosure Acts, intensive methods, chemicals, industrial farming, increase in population
 - key influencers, including Stapledon, Steiner, Rusch, Lady Balfour and Sykes
 - sustainability, e.g. UN Declaration 1987
 - development of organic standards
 - permaculture
 - conversion.
- Regulations associated with key organic organisations:
 - membership or subscriptions to organic certification bodies and associated costs
 - codes of practice and industry schemes
 - labelling schemes, including the Organic Milk Suppliers Cooperative (OMSCo) and the Soil Association
 - current legislative and industry requirements at time of teaching.
- Principles of organic agriculture, including the use of IFOAM – International Federation of Organic Agriculture Movements – principles to identify organic agriculture:
 - the principle of health
 - the principle of ecology
 - the principle of fairness
 - the principle of care.
- Traceability of organic products, including separation, documentation, labelling and inspection processes.

A2 Soil processes

- Soil properties and types.
- Soil structure.
- Testing and assessment of soils.
- Micro-organisms, including bacteria and fungi.
- Macro-organisms, including earthworms and nematodes.
- Chemical properties, including pH, cations, anions and exchange capacity.
- Soil erosion.
- Biological properties, including nitrogen cycle, carbon cycle, biological nitrogen fixation and mycorrhiza.
- Organic matter and humus.

A3 Soil fertility

- Natural fertility, e.g. essential elements, plant nutrients.
- Manures, e.g. green manure, animal manure, breakdown in soil.
- Leaching.
- Compost.
- Crop rotations.
- Current environmental legislation, including closed seasons for spreading organic manures.
- Current restrictions regarding the use of external inputs, including low-solubility mineral fertilisers.

A4 Sustainable agro-ecosystems in an organic environment

- Living and non-living components and their interactions.
- Threats to sustainable food production and ecosystem functioning caused by human impacts on soils and ecosystems.
- Anthropogenic activities, including reducing the environmental impacts of agriculture.
- Similarities and differences between global organic agro-systems and UK organic systems.
- Effectiveness of organic systems compared to intensive systems, including advantages and disadvantages.

Learning aim B: Explore organic crop production methods in the UK in order to plan crop rotation

B1 Soil management

Soil management as a fundamental requirement for healthy agro-systems.

- Conversion process, including fertiliser and pesticide residues.
- Soil degradation.
- Cultivation systems, including timing of crop planting.
- Fallow management.
- Stockless systems.
- Impact of poor soil management.
- Potential problems, including nitrate leaching following ploughing of legume-rich grassland.

B2 Crop rotation

The impact of crop rotation on soil and crop health and management.

- Reasons for crop rotation.
- Role of livestock and manures in crop rotation.
- Importance of choice and diversity, including grasses, arable and permanent crops such as fruit.
- Quality requirements, including the achievement of industry standards to allow crops to be certified as organic.

B3 Potential problems with crop systems

- Weed control methods, including mechanical cultivation, timing, shading, crop competition, mulching and hand weeding.
- Potential weed control problems, including incomplete control and disturbing ground-nesting birds.
- Key aspects of pest and disease control, including cultivar resistance and tolerance, biological control, natural predators, beetle banks and permitted pesticides (including fatty acids and 'basic substances').
- Dealing effectively with potential pest and disease control problems, including appropriate use of biological control agents and the breakdown of single-gene cultivar resistance.
- Crop nutrition in organic systems.

Learning aim C: Explore organic livestock production methods in the UK in order to plan livestock management

C1 Key principles of livestock management

Meeting the needs of different livestock and managing livestock impact on the environment.

- Choice of livestock, including dairy and beef cattle, sheep, pigs and poultry.
- Breed selection and its impact on the environment.
- Welfare and current legislation and codes of practice.
- Grazing systems.
- Stocking rates.
- Use of legumes.

C2 Potential challenges in livestock management

- Demands of markets and outlets, including quality requirements and industry standards.
- Breeding, including closed systems, mating and weaning.
- Zoonoses.
- Biosecurity, including regulations and approved disinfectants for dairy system cleaning and other on-farm uses.
- Preventive management.
- Role of veterinary medicine and restrictions of use in organic farming.
- Grazing management for parasite control.
- Health care plans.
- Advantages and disadvantages of complementary therapies for animals.
- Impact of organic production on animal welfare.

C3 Organic feeding

Regulations and practices for feeding organic livestock.

- Nutrition and feeds.
- Permitted crops for grazing and feeding.
- By-products.
- Use of home-grown feeds.
- Current permitted inclusion rates for non-organic feedstuffs.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate the core principles of organic agricultural production and its ecological impact		A.D1 Evaluate the principles of organic production and the impact that soil processes and fertility can have on agro-ecosystems.
A.P1 Explain the principles of organic production. A.P2 Explain the ecological impact of organic agricultural production.	A.M1 Analyse the principles of organic production and the potential impact of soil processes and fertility on agro-ecosystems.	
Learning aim B: Explore organic crop production methods in the UK in order to plan crop rotation		B.D2 Produce a comprehensive crop rotation plan in an organic system for named crops, evaluating the impact of fundamental soil management principles.
B.P3 Explain the fundamental principles of soil management in organic crop production. B.P4 Produce a basic crop rotation plan in an organic system for named crops.	B.M2 Analyse the importance of fundamental soil management principles in organic crop production. B.M3 Produce a detailed crop rotation plan in an organic system for named crops.	
Learning aim C: Explore organic livestock production methods in the UK in order to plan livestock management		C.D3 Produce a comprehensive animal management plan for livestock species in an organic system, evaluating the role of livestock management.
C.P5 Explain livestock management in an organic system for livestock species. C.P6 Produce a basic animal management plan for a livestock species in an organic system.	C.M4 Analyse livestock management in an organic system for livestock species. C.M5 Produce a detailed animal management plan for livestock species in an organic system.	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M2, B.M3, C.M4, C.M5, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to an organic farm.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will show a robust understanding of the background to organic agriculture and its core principles, making insightful references to key influencers and the IFOAM principles to define the operational nature of organic farms. They will show comprehensive knowledge of organic farming regulatory requirements, with a completely holistic approach, covering crops and livestock. There will be in-depth understanding of the complexities of conversion to organic farming and the organisation and maintenance of organic farms. They will demonstrate an in-depth understanding of soil processes, soil types and properties, testing techniques and chemical properties. They will make consistently relevant, specific links to soil and key biological processes, including nitrogen and carbon cycles, linking them, in turn, to soil health and organic farming success. Learners will give detailed consideration to how soil fertility is vital for farming success, drawing on breadth and depth of knowledge to evaluate appropriate methods of maintaining and improving soil fertility in an organic system. They will make accurate references to the impact of current environmental legislation, restrictions and requirements for organic farmers. Learners will give well-reasoned arguments, including the advantages and disadvantages of organic farming as they synthesise in-depth knowledge and understanding of organisations and legal implications in the UK. They will make direct links to organic practices and ecosystem health by evaluating existing agro-ecosystems and anthropogenic activities, with advantages and disadvantages robustly explored. The evidence will use agricultural terminology appropriately and consistently.

For merit standard, learners will show a clear understanding of the background to organic agriculture and its core principles, making mostly relevant references to key influencers and the IFOAM principles to define the operational nature of organic farms. They will present depth but limited breadth of understanding of the regulatory requirements of organic farms with a holistic approach, covering crops and livestock. There will be clear understanding of the complexities of conversion to organic farming and the organisation and maintenance of organic farms. Learners will show a detailed understanding of soil processes, soil types and properties, testing techniques and chemical properties. They will make limited connections to soil and key biological processes, including nitrogen and carbon cycles. Learners will make mostly relevant connections between soil health and organic farming success. They will provide detail but will lack depth in their understanding of how soil fertility is vital for farming success, explaining appropriate methods of maintaining and improving soil fertility in an organic system. They will show a clear understanding of the role of current environmental legislation, restrictions and requirements for organic farmers. Learners will give mostly relevant reasons for their arguments, including the advantages and disadvantages of organic farming, where they will make appropriate references to organisations and legal implications in the UK. Learners will make links to organic practices and ecosystem health by analysing existing agro-ecosystems and anthropogenic activities, and will explore advantages and disadvantages with some depth of understanding. Learners will use agricultural terminology appropriately in their analysis.

For pass standard, learners will show a basic understanding of the background to organic agriculture and its core principles. They will make general or superficial references to key influencers and the IFOAM principles to define the operational nature of organic farms. Learners will present limited depth and breadth in their understanding of regulatory requirements of organic farms but will adopt a holistic approach, covering crops and livestock with some inaccuracies. They will show narrow or generalised understanding of the complexities of conversion to organic farming and the organisation and maintenance of organic farms. Learners will have a realistic but undeveloped understanding of soil processes, soil types and properties, testing techniques and chemical properties. They will make some valid, limited connections to soil and key biological processes, including nitrogen and carbon cycles. They will demonstrate a realistic but undeveloped understanding of the relationship between soil health and fertility and organic farming success. They will explain some appropriate methods of maintaining and improving soil fertility in an organic system. Learners will demonstrate undeveloped but realistic references to current environmental legislation, restrictions and requirements for organic farmers. There will be some relevant understanding of simple advantages and disadvantages of organic farming, making basic references to organisations and legal implications in the UK, with some inaccuracies. They will make some valid links to organic practices and ecosystem health by explaining existing agro-ecosystems and anthropogenic activities. The evidence will make some use of agricultural terminology.

Learning aims B and C

For distinction standard, learners will produce a convincing, comprehensive organic crop rotation plan over a three-year period for two suitable crop species and a convincing, comprehensive livestock management plan for one suitable species. The plans will be robust and show an in-depth understanding of organic crop and livestock management, giving accurate, well-developed reasons for having an integral approach. They will make well-reasoned references to soil management as a key requirement for healthy agro-systems. Learners will evaluate thoroughly the impact of soil management methods on overall crop and livestock success and farm ecosystem health. They will have a well-developed understanding of soil management strategies, cultivation systems, fallow management, reasons for crop rotation, choice of crops, role of livestock and manures. They will show insight in highlighting potential problems in an organic system for both crops and livestock, offering breadth and depth in their understanding of such problems and in strategies that could be used to overcome them. The evidence will present a holistic approach, having logical plans supported by robust, balanced justifications for choices made, including insightful discussion of advantages and disadvantages. Learners will be consistent and accurate in their use of agricultural terminology.

For merit standard, learners will produce a clear, detailed organic crop rotation plan over a three-year period for two suitable crop species and a clear, detailed livestock management plan for one suitable species. The plans will contain all key information and show detailed understanding of organic crop and livestock management, giving clear but partially developed reasons for having an integral approach. They will make mostly accurate references to soil management as a key requirement for healthy agro-systems. Learners will give a balanced analysis of the impact of soil management methods on overall crop and livestock success and farm ecosystem health. They will show detailed understanding of soil management strategies, cultivation systems, fallow management, reasons for crop rotation, choice of crops, role of livestock and manures. They will give appropriate details of potential problems in an organic system for both crops and livestock, with relevant understanding of such problems. They will show mostly relevant understanding of the appropriate strategies that could be used to overcome these problems. The evidence will present a mainly integrated approach, having a partially developed plan supported by mainly valid reasons for choices made. Learners will explore the advantages and disadvantages of their choices within the plans. Learners will be mostly accurate in their use of agricultural terminology.

For pass standard, learners will choose two suitable crop species for the crop rotation plan and one livestock species for the livestock management plan. The plans will be undeveloped but realistic, showing limited breadth and depth of understanding of the principles of organic crop management, livestock management and soil management. They will present undeveloped reasons for having an integral approach. Learners will give a limited, realistic explanation of the impact of soil management methods on crop and livestock success and overall farm ecosystem health. They will demonstrate basic understanding of soil management strategies, cultivation systems, fallow management, reasons for crop rotation, choice of crops, role of livestock and manures. The evidence will show an undeveloped or unbalanced approach in highlighting the potential problems in an organic system for both crops and livestock. Learners will give a limited discussion of how to overcome these problems, with some relevant examples used to support their ideas. Advantages and disadvantages of their choices will be superficially defined and may contain some irrelevancies. Learners will use some accurate agricultural terminology.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 2: Plant and Soil Science
- Unit 4: Work Experience in the Land-based Sectors
- Unit 6: Crop Production
- Unit 7: Farm Livestock Husbandry
- Unit 9: Managing Environmental Activities in Agriculture
- Unit 10: Crop Handling, Storage and Quality Assurance.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 24: Land-based Workshop Practices

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners develop the skills needed to use facilities, tools and equipment to carry out machine maintenance and repair in a land-based setting.

Unit introduction

Keeping machines and equipment in good running order and carrying out repairs are often essential to their effective use. Many land-based settings have workshop facilities, tools and equipment to carry out these tasks in accordance with current legislative requirements and to meet environmental constraints.

In this unit, you will explore the facilities and equipment necessary to carry out maintenance and repair operations in a workshop setting. You will learn how to use equipment effectively and carry out repairs and maintenance tasks on a range of machines. You will learn how to use operator manuals to support these tasks and to obtain the relevant information.

This unit will support your progression to employment in the sector or to further study, which could be via an apprenticeship, for example in land-based engineering, or via a higher-education course, for example in areas such as land-based engineering or agriculture.

Learning aims

In this unit you will:

- A** Investigate the requirements for a land-based workshop used for the maintenance and repair of machinery and equipment
- B** Use workshop tools and equipment to complete a preparation task
- C** Carry out workshop maintenance and repair of land-based machinery to meet maintenance schedules.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate the requirements for a land-based workshop used for the maintenance and repair of machinery and equipment	A1 Workshop environment and materials A2 Workshop tools and equipment – fixed and portable A3 Legislation and codes of practice	A report or presentation on resource and legislative requirements for a land-based workshop used for maintenance and repair.
B Use workshop tools and equipment to complete a preparation task	B1 Safe and correct use of tools B2 Correct tool maintenance and storage	A portfolio of evidence, to include: <ul style="list-style-type: none"> • correct use of tools and equipment in preparation for carrying out maintenance and repair of machinery, including cleaning and storage, for given tasks • use of workshop tools and equipment to maintain and repair machinery, meeting maintenance schedules, according to operator manual guidelines and required standards.
C Carry out workshop maintenance and repair of land-based machinery to meet maintenance schedules	C1 Use of operator manuals for machinery to be repaired and maintained C2 Selection and use of appropriate tools and equipment C3 Organising and checking work	

Content

Learning aim A: Investigate the requirements for a land-based workshop used for the maintenance and repair of machinery and equipment

A1 Workshop environment and materials

- Workshop environment:
 - secure, dry, clean, appropriate light levels, low fire risk
 - ease of access and emergency exit
 - provision of staff facilities, including washing, toilets, rest room, storage, telephone, computer
 - first-aid facilities, e.g. eye wash, bandages, plasters, clean wipes
 - appropriate waste disposal facilities and storage.
- Materials for use in maintenance and repair:
 - properties of materials, including malleability, tensile strength, ductility, ease of working, resistance to wear, rust resistance, rigidity/flexibility, low friction and insulation
 - metallic, e.g. ferrous, non-ferrous, alloys
 - non-metallic, e.g. thermosetting, thermoplastic, rubber, wood
 - selection, identification and correct use of materials
 - lubricants for drilling and cutting, and for gearboxes, chains and drive systems
 - anti-rust agents.

A2 Workshop tools and equipment – fixed and portable

- Fixed equipment:
 - equipment for drilling and sawing, e.g. pillar drills and powered band saws, powered hacksaws
 - equipment for support, e.g. benches, vices
 - lighting, heating and ventilation equipment.
- Portable equipment:
 - non-powered tools, e.g. hammers, hacksaws, files, spanners, wrenches, measuring devices, screwdrivers, scribers
 - powered tools, e.g. drills, grinders, polishers, cutters.
- Welding and associated cutting equipment:
 - manual metal arc (MMA) for horizontal welds
 - metal inert gas (MIG) for horizontal and vertical welding
 - oxyacetylene gas for welding and cutting, safe storage of gas.

A3 Legislation and codes of practice

Current legislation and codes of practice:

- health and safety, Control of Substances Hazardous to Health (COSHH) Regulations 2002, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013, safe lifting
- general and specific risk assessment for safe working practices, use of tools, machinery and materials
- waste disposal requirements, e.g. storage, recycling, environmental and sustainability considerations.

