Unit 11: Undertake Land-based Industries Pollution and Waste Control Management

Unit code: L/600/9801

QCF Level 3: BTEC National

Credit value: 10

Guided learning hours: 60

Aim and purpose

This unit aims to provide learners with an understanding of the principles of land-based industries pollution and waste management control and how these can be applied in practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

Unit introduction

There are practical activities, based on the application and disposal of organic waste as well as the planning of waste management, that all farms have to deal with since the introduction of the Government's Waste Legislation Act 2007.

This unit applies of theoretical knowledge to practical farm management situations, especially where farmers and farm managers are having to cope with new and imminent waste management legislation that governs their production systems. Learners will become familiar with the major laws governing waste management that affect farm businesses, and how farms are dealing with the problems of waste on both a short-term and long-term basis.

Learning outcomes

On completion of this unit a learner should:

1 Understand the source and attributes of organic and inorganic waste

2 Know the scope of waste management legislation and regulation

3 Know how to manage waste in a farm environment

4 Be able to safely dispose of waste in a farm environment.

Unit content

1 Understand the source and attributes of organic and inorganic waste

Organic waste: types (eg manure and slurry, straw, sprays, feeds, wood, dead-stock, dirty water, milk, paper bags); hazardous wastes; chemical composition of organic wastes

Inorganic waste: types (eg fertilisers, fertiliser bags, sheep dip, batteries, machinery workshop waste, net wrap, twine and bale wrapping, plastics, tyres, building material, veterinary medicine equipment, containers); hazardous wastes; chemical composition of specific inorganic wastes

Attributes of waste: statistics for waste and pollution; types of pollution (eg diffuse, point-source); eutrophication and biological oxygen demand (BOD); nitrogen cycle; carbon cycle; acidification

2 Know the scope of waste management legislation and regulation

Major legislation: Environmental Protection Act (including Nitrate Vulnerable Zones-NVZ's); Waste Regulations 2007

Other relevant legislation: safe manual handling; Control of Substances Hazardous to Health-(COSHH); Groundwater Regulations; Control of Pollution Act; air quality; codes of practice; Health and Safety at Work Act; risk assessment

3 Know how to manage waste in a farm environment

Manage organic waste: calculate amount produced; types of storage; methods of manure analysis; manure management plan; dirty water (where applicable); anaerobic digestion; bio-beds; silage effluent; recycling; records

Manage inorganic wastes: checklist of types produced; personal protective equipment-PPE; types of storage; storage protection

4 Be able to safely dispose of waste in a farm environment

Dispose of organic waste: types of machinery and methods of application; carry out manure disposal activities; dead-stock disposal methods; incineration; records

Dispose of inorganic waste: methods of disposal; exemptions and environmental permits

Assessment and grading criteria

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

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 explain sources of organic and inorganic wastes and their attributes in a given situation	**M1** monitor the quantity of waste produced for a given farm situation	**D1** make recommendations to reduce waste for a given farm situation
P2 discuss factors that influence the quantity of waste		
P3 describe selected current legislation and codes of practice that control the storage, handling and disposal of farm waste		
P4 outline constraints current regulations place on a waste management and husbandry system		
P5 describe appropriate methods for the management of organic and inorganic farm waste in accordance with relevant legislation and regulation	**M2** carry out a waste management audit, using a current standard checklist, for a given farm situation	**D2** evaluate the disposal of a selected farm's waste making recommendations for improvements to the farm's waste management plan.
P6 outline storage and disposal facilities for organic and inorganic farm waste in a given situation		
P7 demonstrate the safe disposal of selected organic farm waste in accordance with a given waste management plan [IE, CT, RL, TW, EP]	**M3** monitor the disposal of a selected farm organic waste over a given period.	
P8 prepare a waste management plan for organic and inorganic waste in a given situation.		

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

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

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical and written assessments and visits to suitable collections. It is likely to have links to work-related experience placements.

Delivery of this unit will have special significance for those farm enterprises that either produce a lot of waste or that are having to come to terms with the current legislation. For example, dairy farms with large herds based on a cubicle-housing system are faced with having to plan for compliance with new waste legislation relating to the storage and application of slurry. Arable farms producing inorganic waste such as fertiliser bags, chemical spray containers and machinery waste are becoming used to the waste regulations, but might re-think their approach to soil management and the wider implications for the whole arable enterprise. Tutors will need, therefore, to consider the experience that the course can offer learners, and where a centre does not have a livestock enterprise, or where it is contracted out, tutors will need to develop links with farmers where learners can gain relevant experience in dealing with organic waste such as manures or slurry.