Learning aim B: Use workshop tools and equipment to complete a preparation task

B1 Safe and correct use of tools

- Locating the correct manual:
 - online, hard copy.
- Identification of requirements:
 - identification of work task and order of work
 - referencing to index and chapter.
- Hand-held tools:
 - use of instruction manuals and personal protective equipment (PPE)
 - ensuring safe access, e.g. removal of guards, use of stands and work benches
 - dexterity and manipulation, e.g. correct handling of tools, including holding, use of whole blade, direction of use.
- Power tools:
 - use of instruction manuals and PPE
 - use of guards, guides and clamping devices
 - safe use of electricity, e.g. battery-operated tools, recognition of dangers of trailing cables, isolation of machinery, testing of electrical circuits, on/off switches and emergency cut-outs.
- Welding and cutting equipment:
 - dangers of use of electrical welders, e.g. in the wet, earthing, arc eye and fumes
 - dangers of use of gas welding equipment and gas storage
 - techniques for flat and vertical welding using electrical and gas welders
 - cutting techniques using gas torch.
- Personal protection:
 - ensuring use of safe working practices
 - PPE, including ear defenders, overalls, steel toecap boots/shoes, aprons, welding masks and eye protection, gloves
 - use of cut-offs, kill switches, removal of leads
 - use of holding equipment such as clamps and vices and equipment for support and to prevent movement, e.g. axle stands, blocks and wedges.

B2 Correct tool maintenance and storage

Correct maintenance and storage of tools to promote safety and efficiency.

- Maintenance of tools:
 - cleaning and lubrication
 - protection in storage
 - sharpening and periodic removal of effects of use, e.g. removal of burrs
 - replacement of wearing parts, e.g. saw blades, cutting and grinding discs, emery/sandpapers
 - periodic calibration and fault-finding.
- Storage:
 - storage environment, e.g. storage temperature and humidity, damp and rust prevention
 - material storage, waste matter storage and disposal, safe chemical handling and storage
 - stock control and replacement of used consumables and stock items.

Learning aim C: Carry out workshop maintenance and repair of land-based machinery to meet maintenance schedules

C1 Use of operator manuals for machinery to be repaired and maintained

- Machine manual:
 - hard copy or computer-based
 - telephone and online support
 - computer diagnosis.
- Service interval:
 - hours of use, period of time or mileage
 - use of charts and tables
 - updating of in-house records.
- Identifying solutions to maintenance issues:
 - use of index, online support, online manuals
 - correct model identification, e.g. date, part number, year of manufacture, registration
 - following identified procedures and pictures.

C2 Selection and use of appropriate tools and equipment

- Selection and use of appropriate tools:
 - identification of size required and unit of measurement, e.g. metric, imperial; Whitworth or AF
 - hand tools, e.g. spanners – ring spanner, torque wrenches, socket sets or open-ended spanners, adjustable, screwdrivers, to include flat and cross-headed, gauges and clamps
 - power tools, e.g. battery, mains – high and low voltage systems.
- Selection and use of appropriate equipment:
 - equipment for ease of access, e.g. stands, benches, boards, steps
 - lifting equipment, e.g. trolley jacks, bottle jacks, portable and static cranes and hoists
 - joining equipment, including welding, glueing and riveting.

C3 Organising and checking work

- Work organisation before start of maintenance or repair:
 - correct identification of procedures to be followed
 - timescales and tools/parts availability
 - location of work to be carried out, e.g. in a workshop or in a field.
- Work organisation in task:
 - selection and layout of appropriate tools, consumables and parts
 - ensuring access and effective order of work
 - storage of disassembled parts
 - appropriate waste collection and disposal to comply with relevant environmental and sustainability practices.
- Checking of work carried out:
 - checking work, including visual check, replacement of all disassembled parts and live test, including running up to full load and road/field test where applicable
 - updating of machine records, identification of next service interval
 - reordering of parts and consumables used.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate the requirements for a land-based workshop used for the maintenance and repair of machinery and equipment		A.D1 Evaluate the relative importance of the identified requirements for a land-based workshop carrying out maintenance and repair.
A.P1 Explain the resource requirements for a land-based workshop used for maintenance and repair. A.P2 Explain the relevant legislative requirements relating to maintenance and repair in a land-based workshop.	A.M1 Analyse the resource and legislative requirements for a land-based workshop used for maintenance and repair.	
Learning aim B: Use workshop tools and equipment to complete a preparation task		B.D2 Demonstrate highly accurate use of appropriate tools and equipment to carry out a complex preparation task to an agreed specification within an agreed timescale.
B.P3 Demonstrate competent use of appropriate tools and equipment to carry out a simple preparation task to an agreed specification. B.P4 Maintain and store tools and equipment according to manufacturer's instructions.	B.M2 Demonstrate efficient use of appropriate tools and equipment to carry out a complex preparation task to an agreed specification within an agreed timescale. B.M3 Maintain and store tools and equipment efficiently according to manufacturer's instructions.	
Learning aim C: Carry out workshop maintenance and repair of land-based machinery to meet maintenance schedules		C.D3 Perform, with a high degree of accuracy, a complex maintenance and repair task, checking and recording maintenance and repair operations carried out.
C.P5 Competently perform basic maintenance and repair operations on a machine. C.P6 Competently check and record maintenance and repair operations carried out.	C.M4 Perform maintenance and repair operations proficiently to undertake a complex maintenance and repair task. C.M5 Demonstrate detailed checking and recording of maintenance and repair operations carried out.	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M2, B.M3, C.M4, C.M5, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- a suitable land-based workshop for the repair and maintenance of machines and equipment
- a range of suitable tools and equipment
- suitable PPE, including aprons, overalls, eye protection and safety footwear
- waste disposal facilities
- a selection of machines and equipment for repair and maintenance.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will produce a thorough account of the requirements for a land-based workshop for machine repair and maintenance, showing a depth of understanding of the facilities, tools and equipment needed. Learners will review both the positive and negative requirements of a workshop and of suggested equipment. They will justify a comprehensive list of staff facilities, including first-aid equipment, and produce well-reasoned comments on their relative importance and use. Learners will show insightful understanding of efficient and legal waste disposal requirements and recommend well-reasoned solutions. They will demonstrate a depth of understanding of the legislation and codes of practice relating to working within a workshop environment used for repair and maintenance of machines and equipment. Learners will consider the potential use of materials thoroughly, with a robust evaluation of the advantages and disadvantages of each. The evidence will include convincing findings, showing a high level of reasoning, be technically accurate and fully relevant. It will be clear that learners have a complete understanding of workshop requirements and how to decide on these requirements.

For merit standard, learners will make mainly relevant, analytical judgements on the identified requirements for a land-based workshop for machine repair and maintenance, showing a clear understanding of the resources required. The requirements must cover physical requirements, tools and equipment, and resources for the staff, including first-aid equipment, using the workshop. Learners will make a clear assessment of a range of materials that might be used within a workshop, with a balanced and mainly relevant analysis of the advantages and disadvantages of each. They will show breadth and some depth of knowledge of the relevant legislation and codes of practice. Learners will assess a range of waste disposal options, relating them to sustainability issues and giving mostly valid solutions. The evidence will be mostly technically accurate and relevant and show that learners have a clear understanding of workshop requirements.

For pass standard, learners will give a limited, realistic account of the requirements for a workshop for machine repair and maintenance in terms of facilities, tools and equipment. They will demonstrate some relevant understanding of the physical requirements for a workshop, and correctly identify suitable first-aid equipment. Learners will show a realistic awareness of suitable ways to dispose of waste materials. There will be a basic understanding of the materials and the range of fixed and portable equipment that might be used in the repair and maintenance of machinery, with basic explanations of suitable equipment. This will be supported by limited examples of what the equipment might be used for. Learners will recall basic knowledge of relevant legislation and codes of practice. The evidence will include some technical accuracy and relevance, but there may be omissions, and show a realistic awareness of workshop requirements.

Learning aims B and C

In order to achieve learning aims B and C, learners must provide evidence that they have used at least one type of **each** of the following tools: hand tool, power tool, welding equipment, cutting equipment. Teachers should ensure that the tasks selected by learners provide sufficient scope for them to fully complete the assessments.

For distinction standard, learners will use the specified range of tools and equipment to perform complex tasks to a very high standard and fully meet the objectives of a given brief. In carrying out the preparation task, there will be evidence of learners having developed the relevant practical skills and safety awareness required to subsequently take on a complex maintenance and repair task with a high degree of accuracy and insight.

Learners will carry out confidently both the practical preparation task and the actual maintenance and repair task, showing a high degree of initiative within the limits of their responsibility. All the tasks will require multiple operations and the use of a variety of hand and powered tools and equipment. Learners will demonstrate a robust understanding of how to look after tools and equipment to a very high standard. They will accurately select and use appropriate tools and equipment to maintain and repair land-based machinery proficiently and to a standard that reflects best workplace practice. The work will be carried out with efficient use of the relevant operator manuals and will be technically correct. Learners will investigate thoroughly the machine both before work, in order to identify issues and produce robust solutions, and after the work is carried out, to check satisfactory completion. All work will be carried out in a sensible, logical order, demonstrating learners' confidence and proficiency.

Learners will demonstrate highly efficient workplace practice by working safely and accurately in accordance with relevant legislation, ensuring the workplace is cleared after task completion. They will provide evidence of effective strategies used to minimise risks. Through the work carried out, they will demonstrate breadth and depth of understanding of practices that relate to environmental issues and sustainable waste disposal. Learners will keep detailed and accurate records as appropriate to the tasks being carried out.

For merit standard, learners will use the specified range of tools and equipment to perform complex tasks safely and efficiently. In carrying out the preparation task, there will be evidence of learners having developed the relevant practical skills and safety awareness required to subsequently take on a complex maintenance and repair task with efficiency.

Learners will efficiently carry out both the practical preparation task and the actual maintenance and repair task to meet given objectives, and show some initiative within the limits of their responsibility. They will demonstrate mostly relevant and accurate knowledge and skills. The tasks will require multiple operations and the use of a variety of hand and powered tools and equipment. Learners will demonstrate breadth of understanding of how to look after tools and equipment safely and effectively, minimising resource wastage. They will select and use tools and equipment to maintain and repair land-based machinery safely and efficiently. Learners will show clear understanding in their use of operator manuals. They will investigate the machine both before work, in order to identify issues and produce clear, mainly relevant solutions, and after the work is carried out, to check satisfactory completion. Tasks will be undertaken competently and efficiently, meeting most of the identified requirements.

Learners will demonstrate proficient workshop practices by working safely in accordance with legislation and codes of practice and ensuring after-use cleaning, maintenance and storage. Learners will assess the associated risks and hazards in a mainly relevant manner. They will organise their work and carry out tasks in a mostly logical sequence, which they will be able to explain clearly. Through the work carried out, they will demonstrate breadth and some depth of understanding of some practices that relate to environmental issues and sustainable waste disposal. Learners will keep records as appropriate to the tasks, with sufficient detail so it is clear what has been carried out.

For pass standard, learners will use the specified range of tools and equipment to carry out simple tasks safely and competently, although some minor errors may occur. In carrying out the preparation task, there will be evidence of learners having developed the relevant practical skills and safety awareness required to subsequently take on a complex maintenance and repair task competently.

Learners will carry out both the practical preparation task and the actual maintenance and repair task competently, but show little initiative within the limits of their responsibility. Learners will demonstrate a basic understanding of how to look after the tools and equipment. They will use the appropriate tools and equipment to carry out maintenance and repair, following an agreed specification and with some supervision. Learners will show that they can use operator manuals to assist in their repair and maintenance of machines and equipment. They will carry out basic checks of the machine before work, in order to identify issues and produce realistic but limited solutions, with some supervision. Learners will check the work carried out, but this may be limited and lacking in depth and understanding. Tasks will be carried out safely and meet the key aspects of the given specification.

Learners will demonstrate safe workshop practice and comply with relevant legislation and codes of practice, ensuring some after-use cleaning, maintenance and storage. Learners will show a realistic awareness of the risks and potential issues that could arise. They will demonstrate limited understanding of determining sensible sequences of work. Through the work carried out, they will demonstrate superficial but realistic understanding of practices that relate to environmental issues and sustainable waste disposal. Learners will show an appropriate awareness of the importance of keeping the required records and providing the key information.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 4: Work Experience in the Land-based Sectors
- Unit 5: Estate Skills.

Employer involvement

This unit would benefit from employer involvement in the form of:

- masterclasses
- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 25: Agricultural Business Improvements

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners examine the environment in which agricultural businesses operate in order to identify and plan opportunities for improvements or diversification.

Unit introduction

The successful operation of agricultural businesses requires staff to have insight into the business environment and into the marketplace in which they operate. Internal and external pressures on agriculture, and the businesses that operate in the sector, have increased and changed in recent years. This means that, in order to remain viable, many agricultural businesses must consider ways of improving or diversifying operations.

In this unit, you will learn about the features of agricultural businesses, their scope and importance, and the markets in which they operate. You will investigate the external and internal influences that have an impact on the performance of a business, including customer trends and legislation. You will carry out a review of a business's performance to identify and recommend changes or alternatives to its operations in order to improve performance. This builds on the tasks carried out in *Unit 13: Managing Activities for Agricultural Enterprises* and it is expected that you will select and apply learning from the content of that unit. You will also draw on the skills and knowledge developed in *Unit 1: Professional Working Responsibilities*, *Unit 2: Plant and Soil Science*, *Unit 3: Contemporary Issues in the Land-based Sectors*, *Unit 5: Estate Skills*, *Unit 8: Land-based Machinery Operations* and *Unit 9: Managing Environmental Activities in Agriculture*. You will also use your experience of real working practices in the sector that you gained in *Unit 4: Work Experience in the Land-based Sectors*.

This unit will prepare you for employment in the land-based sector in roles such as unit manager and stockperson, the unit will also prepare you for self-employment in the sector. This unit will enable you to progress to higher education courses such as a degree in land-based business management.

Learning aims

In this unit you will:

- A** Explore the agricultural business environment in order to identify opportunities for improvements
- B** Examine the influences on agricultural business performance
- C** Plan opportunities for improvements in an agricultural business.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Explore the agricultural business environment in order to identify opportunities for improvements	<p>A1 The scope and importance of agricultural businesses in the UK</p> <p>A2 Agricultural business operations</p> <p>A3 The agricultural business marketplace</p>	A report on the business environment in which agricultural organisations operate, and the impact of this environment on the operations of a selected agricultural business.
B Examine the influences on agricultural business performance	<p>B1 Product trends and consumer trends</p> <p>B2 Other influences impacting on agricultural business performance</p> <p>B3 Benefits and risks associated with growing an agricultural business</p>	<p>A portfolio of evidence including:</p> <ul style="list-style-type: none"> • A review of the performance of an agricultural organisation and the factors that influence its performance. • A plan to improve the business performance of the agricultural organisation with accompanying rationale.
C Plan opportunities for improvements in an agricultural business	<p>C1 Improving agricultural business performance</p> <p>C2 Planning agricultural business improvements</p>	Learners will be expected to select and apply learning from other mandatory units and optional units as appropriate.

Content

Learning aim A: Explore the agricultural business environment in order to identify opportunities for improvements

A1 The scope and importance of agricultural businesses in the UK

- Range of organisations and their purpose, e.g. commercial, not-for-profit, regulatory.
- Importance of land-based industries to regional and local economies, including social and environmental impact, e.g. bringing employment, contribution to GDP, changes in biodiversity, sustainability.
- Reasons for commercial success of agricultural businesses and how they differ depending on ability to meet demand, use of technology, innovative products or farming systems, diversification.
- Associated industries, e.g. relevant industries in primary, secondary and tertiary sectors.
- Associated organisations in the agriculture sector, including:
 - aims and objectives of key organisations
 - suppliers of goods and services, e.g. animal or crop advisers, machinery suppliers
 - representative organisations and professional bodies, e.g. National Farmers' Union (NFU), Agricultural Industries Confederation (AIC)
 - regulatory bodies, e.g. Health and Safety Executive (HSE), Department for Environment, Food and Rural Affairs (Defra).

A2 Agricultural business operations

- Business types, e.g. mixed farms, arable, livestock, fruit, vegetables.
- Aims and objectives of businesses, including mission, vision and purpose, e.g. breeding stock, milk production, potatoes, cereals.
- Role and importance of key operational records, e.g. monitoring, benchmarking, legislation.
- Key financial aspects, including review and interpretation of cash flow, fixed and variable costs, break-even point, sensitivity analysis.
- Organisational structure, including hierarchical, flat, matrix.
- Job roles and responsibilities within agricultural businesses:
 - roles, e.g. director, manager, supervisor, trainee, subcontractor
 - responsibilities, e.g. for financial, physical and human resources, machinery, staff and waste.

A3 The agricultural business marketplace

- Marketplace, customers and competitors, including size of market (local, national, international), customer characteristics and trends, direct and indirect competition, competitor analysis, import or export tariffs.
- Stakeholders:
 - internal, e.g. managers, employees, owners
 - external, e.g. supermarkets, competitors, debtors, creditors, HSE, Defra, communities (local, national, international), trade associations.
- Importance of efficiency and interdependency in the supply chain, e.g. suppliers, distributors, processors, intermediaries, customers, choosing suppliers, ensuring supply and demand, supply chain assurance.
- Quality management systems and practices, including important aspects of quality in agricultural businesses, formal quality standards or schemes and approval, role of quality-assurance schemes, farming systems and practices to achieve quality, problems if quality is not achieved, remedial actions.

Learning aim B: Examine the influences on agricultural business performance

In examining performance and planning opportunities for improvements to agricultural businesses, learners build on the assessment for *Unit 13: Managing Activities for Agricultural Enterprises*, selecting and applying learning from *Unit 1: Professional Working Responsibilities*, *Unit 2: Plant and Soil Science*, *Unit 4: Work Experience in the Land-based Sectors*, *Unit 5: Estate Skills*, *Unit 8: Land-based Machinery Operations* and *Unit 9: Managing Environmental Activities in Agriculture*.

B1 Product trends and consumer trends

Influences that could have a potential impact on a business as it considers opportunities for development.

- Changing customer preferences, e.g. health, cost and value for money, prepared foods, buying local, environmentally friendly products, traceability.
- Advertising campaigns and publicity.
- Changing demographics, e.g. increasing and older population, cultural changes.
- Evolving technologies and technological developments, e.g. improved transport and technological links, environmentally friendly options, changes to traditional seasonal availability of products.

B2 Other influences impacting on agricultural business performance

- PESTLE analysis (Political, Economic, Social, Technological, Legal and Environmental).
- Global factors and their potential impact on agricultural businesses:
 - exchange rate fluctuations
 - weather extremes, e.g. drought, frost, floods
 - differing standards of living and wage costs
 - political and economic stability, e.g. trade barriers, trade agreements
 - technological advances and increasing reliance on technology for business operations, processes and transactions.
- European Union (EU) and regional influences on business:
 - potential positive and negative impacts of migration from EU member states.
- Internal factors impacting on business performance:
 - staff, including skills, availability, training, cost
 - finance and capital, e.g. cash flow, loans
 - use of financial and physical records, e.g. interpreting information on production levels, costs, financial efficiency, break-even, gross margins, losses
 - land and security of tenure
 - equipment and machinery.

B3 Benefits and risks associated with growing an agricultural business

- Business growth, consolidation, improvements, diversification and expansion, advantages and disadvantages.
- New market developments, e.g. niche products, unique selling points (USPs), specialist products (organic, free range), leisure services and customer experience, e.g. open farms, shops.
- Recognition and reputation, e.g. assurance schemes such as Red Tractor, customer feedback, sector awards, e.g. British Farming Awards.
- Promotion of business, e.g. advertising, awards, shows/events.
- Risks, including failure to meet customer needs, buyer requirements, return on investment, risk of losing business.
- Potential impact of improved or weakened business performance on the financial and physical resources of the business, e.g. impact on product quality, trading arrangements, staff, equipment and machinery.

Learning aim C: Plan opportunities for improvements in an agricultural business**C1 Improving agricultural business performance**

- Strategies, including consolidation, expanding market share, product development, market development, diversification, continuous improvement.
- SWOT analysis (strengths, weaknesses, opportunities, threats).
- Key indicators of improved performance:
 - improved effectiveness and efficiency in key functional areas, e.g. production, working practices, financial control
 - competitive advantage, e.g. quality, price, location
 - environmental impact, e.g. recycle, waste, enhancement of the environment.
- Support mechanisms, e.g. quality assurance schemes, organisations (Defra, NFU, HSE), education providers, new entrant schemes and support, local network or discussion groups.
- Additional funding sources, e.g. to support business expansion, grants, overdrafts, loans, area-based schemes, agricultural subsidy schemes.
- Contingency planning and external agencies, e.g. risk analysis, role of consultant, advice and guidance, alternative options available to businesses, use of benchmarking data.

C2 Planning agricultural business improvements

- Plan, to include opportunities, specific actions, rationale, timescale, resource implications, financial implications (costs, likely returns) and risks.
- Key indicators of success and risks, e.g. efficiency and improvements in production, working practices, financial.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Explore the agricultural business environment in order to identify opportunities for improvements		A.D1 Evaluate key factors in the business marketplace, its environment and operations when identifying opportunities for improvements.
A.P1 Explain the breadth and importance of agricultural businesses in the UK. A.P2 Explain the relationship between the operation of an agricultural business and the marketplace in which it operates.	A.M1 Analyse the importance of the business environment, marketplace and operations when identifying opportunities for improvements.	
Learning aim B: Examine the influences on agricultural business performance		B.D2 Carry out a comprehensive review of the performance of an agricultural business, including the influences impacting on operations. C.D3 Produce a comprehensive plan for improving an agricultural business, justifying recommendations.
B.P3 Explain the influences impacting on the performance of agricultural businesses. B.P4 Carry out a basic review of the performance of an agricultural business.	B.M2 Analyse the influences impacting on the performance of an agricultural business. B.M3 Carry out a detailed review of the performance of an agricultural business.	
Learning aim C: Plan opportunities for improvements in an agricultural business		
C.P5 Explain the strategies used to improve business performance. C.P6 Produce a basic business improvement plan for an agricultural business.	C.M4 Produce a detailed business improvement plan for an agricultural business, making recommendations for improvement.	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1,)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M2, B.M3, C.M4, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- an agricultural crop or livestock business such as the college farm, a local agricultural employer or a work experience farm
- input from those currently working in an agricultural business or a related field in the agricultural sector, such as a farm or unit manager.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will show a comprehensive understanding of the environment in which agricultural businesses operate, including how relevant aspects of this environment influence or create opportunities for business improvements. They will demonstrate an in-depth understanding of the range and significance of organisations operating in the agricultural sector and their interrelationships with other industries and organisations. Learners will make valid references to the marketplace in which their chosen business operates and the importance of the supply chain when drawing out valid conclusions on business performance.

They will make use of appropriate, accurate technical terminology throughout.

For merit standard, learners will show a clear understanding of the environment in which agricultural businesses operate, making mostly relevant references to how these influence or create opportunities for improvements. They will present depth, but limited breadth, of understanding of the range and significance of organisations operating in the agricultural sector, making some links between other industries and organisations. Learners will show mostly accurate understanding of the marketplace in which their chosen business operates, making some valid connections to their views of the commercial performance of the business.

They will use appropriate technical language throughout.

For pass standard, learners will show a basic, undeveloped understanding of the environment in which agricultural businesses operate. They will make some limited but appropriate references to the way in which the environment can influence opportunities for business improvement. Learners will make general references to the range of organisations and associations in the agricultural sector, giving some realistic explanation of the links between them. They will show some breadth of understanding of the marketplace in which their chosen business operates.

They will make some use of technical language.

Learning aims B and C

In achieving learning aims B and C, learners must individually prepare and produce their own business improvement plan. They should build on and make connections between their business improvement plan in this unit and the assessment tasks related to the operational activities completed in *Unit 13: Managing Activities for Agricultural Enterprises*.

In completing the assessment activities for these learning aims, learners must independently select and apply knowledge and skills from their learning across the mandatory content. They will be expected to make connections between their improvement plans and the assessments already completed for:

- *Unit 1: Professional Working Responsibilities*, in relation to health, safety and legislative requirements, waste management and record keeping
- *Unit 2: Plant and Soil Science*, in relation to plant and soil management
- *Unit 4: Work Experience in the Land-based Sectors*, in relation to sector standards, work behaviours, communication and the management skills required to undertake activities in an agricultural enterprise

- *Unit 5: Estate Skills*, in relation to agricultural environments, assessing their needs and planning improvement activities, and managing others
- *Unit 8 Land-based Machinery Operations*, in relation to the resourcing, use and maintenance planning of land-based machinery required in agricultural enterprise operational activities
- *Unit 9: Managing Environmental Activities in Agriculture*, in relation to the management of agricultural environments including remedial action for unwanted impacts of agricultural activities
- *Unit 13: Managing Activities for Agricultural Enterprises*, in relation to the management of regular operational activities in agricultural enterprises.

Teachers should ensure that the agricultural enterprise chosen by learners for this unit provides sufficient scope for them to fully complete the assessment.

For distinction standard, learners will demonstrate in-depth understanding of the relevant quality management systems and their benefits when identifying opportunities for improving business performance. Learners will give a detailed account and analysis of the operation of a business, making specific reference to its aims, objectives, planning, maintenance of records and resources, the need for effective staff management and their relevance in identifying opportunities for improvements.

Learners will also make specific, valid reference to the financial status of the business and its role in identifying opportunities for improvements. They will show comprehensive knowledge of the factors, both internal and external, which influence the performance of a business, making accurate references and assessment of the relevant political, economic, social, technological, legal and environmental impacts on business performance. Learners will support their evaluation with well-chosen examples. They will show in-depth understanding of the benefits and risks of growing, consolidating, improving, diversifying and expanding a business, giving well-reasoned arguments, including the advantages and disadvantages, of their appropriateness to the chosen business.

Learners will produce a convincing, comprehensive improvement plan for an identified agricultural business. The plan will show an in-depth understanding of the strategies for improving business performance. Learners will use the analysis of the business's external and internal environment, including the interpretation of financial and physical records, to support logical recommendations.

They will demonstrate a consistently accurate application of knowledge and skills from the assessment completed in *Unit 13: Managing Activities for Agricultural Enterprises*, by showing an in-depth understanding of the relevant agricultural enterprise operational records and planning systems that need to be reviewed in order to support any recommendations. In producing the improvement plan, learners will also accurately select and apply in-depth knowledge of resources and procedures gained from *Unit 13: Managing Activities for Agricultural Enterprises*. They will give well-reasoned references for their recommended actions and show in-depth understanding of the indicators used to measure the business's improvements.

Learners will use their breadth and depth of knowledge, and understanding of the business, its marketplace and its link in the supply chain and environment, to clearly articulate the specific benefits and risks of the identified opportunities for improvements.

Learners will prepare their plans individually, demonstrating a high standard of technical ability, insight, attention to detail, and using consistent and accurate technical terminology throughout.

For merit standard, learners will show a clear understanding of the relevant quality management systems with mostly relevant connection of these to their review of the business performance. They will provide detail and breadth of knowledge but lack in-depth understanding of the operation of a business, maintenance of records, resources and staff management in identifying opportunities for improvements.

Learners will also make some valid reference to the financial status of the business in identifying opportunities for improvements. They will make clear connections between the internal and external factors and their impact on business performance and opportunities. They will provide detail of the benefits and risks of growing a business with mostly relevant reasons for their arguments.

Learners will produce a clear, detailed improvement plan for an identified agricultural business. The plan will contain all of the key information, and it will show a detailed understanding of the strategies for improving business performance. Learners will use the analysis of the business's internal and external environment in a mainly relevant way. They will show a detailed understanding of the relevant agricultural enterprise operational records and planning systems, along with the business's financial and physical records. In doing so, learners will show a clear and mostly relevant application of their knowledge and skills from the assessment completed in *Unit 13: Managing Activities for Agricultural Enterprises*. In producing the improvement plan, learners will select and apply detailed knowledge of resources and procedures gained from *Unit 13: Managing Activities for Agricultural Enterprises*. Learners' recommendations for improvement will be clear, with partially developed reasons, and will show mostly relevant understanding of the indicators used to measure the business's improvements.

Learners will show breadth and some depth of understanding of the business, its environment and its role in the supply chain in identifying opportunities for improvements. Learners will offer mostly valid recommendations for potential improvements. They will identify mostly valid benefits and risks to the business of the recommended improvements.

Learners will use appropriate technical language throughout their individually prepared plan, but this may be inconsistent.

For pass standard, learners will explain some of the quality management systems used in the agriculture sector. They will demonstrate a realistic, but undeveloped or generic, understanding of the ways in which the business operates, maintains its records and resources, manages its staff and monitors its financial status, and how these key factors can be used to assess business performance.

Learners will give an undeveloped or unbalanced explanation of the internal and external factors that influence businesses. Their explanations will be limited in scope and will be supported by basic examples, which may contain some irrelevancies. They will show some breadth of understanding of the benefits and risks of growing a business, making limited or partially developed connections to their chosen business.

Learners will produce a basic improvement plan for an identified agricultural business. They will make simple, realistic suggestions for potential improvements, although some irrelevancies may occur. The plan will be individually prepared and it will contain most of the key information. It will be undeveloped but realistic in its content, explaining the strategies used to improve business performance but showing limited understanding of their use. Learners will show a limited application of their knowledge and skills from the assessment completed in *Unit 13: Managing Activities for Agricultural Enterprises*. In producing the improvement plan, learners will select and apply a limited but realistic knowledge of resources and procedures gained from *Unit 13: Managing Activities for Agricultural Enterprises*. Learners will make some reference to their analysis of the internal and external business environment, presenting undeveloped or generic reasons for their recommendations.

Learners will demonstrate some breadth of understanding of the business, its operation and environment, with some relevant examples of how they link to identifying opportunities for improvement. They will show a basic knowledge of the enterprise operations, with a limited understanding of how they can be used in suggesting improvements. They will make some relevant connections to the knowledge of enterprise operations gained from their learning in *Unit 13: Managing Activities for Agricultural Enterprises*. Some relevant risks and benefits will be identified but these may be generic rather than specific to their business improvement plan. Learners will use some technical language throughout the plan.

Links to other units

This unit should be completed towards the end of the programme. In order to complete the synoptic assessment task in this unit, learners should select and apply the relevant knowledge and skills from other areas of the mandatory content. Learners should build on their knowledge of enterprise and operational activities from *Unit 13: Managing Activities for Agricultural Enterprises*; safe working practices and waste management from *Unit 1: Professional Working Responsibilities*; the role of plant growth, soil and plant management in agricultural activities from *Unit 2: Plant and Soil Science*; issues facing agricultural enterprises from *Unit 3: Contemporary Issues in the Land-based Sectors*; supervision of others undertaking activities on the agricultural enterprise from *Unit 5: Estate Skills*; working practically and safely with a wide range of machinery from *Unit 8: Land-based Machinery Operations*; and farm habitat surveys and habitat management from *Unit 9: Managing Environmental Activities in Agriculture*. Additionally, learners will have completed *Unit 4: Work Experience in the Land-based Sectors* and will be able to apply their experience of and insight into real working practices in the sector.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 26: Selecting and Managing Land-based Machinery

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners study all aspects of selecting and managing a range of machinery, from initial choices, procurement, funding and operating costs to ensuring and monitoring effective and efficient use.

Unit introduction

Machinery is essential to many land-based industries and can account for a very high proportion of the fixed costs for an enterprise. It is, therefore, essential that the correct decisions are made in the selection and management of this machinery and associated equipment. Costs can be significantly reduced by the correct specification, selection and procurement of machinery. In a world where machines are performing a rapidly increasing number of manual labour tasks, operator productivity and efficiency is extremely important.

In this unit, you will explore the decision-making processes in the selection of land-based machinery. You will explore alternatives to the outright purchase of machinery, such as the use of contractors and machine hire. You will investigate the legislation relevant to the use of machinery, and learn how to estimate and monitor the use of machinery to ensure its maximum effectiveness. The efficient management of machinery is key to the economic viability of a land-based enterprise and this unit will help you to develop the skills associated with estimating machinery costs. The unit provides you with an opportunity to undertake an investigation of the costs and efficiency of using machinery for a land-based operation.

The skills that you learn in this unit are key to employment in the sector at supervisor level and above, and will also support your progression into an apprenticeship or to a higher education establishment.

Learning aims

In this unit you will:

- A** Investigate factors influencing the selection and procurement of land-based machinery
- B** Produce a plan for the efficient and legal use of machinery for a land-based enterprise
- C** Calculate the costs and efficiency factors of procuring and using machinery for a land-based task.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate factors influencing the selection and procurement of land-based machinery	A1 Required specifications A2 Factors influencing procurement decisions A3 Common procurement and replacement options	A specification for a machine, including an evaluation of the factors affecting the selection of suitable machinery and the options for procurement.
B Produce a plan for the efficient and legal use of machinery for a land-based enterprise	B1 Operator and on-the-road legislation, and the role of operator competence B2 Planning the monitoring of a machinery operation	A plan for monitoring the performance and efficiency of use of a machine, including consideration of legal and operator competence, along with an evaluation of its effectiveness. Evidence of use of techniques to assess the performance of a machine and calculation of associated costs.
C Calculate the costs and efficiency factors of procuring and using machinery for a land-based task	C1 Monitoring machinery performance C2 Procurement costs C3 Operating, maintenance and servicing costs	

Content

Learning aim A: Investigate factors influencing the selection and procurement of land-based machinery

A1 Required specifications

- Accurately describing the performance of an engine:
 - the concepts of energy, work, force, power, torque and torque backup
 - metric and imperial units of measurement and their conversions
 - how power is measured, including use of dynamometer and engine power ratings
 - methods of indicating power output, including claimed engine power, maximum engine power, take-off power and drawbar power
 - torque and its relationship to engine speed, gearing, and the importance of torque backup.
- Power unit specification:
 - relevant aspects of engine performance, e.g. power output, fuel consumption and efficiency, fuel capacity
 - external services, e.g. hydraulic performance, power take-off (PTO) options
 - ergonomics and working conditions and their effect on operator productivity
 - dimensions, e.g. width, height, length, weight
 - compatibility with existing machines
 - fit for purpose, e.g. requirements of the task, topography, slopes, weather.
- Machinery specification:
 - power requirements
 - fitness for purpose, e.g. working width, capacity, dimensions, ease of operator use, complexity, road-legal
 - other considerations, e.g. specialist attachments, electronics, height/width restrictions.

A2 Factors influencing procurement decisions

- Establishing whether the machine suits and fits the working environment, e.g. considerations relating to size, width, height and weight, access to buildings, use of roadways, field entrances, weight in use and stability on slopes.
- Compatibility with power unit, for mounted and attached equipment, e.g. equipment power requirement compared to engine power available.
- Compatibility with and similarity to other machines already in use, e.g. same manufacturer, similar operating systems, working widths, rates of work.
- Understanding the types of procurement errors that should be avoided, including untried machine, incompatibility, lack of operator skills, non-availability of spares.
- Revising requirements in line with machines available for procurement.
- Performance:
 - fuel consumption, rate of work
 - environmental and sustainability factors, e.g. fuel type and consumption rate, air and noise pollution, recycling of products, machine lifespan
 - minimising soil damage and compaction, e.g. use of correct tyres, machine weight, timing of work, seasonality.
- Dealership considerations:
 - proximity of dealer, dealer backup, dealer availability, availability of spares and potential downtime.

- After-sales support:
 - maintenance and servicing
 - warranty and guarantees.
- Financial factors, e.g. cost, value for money, running costs, fuel costs, spares, reputation, servicing and repair.

A3 Common procurement and replacement options

- Procurement options:
 - direct purchase
 - sources of finance, e.g. manufacturers' schemes, bank loans, hire purchase
 - contract hire, leasing
 - purchase of used machinery
 - alternatives to purchase, e.g. use of contractors and machine hire
 - sharing machinery, cooperatives, and machinery rings, including formal and informal arrangements.
- Replacement options:
 - estimation of value of used machinery or exchange value
 - new versus used
 - replacement policy and timing.

Learning aim B: Produce a plan for the efficient and legal use of machinery for a land-based enterprise

B1 Operator and on-the-road legislation, and the role of operator competence

- The law:
 - minimum age requirements for use of machinery
 - fitness for purpose
 - with regard to use of machinery on the road, including fitness for purpose, widths, road speed, combination weights (gross train weight), lengths, signage and lighting for road use
 - with regard to adequate training for use and the use of personal protective equipment (PPE)
 - health and safety.
- Operator competence:
 - certificates of competence, e.g. spraying, chainsaw use
 - training plans
 - compulsory and recommended training, e.g. telescopic handles, tractor driving, all-terrain vehicles (ATVs)
 - informal training
 - insurance requirements.

B2 Planning the monitoring of a machinery operation

- Identification of operation to be carried out, e.g. size, complexity, timescale, required rate of work, field pattern, turning techniques, limitations, timing and seasonality.
- Key monitoring factors and how the monitoring will be carried out, e.g. rate of work, field efficiency, observation, use of recorded data.
- Use of work study to systematically, objectively and critically examine all factors affecting the operation.
- Use of data information systems to assist machinery management:
 - how data information systems work and are used
 - guidance systems, e.g. Global Positioning System (GPS)
 - using electronic systems for the purposes of crop monitoring and processing harvesting information
 - satellite information, including ground cover, pesticide or fertiliser issues
 - use of photography for recording and analysis.

Learning aim C: Calculate the costs and efficiency factors of procuring and using machinery for a land-based task

C1 Monitoring machinery performance

- Machinery performance:
 - machine capacity, e.g. field capacity, material capacity
 - unused capacity, travel time, downtime, preparation time.
- Work rate and efficiency, e.g. spot rate, field efficiency, seasonal efficiency.
- Cost of operation, e.g. labour, fuel, spares, consumables.

C2 Procurement costs

- Machine purchase cost:
 - deposit and payment schemes, overall cost of payment schemes
 - length of purchase
 - opportunity cost of the procurement funds and what else the procurement funds could be used for
 - opportunity cost of the management time.
- Costs of other methods of obtaining machinery, e.g. hiring, renting, use of contractors, subcontracting, machinery rings and cooperatives.

C3 Operating, maintenance and servicing costs

- Depreciation:
 - calculation, e.g. straight line, diminishing returns.
- Interest:
 - calculation, e.g. average value, real interest rates.
- Service and repair costs:
 - fuel
 - servicing
 - managing repair costs, e.g. through recording, estimating, predicting.
- Other costs:
 - tax, insurance, storage, labour
 - opportunity cost associated with operating maintenance and servicing, considering what else could be done with the funds or labour required for maintenance and servicing.
- Whole-life costs:
 - estimated life
 - resale value
 - indirect costs, e.g. downtime and transport.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate factors influencing the selection and procurement of land-based machinery		A.D1 Produce a comprehensive specification for a machine, evaluating the relative importance of factors influencing procurement.
A.P1 Produce a basic specification for a machine for a land-based operation. A.P2 Explain the decision-making process involved in the procurement of a machine.	A.M1 Produce a complete specification for a machine for a land-based operation. A.M2 Analyse the decision-making process involved in the procurement of a machine.	
Learning aim B: Produce a plan for the efficient and legal use of machinery for a land-based enterprise		B.D2 Produce a comprehensive plan for monitoring the efficiency of use of a machine for a land-based operation, evaluating its effectiveness. C.D3 Demonstrate highly accurate use of techniques to assess the performance of a machine in work, including calculation of costs.
B.P3 Explain the significance of legal and competence requirements in monitoring the use of a machine for a land-based operation. B.P4 Produce a basic plan for monitoring the efficiency of use of a machine for a land-based operation.	B.M3 Justify choices made in developing a detailed plan for monitoring the efficiency of use of a machine for a land-based operation.	
Learning aim C: Calculate the costs and efficiency factors of procuring and using machinery for a land-based task		
C.P5 Demonstrate competent use of techniques to measure the performance of a specified machine for a land-based operation. C.P6 Calculate the costs associated with operating a specified machine in work.	C.M4 Demonstrate proficient use of techniques to measure the efficiency of use of machinery in work, including calculation of costs.	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.M2, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, B.M3, C.M4, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- a range of machines and equipment
- operator manuals, buyer guides and access to technical information on the machines and equipment
- suitable in-field location and field tasks for study
- stopwatches
- machinery costings.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will produce a comprehensive, accurate specification, which is supported by logical reasoning and contains no irrelevancies. They will demonstrate an in-depth understanding of the concepts of work, power, torque and torque backup, their interrelationship, and how torque and power change with engine speed changes. They will thoroughly evaluate the importance of a complete range of specification requirements for a machine for an identified task. Learners will be able to prioritise elements of the specification in a logical manner, giving comprehensive, well-reasoned justifications for doing so.

Learners will thoroughly consider the significance of factors involved in the process of procuring a machine in a land-based context. They will demonstrate breadth and depth of knowledge of the links between the various factors involved in the decision-making process, including performance, dealer reputation and proximity, value for money, and previous models owned. Considered, detailed arguments will be given to justify the decision made for a suitable machine and the procurement options available.

Learners will make insightful references to performance requirements and procurement opportunities. Decisions will be supported by evidence such as buyer guides, recommendations and investigation of similar operations. They will comprehensively evaluate low-impact, economy and sustainability issues.

Learners will be consistent and accurate in their use of specialist terminology.

For merit standard, learners will produce a complete specification that is accurate, clear and contains mostly relevant decisions and justifications. They will explain and justify the specification in a mainly logical way. They will give a solution that is suitable and technically accurate. Learners will explore the concepts of power and torque and their relationship to engine speed, but explanations may be limited in depth or breadth. They will show clear knowledge and understanding of the factors affecting decisions regarding the specification of a machine for a task and the options for procurement. Learners will show some evidence of prioritising elements of the specification.

Learners will give a clear, balanced analysis of the decision-making processes relevant to the procurement of a machine. They will make mainly relevant references to the various factors influencing the procurement.

Learners' level of understanding and analysis will be that of a competent employee. They will use specialist terminology appropriately.

For pass standard, learners will produce a basic specification that is realistic but limited in scope and it may contain some irrelevant aspects. They will demonstrate a realistic but undeveloped understanding of the concepts of work, power and torque, and will be able to explain these in simple terms. Learners will show some understanding of a basic range of factors to consider when deciding on the specification of a machine, including requirements for the tasks, engine power and compatibility. They will explore the requirements of machine for a task and be able to explain them to a supervisor. Learners may make limited use of supporting information sources and documentation. They will show realistic, limited understanding of the options available for obtaining a machine but the explanations will be mainly generic or contain some irrelevancies. Learners will be able to explain some relevant factors that might affect the final decision-making process; these will be appropriate but explanations will be undeveloped.

The evidence will be limited in scope or generic in parts but will be mostly appropriate, with some undeveloped references to sustainability. The evidence will show some use of appropriate specialist terminology.

Learning aims B and C

For distinction standard, learners will produce a comprehensive plan for monitoring the performance and efficiency of a machine for a land-based operation. They will thoroughly investigate a field-based operation and report on its efficiency, using a comprehensive range of efficiency measures and techniques. Learners will show breadth and depth of skills and knowledge in considering, prioritising and evaluating the relevance of each efficiency measure. Learners will make effective use of standard management data and comprehensive comparisons will be made. Suitable and logically justified suggestions will be given regarding ways to improve the efficiency of the operations investigated.

Learners will demonstrate highly accurate use of a range of techniques to assess the performance of a machine in work. They will work legally and safely at all times.

Learners will accurately calculate, without errors, the costs of the operation under investigation, including procurement, operating and maintenance costs. They will show insight in examining the legal and operator requirements of the task carried out and link their findings logically to the overall use of efficiency measures and techniques. Learners will correctly identify and evaluate the use of data information collection systems in monitoring the efficiency of field operations.

Learners will give well-reasoned justifications for all their recommendations, demonstrating a detailed awareness of the influence of all of the different aspects of the operation in affecting the efficiency of the tasks.

Learners will use appropriate specialist terminology consistently and accurately throughout.

For merit standard, learners will produce a detailed plan to monitor the efficiency of a field operation and apply it to a real operation. They will produce clear and mainly accurate efficiency data and compare this to available management data. The plan will contain all key information and show detailed understanding of factors that might affect the efficiency of the operation, giving appropriate but partially developed reasons for choices made. Learners will make mostly accurate references to the legal and operator requirements for the operation.

Learners will demonstrate a clear understanding of most of the factors that might affect the efficiency of an operation and will be able to prioritise them. They will assess the suitability of a range of data information systems in monitoring a field operation and their use. Judgements will be clear and analytical, showing understanding of most of the components of the operation.

Learners will demonstrate proficient use of techniques for measurement of the efficiency of use of a machine for a land-based task, working safely and legally at all times. Calculation of costs will be mainly accurate, but some costs may be missed out.

Learners will work to the standard of a competent employee. They will use appropriate specialist terminology throughout, but this may be inconsistent.

For pass standard, learners will identify and explain basic factors that affect the efficiency of use of machines for tasks in a field situation. They will show realistic understanding of the application of these measures to a real task. Learners will apply a limited number of simple efficiency measures to a task and report on the overall efficiency of the operation; some factors will be omitted and the report will be generally accurate, but undeveloped or generic in parts. They will explain the legal and operator requirements relevant to such use, but may not relate these requirements to the overall monitoring of the machinery.

Learners will produce a basic plan for monitoring the efficiency of use of a machine for a given land-based operation. The plan will be undeveloped but realistic, showing limited breadth and depth of understanding of the principles for measuring the efficiency of machines.

Learners will demonstrate competent measurement of the performance of a machine for a land-based task and work safely and legally at all times.

Basic costs of purchasing, operating and maintaining a machine for a task will be calculated with some accuracy but may be incomplete. Learners will make limited use of supporting information and management data. They will show a realistic but undeveloped awareness of data information systems that may be used to monitor the efficiency of operations in the field. Learners will give explanations for the efficiency measures used, but these may be limited in scope. Learners will work to the standard of a novice employee.

The evidence will show some use of relevant specialist terminology but there may be omissions.

Links to other units

This unit links to:

- Unit 1: Professional Working Responsibilities
- Unit 8: Land-based Machinery Operations
- Unit 12: Developing a Land-based Enterprise
- Unit 25: Agricultural Business Improvements.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

Unit 27: Animal Genetics

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners investigate the laws of inheritance and the development of animal species, and apply established genetic techniques.

Unit introduction

The study of genetics and genes dates back to the mid-1800s but the majority of information about genes, and how they interact, has been explained only within the last few decades. Examining the molecular role of DNA is the basis of understanding the mechanism of how characteristics may be passed from parent to offspring.

In this unit, you will develop an understanding of genetics and the laws of inheritance set out by Gregor Mendel. You will investigate the structure and function of genes and DNA, and learn how inheritance works. You will explore the principles of population genetics and the impact of genetics in powering evolution through mutation, adaptation and variation in animals. You will undertake experiments with an appropriate species as you learn about laboratory techniques used in genetic manipulation and analysis in animal breeding.

This unit helps prepare you for roles such as herdsman, animal scientist and technical salesperson, and for further study at higher education level in agriculture, equine studies, and the biological sciences.

Learning aims

In this unit you will:

- A** Investigate the basis of genetics to predict inherited characteristics of animals
- B** Explore the development of animal species through natural and artificial selection processes
- C** Apply manipulation and analysis of animal genetics.

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate the basis of genetics to predict inherited characteristics of animals	A1 Genetic control of protein synthesis A2 Inheritance of characteristics and gene expression	A report on the fundamental principles of genetics, inheritance and evolution of animals, including predictions of inheritance characteristics.
B Explore the development of animal species through natural and artificial selection processes	B1 Population genetics and evolution B2 Natural selection B3 Artificial selection	
C Apply manipulation and analysis of animal genetics	C1 Genetic manipulation and analysis techniques C2 Applications, regulations, politics and ethics of genetic techniques	Evidence of experiments demonstrating application of techniques for genetic manipulation and analysis, supported by a report on the impact of the manipulation and analysis of animal genetics.

Content

Learning aim A: Investigate the basis of genetics to predict inherited characteristics of animals

A1 Genetic control of protein synthesis

Structure, function, location, processes and implications of protein synthesis in animal species.

- Structure and function of nucleic acids:
 - nucleotide structure and phosphodiester bonds
 - deoxyribonucleic acid (DNA)
 - ribonucleic acid (RNA), transfer ribonucleic acid (tRNA), messenger ribonucleic acid (mRNA), ribosomal ribonucleic acid (rRNA), short interfering ribonucleic acid (siRNA).
- DNA replication, including the enzymes involved at each stage:
 - comparison of conservative and semi-conservative replication
 - replication forks
 - Okazaki fragments
 - proofreading and repair.
- Gene expression:
 - transcription and translation – triplet codes, amino acids, splicing
 - methylation and splicing
 - primary, secondary and tertiary protein structure.

A2 Inheritance of characteristics and gene expression

Transfer of genetic information in animal species and associated processes, consequences, advantages and disadvantages.

- Formation of gametes via meiosis.
- Inheritance of chromosomes in gametes:
 - karyotypes
 - diploid, haploid and polyploid chromosomal combinations
 - Mendel's three laws of inheritance – Law of Independent Assortment, Law of Dominance and Law of Segregation.
- Genotypes and allelic interactions:
 - heterozygous and homozygous
 - dominant and recessive alleles, e.g. the presence or absence of horns in sheep or cattle
 - incomplete dominance, e.g. roan cattle
 - co-dominance, e.g. speckling in hens
 - lethal and multiple alleles
 - epistatic effects, e.g. albinism
 - hybrid vigour, e.g. heterosis.
- Ratio and probability of genotypes and phenotypes in offspring:
 - linkage, including sex-linkage and sex-influenced effects.
- Genetics diagrams to second filial generation (F₂):
 - monohybrid and dihybrid crosses
 - construction of Punnett squares.
- Variation:
 - continuous and discontinuous
 - heritability of characteristics, e.g. temperament, litter size, food conversion, coat colour or pattern.

- Mutations, to include:
 - spontaneous and induced
 - point, nonsense, frameshift.
- Quantitative comparisons of observed and expected ratios of phenotypes, e.g. use of the chi-square test and table.

Learning aim B: Explore the development of animal species through natural and artificial selection processes

B1 Population genetics and evolution

Biological theories, processes, factors and triggers for evolution and advantages and disadvantages of consequences for animal species.

- Interspecific and intraspecific variation and adaptations leading to evolution:
 - changes in survival or reproduction rates of different genotypes, selective advantages.
- Speciation – allopatric and sympatric.
- Genetic drift – founder and bottleneck effects.
- Gene flow (migration).
- Convergent and divergent evolution.

B2 Natural selection

- Natural selection and changes in allele frequency:
 - stabilising
 - directional
 - disruptive
 - sexual.

B3 Artificial selection

- Artificial selection of desirable traits.
- Patterns of animal domestication, including primary and secondary breeding and common livestock species, artificial selection of breeding stock.
- Non-random mating:
 - inbreeding, line breeding and outbreeding
 - positive and negative assortative mating.

Learning aim C: Apply manipulation and analysis of animal genetics

C1 Genetic manipulation and analysis techniques

Purposes, stages, advantages and disadvantages of processes and techniques involved in manipulating and analysing animal genetics.

- Genome analysis:
 - DNA extraction techniques
 - polymerase chain reaction (PCR).
- Recombinant DNA (rDNA) technology:
 - gene isolation and restriction enzymes
 - requirements for expression factors.
- Transgenic animal transformation:
 - microinjection
 - use of embryonic stem cells into embryos
 - biolistics
 - electroporation
 - use of viral vectors and retroviruses.
- Cloning:
 - somatic cell nuclear transfer (SCNT).

C2 Applications, regulations, politics and ethics of genetic techniques

Applications, advantages and disadvantages of methods and processes used for genetic analysis and manipulation, including economic, social, ethical and practical implications.

- Health:
 - gene therapy
 - DNA screening/testing
 - genetic testing, e.g. freemartinism in cattle, semen sexing.
- Production purposes:
 - 'pharming' (production of medically useful products in the milk of goats, sheep and cows), e.g. alpha-I antitrypsin, antithrombin III, interferon, lactoferrin.
- Main features of current legislation and regulation, e.g.:
 - Genetically Modified Organisms (Contained Use) Regulations 2014 (the GMO (CU) Regulations)
 - Section 108 of the Environmental Protection Act 1990
 - Genetically Modified Organisms (Risk Assessment) (Records and Exemptions) Regulations 1996
 - Genetically Modified Organisms (Deliberate Release and Risk Assessment- Amendment) Regulations 1997
 - European Food Safety Authority (EFSA) control on genetic modification of animals for the food industry
 - UK production of genetically modified foodstuffs for export.
- Ethical considerations:
 - the purpose and methods of research being carried out
 - effects on stakeholders, groups, individuals and the public from the research process and outcomes
 - potential positive and negative outcomes of the research.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate the basis of genetics to predict inherited characteristics of animals		A.D1 For two animal species from separate classes, assess the extent to which the structural components involved in gene expression contribute to predicted phenotypes.
A.P1 Explain the genetic basis of gene expression. A.P2 For two animal species from separate classes, perform basic predictions of inheritance of characteristics, linking these to the observed phenotypes.	A.M1 Assess how structural components function in the process of gene expression. A.M2 For two animal species from separate classes, perform complex predictions of inheritance of characteristics, linking these to the observed phenotypes.	
Learning aim B: Explore the development of animal species through natural and artificial selection processes		B.D2 Evaluate changes to allele frequencies within populations related to the evolution of an animal species.
B.P3 Explain genetic and environmental factors affecting allele frequencies within an animal species. B.P4 Explain the development of an animal species through natural and artificial selection.	B.M3 Analyse how genetic, environmental and human factors affect development and allele frequencies within an animal species.	
Learning aim C: Apply manipulation and analysis of animal genetics		C.D3 Carry out, with a high degree of accuracy, established animal genetic manipulation and analytical techniques, evaluating the regulation and implications of using genetic manipulation and analytical techniques.
C.P5 Competently carry out established animal genetic manipulation and analytical techniques. C.P6 Explain the regulation and implications of manipulating and analysing animal genetics.	C.M4 Efficiently carry out established animal genetic manipulation and analytical techniques. C.M5 Assess the regulation and implications of using manipulation and analytical techniques in animal genetics.	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aims: A and B (A.P1, A.P2, B.P3, B.P4, A.M1, A.M2, B.M3, A.D1, B.D2)

Learning aim: C (C.P5, C.P6, C.M4, C.M5, B.D2, C.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to:

- PCR thermal cyclers
- DNA collecting and analysis equipment
- a laboratory
- livestock.

Essential information for assessment decisions

Learning aims A and B

For distinction standard, learners will use consistently relevant examples to demonstrate knowledge and understanding of the fundamental principles of genetics and inheritance, thoroughly reviewing the laws of inheritance and the role they have in gene interactions in two relevant animal species. Learners will complete genetic diagrams accurately and independently, with probabilities in ratio form, showing a robust accuracy in making connections between ratios and given scenarios. They will produce detailed and annotated diagrams of protein synthesis and the process of DNA replication, clearly distinguishing transcription and translation and the key elements of each stage. Learners will show breadth and depth in their understanding of Mendelian genetics, relating the laws of inheritance to modern-day animal reproductive scenarios with accuracy. They will also clarify gene interactions and fully explain how they are fundamental in inheritance. Learners' discussions will be supported by valid examples.

Learners will apply comprehensive knowledge and understanding of the evolutionary principles of animal species relevant to modern reproduction systems. The evidence will refer to one animal species, making clear, relevant connections between the intrinsic link between genes and evolution. Learners will make valid references to Charles Darwin's theory of natural selection, common ancestor theory, mutation and adaptation. Learners will meticulously apply evolutionary theory to the domestication of a modern animal species, showing how a species is evolving under artificial reproduction pressures, selective breeding and gene-manipulation techniques. They will provide detailed, in-depth consideration of how genetics and evolution are intrinsically linked to bring about variation and adaptation to environmental factors. Learners will make robust, valid connections between gene manipulation techniques and relevant applications of the techniques used to improve animal production.

The evidence will use technical language accurately and consistently throughout, strengthening the breadth and depth of understanding of genetic principles relating to practical applications.

For merit standard, learners will use mostly relevant examples to demonstrate knowledge and understanding of the fundamental principles of genetics and inheritance. They will give a clear review of the laws of inheritance and the role they have in gene interactions in two relevant animal species. Learners will independently complete genetic diagrams with probabilities in ratio form, showing general accuracy in making connections between ratios and given scenarios. They will produce clear, annotated diagrams of protein synthesis and the process of DNA replication, distinguishing transcription and translation and the key elements of each stage. Learners will show breadth with limited depth in their understanding of Mendelian genetics, relating the laws of inheritance to modern-day animal reproductive scenarios. They will also make mostly accurate use of examples of gene interactions and clearly explain how they are fundamental in inheritance.

Learners will apply relevant knowledge and understanding of the evolutionary principles of animal species relevant to modern reproduction systems. They will refer to one animal species, making mainly relevant and clear connections between the intrinsic link between genes and evolution. Learners will make mostly valid references to Charles Darwin's theory of natural selection, common ancestor theory, mutation and adaptation. Learners will apply evolutionary theory to the domestication of a modern animal species, clearly showing how a species is evolving under artificial reproduction pressures, selective breeding and gene manipulation techniques. They will give a clear, balanced analysis of how genetics and evolution are intrinsically linked to bring about variation and adaptation to environmental factors. Learners will make mostly accurate connections between gene manipulation techniques and relevant applications of the techniques used to improve animal production.

The evidence will use technical language appropriately throughout, with mostly valid connections being made to practical applications.

For pass standard, learners will use some relevant examples to demonstrate basic knowledge and understanding of the fundamental principles of genetics and inheritance. They will give a realistic but undeveloped review of the laws of inheritance and the role they have in gene interactions in two relevant animal species. Learners will complete genetic diagrams independently. These will provide probabilities in ratio form, showing some accuracy but making limited connections to given scenarios, with some irrelevancies. Learners will produce realistic but basic annotated diagrams of protein synthesis and the process of DNA replication, distinguishing transcription and translation, and the key elements of each stage. They will demonstrate breadth with limited depth in their understanding of Mendelian genetics. Learners will be able to clarify gene interactions and explain how they are fundamental in inheritance, although the evidence will be undeveloped or limited in scope.

Learners will apply relevant knowledge and understanding of the evolutionary principles of animal species relevant to modern reproduction systems. They will refer to one appropriate animal species, giving basic, realistic explanations of the intrinsic link between genes and evolution referring to Charles Darwin's theory of natural selection, common ancestor theory, mutation and adaptation. Learners will link evolutionary theory to the domestication of a modern animal species. They will show limited breadth and depth of knowledge regarding how a species is evolving under artificial reproduction pressures, selective breeding and gene manipulation techniques.

The evidence may make some use of appropriate technical language with some relevant connections being made to practical applications.

Learning aim C

In order to achieve learning aim C, learners are required to carry out established animal genetic manipulation and analytical techniques, including DNA extraction and PCR, using genetic kits/ standard laboratory protocol on suitable samples. Learners should carry out the techniques and analysis in relation to one appropriate species, such as the *Drosophila* fruit fly, or a bacteria species, or they should extract DNA from saliva samples, liver or a similar source, or teaching kits. Teachers should ensure that, before carrying out the practical tasks, learners have been made aware of all relevant ethical issues and guidelines. In carrying out the practical tasks, learners should comply with all relevant ethical guidelines.

For distinction standard, learners will demonstrate established techniques for genetic manipulation with a high degree of accuracy. They will interpret practical application for animal improvement, showing insight in reviewing the regulatory and ethical considerations of genetic manipulation and the implications of techniques and associated applications for stakeholder interests and public perception. Learners will be thorough and accurate in demonstrating basic genetic tests such as PCR and DNA extraction practically, using results logically to support their overall evaluations. They will also show breadth and depth of knowledge of the scientific principles and practices behind the techniques used. Learners will carry out all practical tasks confidently and show initiative in doing so within the limits of their responsibility. They will work in a safe manner as required in a laboratory setting, observing all relevant health and safety practices.

Evidence of their series of experiments will be meticulously recorded in an appropriate format such as a laboratory book. Learners will use technical language accurately and consistently throughout.

For merit standard, learners will efficiently demonstrate established techniques for genetic manipulation and associated practical applications for animal improvement. They will apply regulatory and ethical considerations of genetic manipulation in an appropriate way. Learners will show clear understanding of the impact of techniques and associated applications on stakeholder interests and public perception. They will demonstrate basic genetic tests such as PCR and DNA extraction practically and efficiently, using results to give mostly accurate explanations of the process. They will demonstrate breadth with limited depth of understanding of the scientific principles and practices behind the techniques used. Learners will carry out all practical tasks efficiently and show some initiative in doing so within the limits of their responsibility. They will work in a safe manner as required in a laboratory setting, observing all relevant health and safety practices.

Evidence of their series of experiments will be recorded clearly and with some detail in an appropriate format such as a laboratory book. Learners will use technical language throughout.

For pass standard, learners will demonstrate competence in established techniques for genetic manipulation but limited understanding of the practical applications for animal improvement. Their understanding of regulatory and ethical considerations of genetic manipulation will be realistic but limited in scope. Learners will show appropriate but undeveloped consideration of the impact of techniques and associated applications on stakeholder interests and public perception, making limited connections between the various factors involved. They will demonstrate basic genetic tests such as PCR and DNA extraction practically and competently, using results to give some basic explanations of the process. Learners will carry out all practical tasks appropriately but show little initiative in doing so within the limits of their responsibility. They will work in a safe manner as required in a laboratory setting, observing all key health and safety practices.

Evidence of their series of experiments will be recorded in a generally appropriate manner and in an appropriate format such as a laboratory book. Learners may use some appropriate technical language but there may be omissions.

Links to other units

This unit links to:

- Unit 3: Contemporary Issues in the Land-based Sectors
- Unit 7: Farm Livestock Husbandry
- Unit 17: Poultry Production
- Unit 18: Pig Production
- Unit 19: Sheep Production
- Unit 20: Beef Production
- Unit 21: Dairy Production.

Employer involvement

This unit would benefit from employer involvement in the form of:

- technical workshops involving staff from local land-based organisations
- contribution of ideas to unit assignment/project materials
- observation during work experience
- support from local land-based organisation staff as mentors.

4 Planning your programme

How do I choose the right BTEC National qualification for my learners?

BTEC Nationals come in a range of sizes, each with a specific purpose. You will need to assess learners very carefully to ensure that they start on the right size of qualification to fit into their 16–19 study programme, and that they take the right pathways or optional units that allow them to progress to the next stage.

If a learner is clear that they want to progress to the workplace they should be directed towards an occupationally-specific qualification, such as a BTEC National Diploma, from the outset.

Some learners may want to take a number of complementary qualifications or keep their progression options open. These learners may be suited to taking a BTEC National Certificate or Extended Certificate. Learners who then decide to continue with a fuller vocational programme can transfer to a BTEC National Diploma or Extended Diploma, for example for their second year.

Some learners are sure of the sector they want to work in and are aiming for progression into that sector via higher education. These learners should be directed to the two-year BTEC National Extended Diploma as the most suitable qualification.

As a centre, you may want to teach learners who are taking different qualifications together. You may also wish to transfer learners between programmes to meet changes in their progression needs. You should check the qualification structures and unit combinations carefully as there is no exact match among the different sizes. You may find that learners need to complete more than the minimum number of units when transferring.

When learners are recruited, you need to give them accurate information on the title and focus of the qualification for which they are studying.

Is there a learner entry requirement?

As a centre it is your responsibility to ensure that learners who are recruited have a reasonable expectation of success on the programme. There are no formal entry requirements but we expect learners to have qualifications at or equivalent to Level 2.

Learners are most likely to succeed if they have:

- five GCSEs at good grades and/or
- BTEC qualification(s) at Level 2
- achievement in English and mathematics through GCSE or Functional Skills.

Learners may demonstrate ability to succeed in various ways. For example, learners may have relevant work experience or specific aptitude shown through diagnostic tests or non-educational experience.

What is involved in becoming an approved centre?

All centres must be approved before they can offer these qualifications – so that they are ready to assess learners and so that we can provide the support that is needed. Further information is given in *Section 8*.

What level of sector knowledge is needed to teach these qualifications?

We do not set any requirements for teachers but expect that centres will assess the overall skills and knowledge of the teaching team to ensure that they are relevant and up to date. This will give learners a rich programme to prepare them for employment in the sector. As part of the requirements of the programme are to involve employers in delivery this should support centres in ensuring that they are following up to date practices when delivering the programme.

What resources are required to deliver these qualifications?

As part of your centre approval you will need to show that the necessary material resources and work spaces are available to deliver BTEC Nationals. For some units, specific resources are required. This is indicated in the units.

Which modes of delivery can be used for these qualifications?

You are free to deliver BTEC Nationals using any form of delivery that meets the needs of your learners. We recommend making use of a wide variety of modes, including direct instruction in classrooms or work environments, investigative and practical work, group and peer work, private study and e-learning.

What are the requirements for meaningful employer involvement?

Requirements

This BTEC National Extended Diploma in Agriculture has been designed as a Tech Level qualification. As an approved centre you are required to ensure that during their study, every learner has access to meaningful activity involving employers. Involvement should be with employers from the agriculture sector and should form a significant part of the delivery or assessment of the qualification. Each centre's approach to employer involvement will be monitored in two ways. It will be monitored at centre level in the first term each year as part of the annual quality management review process that addresses centre strategy for delivery, assessment and quality assurance, when we will ask you to show evidence of how employer involvement is provided for all learners. You will need to show evidence in order to gain reporting clearance for certification. It will be monitored also at programme level as part of the standards verification process to confirm that plans for employer involvement meet the requirements of the specification. These approaches are designed to ensure additional activities can be scheduled where necessary so learners are not disadvantaged (see *Section 8 Quality assurance*).

We know that the vast majority of programmes already have established links with employers. In order to give you maximum flexibility in creating and strengthening employer involvement, we have not specified a particular level of input from employers. However, meaningful employer involvement, as defined below, should contribute significantly to at least **three** units of which one must be a mandatory unit. For this qualification, learners are expected to undertake 300 hours of work experience.

There are suggestions in many of the units about how employers could become involved in delivery and/or assessment. These suggestions are not exhaustive and there will be other possibilities at local level.

Employer involvement in these units is subject to verification as part of the standards verification process (see *Section 8*).

Definition

Activities that are eligible to be counted as meaningful engagement are:

- structured work experience or work placements that develop skills and knowledge relevant to the qualification
- projects or assessments set with input from industry practitioners
- masterclasses or guest lectures from industry practitioners
- 'expert witness' reports from practitioners that contribute to the assessment of a learner's work.

There may be other ways in which learners can benefit from contact with employers or prepare for employment, such as listening to careers talks or working in simulated environments. While they provide benefits to learners they do not count as meaningful engagement.

Support

It is important that you give learners opportunities that are high quality and directly relevant to their study. We will support you in this through guidance materials and by giving you examples of best practice.

What support is available?

We provide a wealth of support materials, including curriculum plans, delivery guides, authorised assignment briefs, additional papers for external assessments and examples of marked learner work.

You will be allocated a Standards Verifier early on in the planning stage to support you with planning your assessments. There will be extensive training programmes as well as support from our Subject Advisor team.

For further details see *Section 10*.

How will my learners become more employable through these qualifications?

BTEC Nationals are mapped to relevant occupational standards (see *Appendix 1*).

In the mandatory content and the selected optional units that focus on technical preparation learners will be acquiring the key knowledge and skills that employers need. Also, employability skills such as team working and entrepreneurialism, and completing realistic tasks, have been built into the design of the learning aims and content. This gives you the opportunity to use relevant contexts, scenarios and materials to enable learners to develop a portfolio of evidence that demonstrates the breadth of their skills and knowledge in a way that equips them for employment.

5 Assessment structure and external assessment

Introduction

BTEC Nationals are assessed using a combination of *internal assessments*, which are set and marked by teachers, and *external assessments* which are set and marked by Pearson:

- mandatory units have a combination of internal and external assessments
- all optional units are internally assessed.

We have taken great care to ensure that the assessment method chosen is appropriate to the content of the unit and in line with requirements from employers and higher education.

In developing an overall plan for delivery and assessment for the programme, you will need to consider the order in which you deliver units, whether delivery is over short or long periods and when assessment can take place. Some units are defined as synoptic units (see *Section 2*). Normally, a synoptic assessment is one that a learner would take later in a programme and in which they will be expected to apply learning from a range of units. Synoptic units may be internally or externally assessed. Where a unit is externally assessed you should refer to the sample assessment materials (SAMs) to identify where there is an expectation that learners draw on their wider learning. For internally-assessed units, you must plan the assignments so that learners can demonstrate learning from across their programme. A unit may be synoptic in one qualification and not another because of the relationship it has to the rest of the qualification.

We have addressed the need to ensure that the time allocated to final assessment of internal and external units is reasonable so that there is sufficient time for teaching and learning, formative assessment and development of transferable skills.

In administering internal and external assessment, the centre needs to be aware of the specific procedures and policies that apply, for example to registration, entries and results. An overview with signposting to relevant documents is given in *Section 7*.

Internal assessment

Our approach to internal assessment for these qualifications will be broadly familiar to experienced centres. It offers flexibility in how and when you assess learners, provided that you meet assessment and quality assurance requirements. You will need to take account of the requirements of the unit format, which we explain in *Section 3*, and the requirements for delivering assessment given in *Section 6*.

External assessment

A summary of the external assessment for this qualification is given in *Section 2*. You should check this information carefully, together with the unit specification and the sample assessment materials, so that you can timetable learning and assessment periods appropriately.

Learners must be prepared for external assessment by the time they undertake it. In preparing learners for assessment you will want to take account of required learning time, the relationship with other external assessments and opportunities for retaking. You should ensure that learners are not entered for unreasonable amounts of external assessment in one session. Learners may resit an external assessment to obtain a higher grade of near pass or above. If a learner has more than one attempt, then the best result will be used for qualification grading, up to the permitted maximum. It is unlikely that learners will need to or benefit from taking all assessments twice so you are advised to plan appropriately. Some assessments are synoptic and learners are likely to perform best if these assessments are taken towards the end of the programme.

Key features of external assessment in agriculture

In agriculture, after consultation with stakeholders, we have developed the following:

- *Unit 1: Professional Working Responsibilities* – learners complete written tasks examining their knowledge and skills in the areas of professional working practice, personal welfare, and responsibilities for themselves, others and the environment. The unit provides crucial knowledge and skills for the wide-ranging roles found in the agricultural sector.
- *Unit 2: Plant and Soil Science* – learners complete a written examination demonstrating their knowledge of plant structures, systemic processes, and nutrition and soil composition and management. The unit provides fundamental knowledge of the processes for healthy plant growth, which is important for the wide-ranging roles in agriculture, such as crop technician.
- *Unit 3: Contemporary Issues in the Land-based Sectors* – learners complete written tasks consolidating their research into contemporary issues in the land-based sectors. The unit provides essential skills to interrogate sources of information on issues facing those working in the sectors and to draw critical conclusions on the validity and importance of the information.

Units

The externally-assessed units have a specific format which we explain in *Section 3*. The content of units will be sampled across external assessments over time, through appropriate papers and tasks. The ways in which learners are assessed are shown through the assessment outcomes and grading descriptors. External assessments are marked and awarded using the grade descriptors. The grades available are Distinction (D), Merit (M), Pass (P) and Near Pass (N). The Near Pass (N) grade gives learners credit below a Pass, where they have demonstrated evidence of positive performance which is worth more than an unclassified result but not yet at the Pass standard.

Sample assessment materials

Each externally-assessed unit has a set of sample assessment materials (SAMs) that accompanies this specification. The SAMs are there to give you an example of what the external assessment will look like in terms of the feel and level of demand of the assessment. In the case of units containing synoptic assessment, the SAMs will also show where learners are expected to select and apply from across the programme.

The SAMs show the range of possible question types that may appear in the actual assessments. They give you a good indication of how the assessments will be structured. While SAMs can be used for practice with learners as with any assessment, the content covered and specific details of the questions asked will change in each assessment.

A copy of each of these assessments can be downloaded from our website. To allow your learners further opportunities for practice, an additional sample of each of the Pearson-set units will be available before the first sitting of the assessment.

6 Internal assessment

This section gives an overview of the key features of internal assessment and how you, as an approved centre, can offer it effectively. The full requirements and operational information are given in the *Pearson Quality Assurance Handbook*. All members of the assessment team need to refer to this document.

For BTEC Nationals it is important that you can meet the expectations of stakeholders and the needs of learners by providing a programme that is practical and applied. Centres can tailor programmes to meet local needs and use links with local employers and the wider vocational sector.

When internal assessment is operated effectively it is challenging, engaging, practical and up to date. It must also be fair to all learners and meet national standards.

Principles of internal assessment

Assessment through assignments

For internally-assessed units, the format of assessment is an assignment taken after the content of the unit, or part of the unit if several assignments are used, has been delivered. An assignment may take a variety of forms, including practical and written types. An assignment is a distinct activity completed independently by learners that is separate from teaching, practice, exploration and other activities that learners complete with direction from, and formative assessment by, teachers.

An assignment is issued to learners as an assignment brief with a defined start date, a completion date and clear requirements for the evidence that they need to provide. There may be specific observed practical components during the assignment period. Assignments can be divided into tasks and may require several forms of evidence. A valid assignment will enable a clear and formal assessment outcome based on the assessment criteria.

Assessment decisions through applying unit-based criteria

Assessment decisions for BTEC Nationals are based on the specific criteria given in each unit and set at each grade level. To ensure that standards are consistent in the qualification and across the suite as a whole, the criteria for each unit have been defined according to a framework. The way in which individual units are written provides a balance of assessment of understanding, practical skills and vocational attributes appropriate to the purpose of qualifications.

The assessment criteria for a unit are hierarchical and holistic. For example, if an M criterion requires the learner to show 'analysis' and the related P criterion requires the learner to 'explain', then to satisfy the M criterion a learner will need to cover both 'explain' and 'analyse'. The unit assessment grid shows the relationships among the criteria so that assessors can apply all the criteria to the learner's evidence at the same time. In *Appendix 2* we have set out a definition of terms that assessors need to understand.

Assessors must show how they have reached their decisions using the criteria in the assessment records. When a learner has completed all the assessment for a unit then the assessment team will give a grade for the unit. This is given simply according to the highest level for which the learner is judged to have met all the criteria. Therefore:

- to achieve a Distinction, a learner must have satisfied all the Distinction criteria (and therefore the Pass and Merit criteria); these define outstanding performance across the unit as a whole
- to achieve a Merit, a learner must have satisfied all the Merit criteria (and therefore the Pass criteria) through high performance in each learning aim
- to achieve a Pass, a learner must have satisfied all the Pass criteria for the learning aims, showing coverage of the unit content and therefore attainment at Level 3 of the national framework.

The award of a Pass is a defined level of performance and cannot be given solely on the basis of a learner completing assignments. Learners who do not satisfy the Pass criteria should be reported as Unclassified.

The assessment team

It is important that there is an effective team for internal assessment. There are three key roles involved in implementing assessment processes in your centre, each with different interrelated responsibilities, the roles are listed below. Full information is given in the *Pearson Quality Assurance Handbook*.

- The Lead Internal Verifier (the Lead IV) has overall responsibility for the programme, its assessment and internal verification to meet our requirements, record keeping and liaison with the Standards Verifier. The Lead IV registers with Pearson annually. The Lead IV acts as an assessor, supports the rest of the assessment team, makes sure that they have the information they need about our assessment requirements and organises training, making use of our guidance and support materials.
- Internal Verifiers (IVs) oversee all assessment activity in consultation with the Lead IV. They check that assignments and assessment decisions are valid and that they meet our requirements. IVs will be standardised by working with the Lead IV. Normally, IVs are also assessors but they do not verify their own assessments.
- Assessors set or use assignments to assess learners to national standards. Before taking any assessment decisions, assessors participate in standardisation activities led by the Lead IV. They work with the Lead IV and IVs to ensure that the assessment is planned and carried out in line with our requirements.

Effective organisation

Internal assessment needs to be well organised so that the progress of learners can be tracked and so that we can monitor that assessment is being carried out in line with national standards. We support you through, for example, providing training materials and sample documentation.

It is particularly important that you manage the overall assignment programme and deadlines to make sure that learners are able to complete assignments on time.

Learner preparation

To ensure that you provide effective assessment for your learners, you need to make sure that they understand their responsibilities for assessment and the centre's arrangements.

From induction onwards, you will want to ensure that learners are motivated to work consistently and independently to achieve the requirements of the qualifications. Learners need to understand how assignments are used, the importance of meeting assignment deadlines and that all the work submitted for assessment must be their own.

You will need to give learners a guide that explains how assignments are used for assessment, how assignments relate to the teaching programme and how learners should use and reference source materials, including what would constitute plagiarism. The guide should also set out your approach to operating assessment, such as how learners must submit work and request extensions.

Setting effective assignments

Setting the number and structure of assignments

In setting your assignments, you need to work with the structure of assignments shown in the *Essential information for assignments* section of a unit. This shows the structure of the learning aims and criteria that you must follow and the recommended number of assignments that you should use. For some units we provide authorised assignment briefs. For all the units we give you suggestions on how to create suitable assignments. You can find these materials along with this specification on our website. In designing your own assignment briefs you should bear in mind the following points.

- The number of assignments for a unit must not exceed the number shown in *Essential information for assignments*. However, you may choose to combine assignments, for example to create a single assignment for the whole unit.
- You may also choose to combine all or parts of different units into single assignments, provided that all units and all their associated learning aims are fully addressed in the programme overall. If you choose to take this approach, you need to make sure that learners are fully prepared so that they can provide all the required evidence for assessment and that you are able to track achievement in the records.
- A learning aim must always be assessed as a whole and must not be split into two or more tasks.
- The assignment must be targeted to the learning aims but the learning aims and their associated criteria are not tasks in themselves. Criteria are expressed in terms of the outcome shown in the evidence.
- For units containing synoptic assessment, the planned assignments must allow learners to select and apply their learning using appropriate self-management of tasks.
- You do not have to follow the order of the learning aims of a unit in setting assignments but later learning aims often require learners to apply the content of earlier learning aims and they may require learners to draw their learning together.
- Assignments must be structured to allow learners to demonstrate the full range of achievement at all grade levels. Learners need to be treated fairly by being given the opportunity to achieve a higher grade if they have the ability.
- As assignments provide a final assessment, they will draw on the specified range of teaching content for the learning aims. The specified content is compulsory. The evidence for assessment need not cover every aspect of the teaching content as learners will normally be given particular examples, case studies or contexts in their assignments. For example, if a learner is carrying out one practical performance, or an investigation of one organisation, then they will address all the relevant range of content that applies in that instance.

Providing an assignment brief

A good assignment brief is one that, through providing challenging and realistic tasks, motivates learners to provide appropriate evidence of what they have learned.

An assignment brief should have:

- a vocational scenario, this could be a simple situation or a full, detailed set of vocational requirements that motivates the learner to apply their learning through the assignment
- clear instructions to the learner about what they are required to do, normally set out through a series of tasks
- an audience or purpose for which the evidence is being provided
- an explanation of how the assignment relates to the unit(s) being assessed.

Forms of evidence

BTEC Nationals have always allowed for a variety of forms of evidence to be used, provided that they are suited to the type of learning aim being assessed. For many units, the practical demonstration of skills is necessary and for others, learners will need to carry out their own research and analysis. The units give you information on what would be suitable forms of evidence to give learners the opportunity to apply a range of employability or transferable skills. Centres may choose to use different suitable forms for evidence to those proposed. Overall, learners should be assessed using varied forms of evidence.

Full definitions of types of assessment are given in *Appendix 2*. These are some of the main types of assessment:

- written reports
- projects
- time-constrained practical assessments with observation records and supporting evidence
- recordings of performance
- sketchbooks, working logbooks, reflective journals
- presentations with assessor questioning.

The form(s) of evidence selected must:

- allow the learner to provide all the evidence required for the learning aim(s) and the associated assessment criteria at all grade levels
- allow the learner to produce evidence that is their own independent work
- allow a verifier to independently reassess the learner to check the assessor's decisions.

For example, when you are using performance evidence, you need to think about how supporting evidence can be captured through recordings, photographs or task sheets.

Centres need to take particular care that learners are enabled to produce independent work.

For example, if learners are asked to use real examples, then best practice would be to encourage them to use their own or to give the group a number of examples that can be used in varied combinations.

Making valid assessment decisions

Authenticity of learner work

Once an assessment has begun, learners must not be given feedback on progress towards fulfilling the targeted criteria.

An assessor must assess only learner work that is authentic, i.e. learners' own independent work. Learners must authenticate the evidence that they provide for assessment through signing a declaration stating that it is their own work.

Assessors must ensure that evidence is authentic to a learner through setting valid assignments and supervising them during the assessment period. Assessors must take care not to provide direct input, instructions or specific feedback that may compromise authenticity.

Assessors must complete a declaration that:

- the evidence submitted for this assignment is the learner's own
- the learner has clearly referenced any sources used in the work
- they understand that false declaration is a form of malpractice.

Centres can use Pearson templates or their own templates to document authentication.

During assessment, an assessor may suspect that some or all of the evidence from a learner is not authentic. The assessor must then take appropriate action using the centre's policies for malpractice. Further information is given in *Section 7*.

Making assessment decisions using criteria

Assessors make judgements using the criteria. The evidence from a learner can be judged using all the relevant criteria at the same time. The assessor needs to make a judgement against each criterion that evidence is present and sufficiently comprehensive. For example, the inclusion of a concluding section may be insufficient to satisfy a criterion requiring 'evaluation'.

Assessors should use the following information and support in reaching assessment decisions:

- the *Essential information for assessment decisions* section in each unit gives examples and definitions related to terms used in the criteria
- the explanation of key terms in *Appendix 2*
- examples of assessed work provided by Pearson
- your Lead IV and assessment team's collective experience, supported by the standardisation materials we provide.

Pass and Merit criteria relate to individual learning aims. The Distinction criteria as a whole relate to outstanding performance across the unit. Therefore, criteria may relate to more than one learning aim (for example A.D1) or to several learning aims (for example DE.D3). Distinction criteria make sure that learners have shown that they can perform consistently at an outstanding level across the unit and/or that they are able to draw learning together across learning aims.

Dealing with late completion of assignments

Learners must have a clear understanding of the centre policy on completing assignments by the deadlines that you give them. Learners may be given authorised extensions for legitimate reasons, such as illness at the time of submission, in line with your centre policies.

For assessment to be fair, it is important that learners are all assessed in the same way and that some learners are not advantaged by having additional time or the opportunity to learn from others. Therefore, learners who do not complete assignments by your planned deadline or the authorised extension deadline may not have the opportunity to subsequently resubmit.

If you accept a late completion by a learner, then the assignment should be assessed normally when it is submitted using the relevant assessment criteria.

Issuing assessment decisions and feedback

Once the assessment team has completed the assessment process for an assignment, the outcome is a formal assessment decision. This is recorded formally and reported to learners.

The information given to the learner:

- must show the formal decision and how it has been reached, indicating how or where criteria have been met
- may show why attainment against criteria has not been demonstrated
- must not provide feedback on how to improve evidence
- must be validated by an IV before it is given to the learner.

Resubmission of improved evidence

An assignment provides the final assessment for the relevant learning aims and is normally a final assessment decision, except where the Lead IV approves one opportunity to resubmit improved evidence based on the completed assignment brief.

The Lead IV has the responsibility to make sure that resubmission is operated fairly. This means:

- checking that a learner can be reasonably expected to perform better through a second submission, for example that the learner has not performed as expected
- making sure that giving a further opportunity can be done in such a way that it does not give an unfair advantage over other learners, for example through the opportunity to take account of feedback given to other learners
- checking that the assessor considers that the learner will be able to provide improved evidence without further guidance and that the original evidence submitted remains valid.

Once an assessment decision has been given to the learner, the resubmission opportunity must have a deadline within 15 working days in the same academic year.

A resubmission opportunity must not be provided where learners:

- have not completed the assignment by the deadline without the centre's agreement
- have submitted work that is not authentic.

Retake of internal assessment

A learner who has not achieved the level of performance required to pass the relevant learning aims after resubmission of an assignment may be offered a single retake opportunity using a new assignment. The retake may only be achieved at a Pass.

The Lead Internal Verifier must only authorise a retake of an assignment in exceptional circumstances where they believe it is necessary, appropriate and fair to do so. For further information on offering a retake opportunity, you should refer to the *BTEC Centre Guide to Internal Assessment*. We provide information on writing assignments for retakes on our website (www.btec.co.uk/keydocuments).

Planning and record keeping

For internal processes to be effective, an assessment team needs to be well organised and keep effective records. The centre will also work closely with us so that we can quality assure that national standards are being satisfied. This process gives stakeholders confidence in the assessment approach.

The Lead IV must have an assessment plan, produced as a spreadsheet. When producing a plan, the assessment team may wish to consider:

- the time required for training and standardisation of the assessment team
- the time available to undertake teaching and carry out assessment, taking account of when learners may complete external assessments and when quality assurance will take place
- the completion dates for different assignments
- who is acting as IV for each assignment and the date by which the assignment needs to be verified
- setting an approach to sampling assessor decisions through internal verification that covers all assignments, assessors and a range of learners
- how to manage the assessment and verification of learners' work so that they can be given formal decisions promptly
- how resubmission opportunities can be scheduled.

The Lead IV will also maintain records of assessment undertaken. The key records are:

- verification of assignment briefs
- learner authentication declarations
- assessor decisions on assignments, with feedback given to learners
- verification of assessment decisions.

Examples of records and further information are given in the *Pearson Quality Assurance Handbook*.

7 Administrative arrangements

Introduction

This section focuses on the administrative requirements for delivering a BTEC qualification. It will be of value to Quality Nominees, Lead IVs, Programme Leaders and Examinations Officers.

Learner registration and entry

Shortly after learners start the programme of learning, you need to make sure that they are registered for the qualification and that appropriate arrangements are made for internal and external assessment. You need to refer to the *Information Manual* for information on making registrations for the qualification and entries for external assessments.

Learners can be formally assessed only for a qualification on which they are registered. If learners' intended qualifications change, for example if a learner decides to choose a different pathway specialism, then the centre must transfer the learner appropriately.

Access to assessment

Both internal and external assessments need to be administered carefully to ensure that all learners are treated fairly, and that results and certification are issued on time to allow learners to progress to chosen progression opportunities.

Our equality policy requires that all learners should have equal opportunity to access our qualifications and assessments, and that our qualifications are awarded in a way that is fair to every learner. We are committed to making sure that:

- learners with a protected characteristic are not, when they are undertaking one of our qualifications, disadvantaged in comparison to learners who do not share that characteristic
- all learners achieve the recognition they deserve for undertaking a qualification and that this achievement can be compared fairly to the achievement of their peers.

Further information on access arrangements can be found in the Joint Council for Qualifications (JCQ) document *Access Arrangements, Reasonable Adjustments and Special Consideration for General and Vocational Qualifications*.

Administrative arrangements for internal assessment

Records

You are required to retain records of assessment for each learner. Records should include assessments taken, decisions reached and any adjustments or appeals. Further information can be found in the *Information Manual*. We may ask to audit your records so they must be retained as specified.

Reasonable adjustments to assessment

A reasonable adjustment is one that is made before a learner takes an assessment to ensure that they have fair access to demonstrate the requirements of the assessments. You are able to make adjustments to internal assessments to take account of the needs of individual learners. In most cases this can be achieved through a defined time extension or by adjusting the format of evidence. We can advise you if you are uncertain as to whether an adjustment is fair and reasonable. You need to plan for time to make adjustments if necessary.

Further details on how to make adjustments for learners with protected characteristics are given on our website in the document *Supplementary guidance for reasonable adjustment and special consideration in vocational internally-assessed units*.

Special consideration

Special consideration is given after an assessment has taken place for learners who have been affected by adverse circumstances, such as illness. You must operate special consideration in line with our policy (see previous paragraph). You can provide special consideration related to the period of time given for evidence to be provided or for the format of the assessment if it is equally valid. You may not substitute alternative forms of evidence to that required in a unit, or omit the application of any assessment criteria to judge attainment. Pearson can consider applications for special consideration in line with the policy.

Appeals against assessment

Your centre must have a policy for dealing with appeals from learners. These appeals may relate to assessment decisions being incorrect or assessment not being conducted fairly. The first step in such a policy could be a consideration of the evidence by a Lead IV or other member of the programme team. The assessment plan should allow time for potential appeals after assessment decisions have been given to learners. If there is an appeal by a learner, you must document the appeal and its resolution. Learners have a final right of appeal to Pearson but only if the procedures that you have put in place have not been followed. Further details are given in the document *Enquiries and appeals about Pearson vocational qualifications and end point assessment policy*.

Administrative arrangements for external assessment

Entries and resits

For information on the timing of assessment and entries, please refer to the annual examinations timetable on our website.

Access arrangements requests

Access arrangements are agreed with Pearson before an assessment. They allow students with special educational needs, disabilities or temporary injuries to:

- access the assessment
- show what they know and can do without changing the demands of the assessment.

Access arrangements should always be processed at the time of registration. Learners will then know what type of arrangements are available in place for them.

Granting reasonable adjustments

For external assessment, a reasonable adjustment is one that we agree to make for an individual learner. A reasonable adjustment is defined for the individual learner and informed by the list of available access arrangements.

Whether an adjustment will be considered reasonable will depend on a number of factors, to include:

- the needs of the learner with the disability
- the effectiveness of the adjustment
- the cost of the adjustment; and
- the likely impact of the adjustment on the learner with the disability and other learners.

Adjustment may be judged unreasonable and not approved if it involves unreasonable costs, timeframes or affects the integrity of the assessment.

Special consideration requests

Special consideration is an adjustment made to a learner's mark or grade after an external assessment to reflect temporary injury, illness or other indisposition at the time of the assessment. An adjustment is made only if the impact on the learner is such that it is reasonably likely to have had a material effect on that learner being able to demonstrate attainment in the assessment.

Centres are required to notify us promptly of any learners who they believe have been adversely affected and request that we give special consideration. Further information can be found in the special requirements section on our website.

Conducting external assessments

Centres must make arrangements for the secure delivery of external assessments. External assessments for BTEC qualifications include examinations, set tasks and performance.

Each external assessment has a defined degree of control under which it must take place. Some external assessments may have more than one part and each part may have a different degree of control. We define degrees of control as follows.

High control

This is the completion of assessment in formal invigilated examination conditions.

Medium control

This is completion of assessment, usually over a longer period of time, which may include a period of controlled conditions. The controlled conditions may allow learners to access resources, prepared notes or the internet to help them complete the task.

Low control

These are activities completed without direct supervision. They may include research, preparation of materials and practice. The materials produced by learners under low control will not be directly assessed.

Further information on responsibilities for conducting external assessment is given in the document *Instructions for Conducting External Assessments*, available on our website.

Dealing with malpractice in assessment

Malpractice means acts that undermine the integrity and validity of assessment, the certification of qualifications, and/or that may damage the authority of those responsible for delivering the assessment and certification.

Pearson does not tolerate actions (or attempted actions) of malpractice by learners, centre staff or centres in connection with Pearson qualifications. Pearson may impose penalties and/or sanctions on learners, centre staff or centres where incidents (or attempted incidents) of malpractice have been proven.

Malpractice may arise or be suspected in relation to any unit or type of assessment within the qualification. For further details regarding malpractice and advice on preventing malpractice by learners, please see Pearson's *Centre guidance: Dealing with malpractice and maladministration in vocational qualifications*, available on our website.

The procedures we ask you to adopt vary between units that are internally-assessed and those that are externally assessed.

Internally-assessed units

Centres are required to take steps to prevent malpractice and to investigate instances of suspected malpractice. Learners must be given information that explains what malpractice is for internal assessment and how suspected incidents will be dealt with by the centre. The *Centre Guidance: Dealing with Malpractice* document gives full information on the actions we expect you to take.

Pearson may conduct investigations if we believe that a centre is failing to conduct internal assessment according to our policies. The above document gives further information, examples and details the penalties and sanctions that may be imposed.

In the interests of learners and centre staff, centres need to respond effectively and openly to all requests relating to an investigation into an incident of suspected malpractice.

Externally-assessed units

External assessment means all aspects of units that are designated as external in this specification, including preparation for tasks and performance. For these assessments, centres must follow the JCQ procedures set out in the latest version of *JCQ Suspected Malpractice in Examinations and Assessments Policies and Procedures* (www.jcq.org.uk).

In the interests of learners and centre staff, centres need to respond effectively and openly to all requests relating to an investigation into an incident of suspected malpractice.

Learner malpractice

Heads of Centres are required to report incidents of any suspected learner malpractice that occur during Pearson external assessments. We ask that centres do so by completing a *JCQ Form M1* (available at www.jcq.org.uk/exams-office/malpractice) and emailing it and any accompanying documents (signed statements from the learner, invigilator, copies of evidence, etc.) to the Investigations Team at candidatemaalpractice@pearson.com. The responsibility for determining appropriate sanctions or penalties to be imposed on learners lies with Pearson.

Learners must be informed at the earliest opportunity of the specific allegation and the centre's malpractice policy, including the right of appeal. Learners found guilty of malpractice may be disqualified from the qualification for which they have been entered with Pearson.

Teacher/centre malpractice

Heads of Centres are required to inform Pearson's Investigations Team of any incident of suspected malpractice by centre staff, before any investigation is undertaken. Heads of centres are requested to inform the Investigations Team by submitting a *JCQ Form M2(a)* (available at www.jcq.org.uk/exams-office/malpractice) with supporting documentation to pqsmalpractice@pearson.com. Where Pearson receives allegations of malpractice from other sources (for example Pearson staff or anonymous informants), the Investigations Team will conduct the investigation directly or may ask the head of centre to assist.

Incidents of maladministration (accidental errors in the delivery of Pearson qualifications that may affect the assessment of learners) should also be reported to the Investigations Team using the same method.

Heads of Centres/Principals/Chief Executive Officers or their nominees are required to inform learners and centre staff suspected of malpractice of their responsibilities and rights; see Section 6.15 of the *JCQ Suspected Malpractice in Examinations and Assessments Policies and Procedures* document.

Pearson reserves the right in cases of suspected malpractice to withhold the issuing of results and/or certificates while an investigation is in progress. Depending on the outcome of the investigation results and/or certificates may be released or withheld.

You should be aware that Pearson may need to suspend certification when undertaking investigations, audits and quality assurances processes. You will be notified within a reasonable period of time if this occurs.

Sanctions and appeals

Where malpractice is proven we may impose sanctions or penalties.

Where learner malpractice is evidenced, penalties may be imposed such as:

- mark reduction for external assessments
- disqualification from the qualification
- being barred from registration for Pearson qualifications for a period of time.

If we are concerned about your centre's quality procedures we may impose sanctions such as:

- working with you to create an improvement action plan
- requiring staff members to receive further training
- placing temporary blocks on your certificates
- placing temporary blocks on registration of learners
- debarring staff members or the centre from delivering Pearson qualifications
- suspending or withdrawing centre approval status.

The centre will be notified if any of these apply.

Pearson has established procedures for centres that are considering appeals against penalties and sanctions arising from malpractice. Appeals against a decision made by Pearson will normally be accepted only from Heads of Centres (on behalf of learners and/or members of staff) and from individual members (in respect of a decision taken against them personally). Further information on appeals can be found in our *Enquiries and appeals about Pearson vocational qualifications and end point assessment policy*, which is on our website. In the initial stage of any aspect of malpractice, please notify the Investigations Team by email via pqsmalpractice@pearson.com who will inform you of the next steps.

Certification and results

Once a learner has completed all the required components for a qualification, even if final results for external assessments have not been issued, then the centre can claim certification for the learner, provided that quality assurance has been successfully completed. For the relevant procedures please refer to our *Information Manual*. You can use the information provided on qualification grading to check overall qualification grades.

Results issue

After the external assessment session, learner results will be issued to centres. The result will be in the form of a grade. You should be prepared to discuss performance with learners, making use of the information we provide and post-results services.

Post-assessment services

Once results for external assessments are issued, you may find that the learner has failed to achieve the qualification or to attain an anticipated grade. It is possible to transfer or reopen registration in some circumstances. The *Information Manual* gives further information.

Changes to qualification requests

Where a learner who has taken a qualification wants to resit an externally-assessed unit to improve their qualification grade, you firstly need to decline their overall qualification grade. You may decline the grade before the certificate is issued. For a learner receiving their results in August, you should decline the grade by the end of September if the learner intends to resit an external assessment.

Additional documents to support centre administration

As an approved centre you must ensure that all staff delivering, assessing and administering the qualifications have access to this documentation. These documents are reviewed annually and are reissued if updates are required.

- *Pearson Quality Assurance Handbook*: this sets out how we will carry out quality assurance of standards and how you need to work with us to achieve successful outcomes.
- *Information Manual*: this gives procedures for registering learners for qualifications, transferring registrations, entering for external assessments and claiming certificates.
- *Lead Examiners' Reports*: these are produced after each series for each external assessment and give feedback on the overall performance of learners in response to tasks or questions set.
- *Instructions for the Conduct of External Assessments (ICEA)*: this explains our requirements for the effective administration of external assessments, such as invigilation and submission of materials.
- *Regulatory policies*: our regulatory policies are integral to our approach and explain how we meet internal and regulatory requirements. We review the regulated policies annually to ensure that they remain fit for purpose. Policies related to this qualification include:
 - adjustments for candidates with disabilities and learning difficulties, access arrangements and reasonable adjustments for general and vocational qualifications
 - age of learners
 - centre guidance for dealing with malpractice
 - recognition of prior learning and process.

This list is not exhaustive and a full list of our regulatory policies can be found on our website.

8 Quality assurance

Centre and qualification approval

As part of the approval process, your centre must make sure that the resource requirements listed below are in place before offering the qualification.

- Centres must have appropriate physical resources (for example equipment, IT, learning materials, teaching rooms) to support the delivery and assessment of the qualification.
- Staff involved in the assessment process must have relevant expertise and/or occupational experience.
- There must be systems in place to ensure continuing professional development for staff delivering the qualification.
- Centres must have in place appropriate health and safety policies relating to the use of equipment by learners.
- Centres must deliver the qualification in accordance with current equality legislation.
- Centres should refer to the teacher guidance section in individual units to check for any specific resources required.

Continuing quality assurance and standards verification

On an annual basis, we produce the *Pearson Quality Assurance Handbook*. It contains detailed guidance on the quality processes required to underpin planning for delivery including appropriate employer involvement, and for robust assessment and internal verification.

The key principles of quality assurance are that:

- a centre delivering BTEC programmes must be an approved centre, and must have approval for the programmes or groups of programmes that it is delivering
- the centre agrees, as part of gaining approval, to abide by specific terms and conditions around the effective delivery and quality assurance of assessment; it must abide by these conditions throughout the period of delivery
- Pearson makes available to approved centres a range of materials and opportunities, through online standardisation, intended to exemplify the processes required for effective assessment, and examples of effective standards. Approved centres must use the materials and services to ensure that all staff delivering BTEC qualifications keep up to date with the guidance on assessment
- an approved centre must follow agreed protocols for standardisation of assessors and verifiers, for the planning, monitoring and recording of assessment processes, and for dealing with special circumstances, appeals and malpractice.

The approach of quality-assured assessment is through a partnership between an approved centre and Pearson. We will make sure that each centre follows best practice and employs appropriate technology to support quality-assurance processes, where practicable. We work to support centres and seek to make sure that our quality-assurance processes do not place undue bureaucratic processes on centres. We monitor and support centres in the effective operation of assessment and quality assurance.

The methods we use to do this for BTEC Level 3 include:

- making sure that all centres complete appropriate declarations at the time of approval
- undertaking approval visits to centres
- making sure that centres have effective teams of assessors and verifiers who are trained to undertake assessment
- assessment sampling and verification, through requested samples of assessments, completed assessed learner work and associated documentation
- an overarching review and assessment of a centre's strategy for delivering and quality assuring its BTEC programmes, for example making sure that synoptic units are placed appropriately in the order of delivery of the programme.

Centres that do not fully address and maintain rigorous approaches to delivering, assessing and quality assurance cannot seek certification for individual programmes or for all BTEC Level 3 programmes. An approved centre must make certification claims only when authorised by us and strictly in accordance with requirements for reporting.

Centres that do not comply with remedial action plans may have their approval to deliver qualifications removed.

9 Understanding the qualification grade

Awarding and reporting for the qualification

This section explains the rules that we apply in awarding a qualification and in providing an overall qualification grade for each learner. It shows how all the qualifications in this sector are graded.

The awarding and certification of these qualifications will comply with regulatory requirements.

Eligibility for an award

In order to be awarded a qualification, a learner must complete all units, achieve a Near Pass (N) or above in all external units and a pass or above in all mandatory units unless otherwise specified. Refer to the structure in *Section 2*.

To achieve any qualification grade, learners must:

- complete and **have an outcome** (D, M, P, N or U) for all units within a valid combination
- achieve the **required units at pass or above** shown in *Section 2*, and for the Diploma achieve a minimum of 600 GLH and Extended Diploma achieve a minimum 900 GLH at Pass or above (or N or above in external units)
- achieve the **minimum number of points** at a grade threshold.

It is the responsibility of a centre to ensure that a correct unit combination is adhered to. Learners who do not achieve the required minimum grade (N or P) in units shown in the structure will not achieve a qualification.

Learners who do not achieve sufficient points for a qualification or who do not achieve all the required units may be eligible to achieve a smaller qualification in the same suite provided they have completed and achieved the correct combination of units and met the appropriate qualification grade points threshold.

Calculation of the qualification grade

The final grade awarded for a qualification represents an aggregation of a learner's performance across the qualification. As the qualification grade is an aggregate of the total performance, there is some element of compensation in that a higher performance in some units may be balanced by a lower outcome in others.

In the event that a learner achieves more than the required number of optional units, the mandatory units along with the optional units with the highest grades will be used to calculate the overall result, subject to the eligibility requirements for that particular qualification title.

BTEC Nationals are Level 3 qualifications and are awarded at the grade ranges shown in the table below.

Qualification	Available grade range
Certificate, Extended Certificate, Foundation Diploma	P to D*
Diploma	PP to D*D*
Extended Diploma	PPP to D*D*D*

The *Calculation of qualification grade* table, shown further on in this section, shows the minimum thresholds for calculating these grades. The table will be kept under review over the lifetime of the qualification. The most up to date table will be issued on our website.

Pearson will monitor the qualification standard and reserves the right to make appropriate adjustments.

Learners who do not meet the minimum requirements for a qualification grade to be awarded will be recorded as Unclassified (U) and will not be certificated. They may receive a Notification of Performance for individual units. The *Information Manual* gives full information.

Points available for internal units

The table below shows the number of **points** available for internal units. For each internal unit, points are allocated depending on the grade awarded.

	Unit size	
	60 GLH	
U	0	
Pass	6	
Merit	10	
Distinction	16	

Points available for external units

Raw marks from the external units will be awarded **points** based on performance in the assessment. The table below shows the **minimum number of points** available for each grade in the external units.

	Unit size	
	90 GLH	120 GLH
U	0	0
Near Pass	6	8
Pass	9	12
Merit	15	20
Distinction	24	32

Pearson will automatically calculate the points for each external unit once the external assessment has been marked and grade boundaries have been set. For more details about how we set grade boundaries in the external assessment please go to our website.

Claiming the qualification grade

Subject to eligibility, Pearson will automatically calculate the qualification grade for your learners when the internal unit grades are submitted and the qualification claim is made. Learners will be awarded qualification grades for achieving the sufficient number of points within the ranges shown in the relevant *Calculation of qualification grade* table for the cohort.

Calculation of qualification grade

Applicable for registration from 1 September 2019.

Extended Certificate		Foundation Diploma		Diploma		Extended Diploma	
360 GLH		540 GLH		720 GLH		1080 GLH	
Grade	Points threshold	Grade	Points threshold	Grade	Points threshold	Grade	Points threshold
U	0	U	0	U	0	U	0
Pass	36	P	54	PP	72	PPP	108
				MP	88	MPP	124
						MMP	140
Merit	52	M	78	MM	104	MMM	156
				DM	124	DMM	176
						DDM	196
Distinction	74	D	108	DD	144	DDD	216
				D*D	162	D*DD	234
						D*D*D	252
Distinction*	90	D*	138	D*D*	180	D*D*D*	270

The table is subject to review over the lifetime of the qualification. The most up-to-date version will be issued on our website.

Examples of grade calculations based on table applicable to registrations from September 2019

Example 1: Achievement of an Extended Diploma with a PPP grade

	GLH	Type (Int/Ext)	Grade	Unit points
Unit 1	120	Ext	Pass	12
Unit 2	120	Ext	Pass	12
Unit 3	120	Ext	Pass	12
Unit 4	60	Int	Merit	10
Unit 5	60	Int	Pass	6
Unit 8	60	Int	Distinction	16
Unit 9	60	Int	Pass	6
Unit 13	60	Int	Pass	6
Unit 25	60	Int	Pass	6
Unit 6	60	Int	Pass	6
Unit 7	60	Int	Pass	6
Unit 10	60	Int	Pass	6
Unit 16	60	Int	Pass	6
Unit 18	60	Int	Merit	10
Unit 26	60	Int	U	0
Totals	1080		PPP	120

The learner has achieved N or higher in Units 1, 2 and 3, and P or higher in Units 13 and 25.

The learner has sufficient points for a PPP grade.

Example 2: Achievement of an Extended Diploma with a DDD grade

	GLH	Type (Int/Ext)	Grade	Unit points
Unit 1	120	Ext	Merit	20
Unit 2	120	Ext	Near Pass	8
Unit 3	120	Ext	Distinction	32
Unit 4	60	Int	Merit	10
Unit 5	60	Int	Distinction	16
Unit 8	60	Int	Distinction	16
Unit 9	60	Int	Merit	10
Unit 13	60	Int	Distinction	16
Unit 25	60	Int	Distinction	16
Unit 6	60	Int	Distinction	16
Unit 7	60	Int	Distinction	16
Unit 10	60	Int	Distinction	16
Unit 16	60	Int	Distinction	16
Unit 18	60	Int	Distinction	16
Unit 26	60	Int	Pass	6
Totals	1080		DDD	230

The learner has sufficient points for a DDD grade.

Example 3: An Unclassified result for an Extended Diploma

	GLH	Type (Int/Ext)	Grade	Unit points
Unit 1	120	Ext	Merit	20
Unit 2	120	Ext	Pass	12
Unit 3	120	Ext	Pass	12
Unit 4	60	Int	Merit	10
Unit 5	60	Int	Merit	10
Unit 8	60	Int	Distinction	16
Unit 9	60	Int	Merit	10
Unit 13	60	Int	Merit	10
Unit 25	60	Int	Merit	10
Unit 6	60	Int	U	0
Unit 7	60	Int	U	0
Unit 10	60	Int	U	0
Unit 16	60	Int	U	0
Unit 18	60	Int	Merit	10
Unit 26	60	Int	Pass	6
Totals	1080		U	126

The learner has 240 GLH at U.

The learner has sufficient points for an MPP and has achieved N or higher in Units 1, 2, and 3, and P or higher in Units 13 and 25, but has not met the minimum requirement for 900 GLH at Pass or above.

10 Resources and support

Our aim is to give you a wealth of resources and support to enable you to deliver BTEC National qualifications with confidence. On our website you will find a list of resources to support teaching and learning, and professional development.

Support for setting up your course and preparing to teach

Specification

This **specification** (for teaching from September 2019) includes details on the administration of qualifications and information on all the units for the qualification.

Delivery Guide

This free guide gives you important advice on how to choose the right course for your learners and how to ensure you are fully prepared to deliver the course. It explains the key features of BTEC Nationals (for example employer involvement and employability skills). It also covers guidance on assessment (internal and external) and quality assurance. The guide tells you where you can find further support and gives detailed unit-by-unit delivery guidance. It includes teaching tips and ideas, assessment preparation and suggestions for further resources.

Schemes of work

Free sample schemes of work are provided for each mandatory unit. These are available in Word™ format for ease of customisation.

Curriculum models

These show how the BTECs in the suite fit into a 16–19 study programme, depending on their size and purpose. The models also show where other parts of the programme, such as work experience, maths and English, tutorial time and wider study, fit alongside the programme.

Study skills activities

A range of case studies and activities is provided; they are designed to help learners develop the study skills they need to successfully complete their BTEC course. The case studies and activities are provided in Word™ format for easy customisation.

Support for teaching and learning

Pearson Learning Services provides a range of engaging resources to support BTEC Nationals, including introductory guides to the Next Generation BTEC National approach to learning.

Teaching and learning resources are also available from a number of other publishers.

Details of Pearson's own resources and of all endorsed resources can be found on our website.

Support for assessment

Sample assessment materials for externally-assessed units

Sample assessments are available for the Pearson-set units. One copy of each of these assessments can be downloaded from the website/available in print. For each suite, an additional sample for one of the Pearson-set units is also available, allowing your learners further opportunities for practice.

Further sample assessments will be made available through our website on an ongoing basis.

Sample assessment materials for internally-assessed units

We do not prescribe the assessments for the internally-assessed units. Rather, we allow you to set your own, according to your learners' preferences and to link with your local employment profile.

We do provide a service in the form of Authorised Assignment Briefs, which are approved by Pearson Standards Verifiers. They are available via our website.

Sample marked learner work

To support you in understanding the expectation of the standard at each grade, examples of marked learner work at PM/MD grades are linked to the Authorised Assignment Briefs.

Training and support from Pearson

People to talk to

There are many people who are available to support you and provide advice and guidance on delivery of your BTEC Nationals. These include:

- Subject Advisors – available for all sectors. They understand all Pearson qualifications in their sector and so can answer sector-specific queries on planning, teaching, learning and assessment
- Standards Verifiers – they can support you with preparing your assignments, ensuring that your assessment plan is set up correctly, and support you in preparing learner work and providing quality assurance through sampling
- Curriculum Development Managers (CDMs) – they are regionally based and have a full overview of the BTEC qualifications and of the support and resources that Pearson provides. CDMs often run network events
- Customer Services – the 'Support for You' section of our website gives the different ways in which you can contact us for general queries. For specific queries, our service operators can direct you to the relevant person or department.

Training and professional development

Pearson provides a range of training and professional development events to support the introduction, delivery, assessment and administration of BTEC National qualifications. These sector-specific events, developed and delivered by specialists, are available both face to face and online.

'Getting Ready to Teach'

These events are designed to get teachers ready for delivery of the BTEC Nationals. They include an overview of the qualifications' structures, planning and preparation for internal and external assessment, and quality assurance.

Teaching and learning

Beyond the 'Getting Ready to Teach' professional development events, there are opportunities for teachers to attend sector- and role-specific events. These events are designed to connect practice to theory; they provide teacher support and networking opportunities with delivery, learning and assessment methodology.

Details of our training and professional development programme can be found on our website.

Appendix 1 Links to industry standards

BTEC Nationals have been developed in consultation with industry and appropriate sector bodies to ensure that the qualification content and approach to assessment aligns closely to the needs of employers. Where they exist, and are appropriate, National Occupational Standards (NOS) and professional body standards have been used to establish unit content.

In the agriculture sector, the following approach has been used: the mandatory content has been mapped to NOS to reflect the essential skills and knowledge needed for entry to employment.

Appendix 2 Glossary of terms used for internally-assessed units

This is a summary of the key terms used to define the requirements in the units.

Term	Definition
Analyse	Learners present the outcome of methodical and detailed examination, either: <ul style="list-style-type: none"> • breaking down a theme, topic or situation in order to interpret and study the interrelationships between the parts and/or • of information or data to interpret and study key trends and interrelationships. Analysis can be through performance, practice, written or, less commonly, verbal presentation.
Apply	Learners complete practical tasks drawing on knowledge of concepts and processes.
Assess	Learners present a careful consideration of varied factors or events that apply to a specific situation, or identify those which are the most important or relevant and arrive at a conclusion.
Carry out	Learners demonstrate skills through practical activities, in line with certain requirements. Learners do this in order to complete an identified activity or to demonstrate personal achievement for an audience.
Compare	Learners identify the main factors relating to two or more items/situations or aspects of a subject that is extended to explain the similarities, differences, advantages and disadvantages. This is used to show depth of knowledge through selection and isolation of characteristics.
Demonstrate	Learners' work, performance or practice evidences the ability to carry out and apply knowledge, understanding and/or skills in a practical situation.
Develop	Learners acquire and apply skills and understanding through practical activities that involve the use of concepts, processes or techniques to expand or progress something.
Evaluate	Learners' work draws on varied information, themes or concepts to consider aspects such as: <ul style="list-style-type: none"> • strengths or weaknesses • advantages or disadvantages • alternative actions • relevance or significance. Learners' inquiries should lead to a supported judgement showing relationship to its context. This will often be in a conclusion. Evidence of explanations could be through visual explanations with annotations as well as written work, presentation, performance or practice.

Term	Definition
Examine	Learners select and apply knowledge to less familiar contexts.
Explain	Learners' work shows clear detail and gives reasons and/or evidence to support an opinion, view or argument. It could show how conclusions are drawn (arrived at). Learners show that they comprehend the origins, functions and objectives of a subject, and its suitability for purpose.
Explore	Learners apply their skills and/or knowledge in contexts involving practical research or investigation.
Justify	Learners give reasons or evidence to: <ul style="list-style-type: none"> • support an opinion • prove something right or reasonable.
Perform	Learners demonstrate a range of skills required to complete a given activity.
Plan	Learners create a way of doing a task or series of tasks to achieve specific requirements or objectives, showing progress from start to finish.
Produce	Learners' knowledge, understanding and/or skills are applied to develop a particular type of evidence, for example a proposal, plan, product, service or report.
Reflect	Learners consider their own performance and/or skills and development in relation to a specific scenario or scenarios and/or wider context(s). This may include feedback from others. There is often a requirement for learners to identify strengths and areas for improvement, along with a personal development or action plan.
Review	Learners make a formal assessment of work produced. The assessment allows learners to appraise existing information or prior events, and reconsider information with the intention of making changes, if necessary.
Select	Learners choose the best or most suitable option, whether this is of materials, techniques, equipment or processes. The options and choices should be based on specific criteria.
Undertake	Learners demonstrate skills through practical activities, often referring to given processes or techniques.

This is a key summary of the types of evidence used for BTEC Nationals.

Type of evidence	Definition and purpose
Case study	A specific example to which all learners must select and apply knowledge. Used to show application to a realistic context where direct experience cannot be gained.
Development log	A record kept by learners to show the process of development. Used to show method, self-management and skill development.
Individual project	A self-directed, large-scale activity requiring planning, research, exploration, outcome and review. Used to show self-management, project management and/or deep learning, including synopticity.
Log	A record made by learners of how a process of development was carried out, including experimental stages, testing, selection and rejection of alternatives, practice or development steps.
Plan	Learners produce a plan as an outcome related to a given or limited task.
Portfolio	Digital or physical, showing a selection of work that contributes towards a project or for a specific purpose.
Practical task (artefact/outcome)	Learners carry out a defined or self-defined task to produce an outcome.
Presentation	To show presentation skills, including communication. To direct to a given audience and goal. To extract and summarise information.
Project	A large-scale activity requiring planning, research, exploration, outcome and review. Used to show self-management, project management and/or deep learning, including synopticity.
Research	An analysis of substantive research organised by learners from secondary and, if applicable, primary sources.
Written task/report	Individual completion of a task in a work-related format, e.g. a report, marketing communication, set of instructions.

Pearson BTEC Level 3 Nationals in Agriculture

Extended Certificate in Agriculture

Foundation Diploma in Agriculture

Diploma in Agriculture

Extended Diploma in Agriculture

For more information about Edexcel, BTEC or LCCI qualifications
visit qualifications.pearson.com

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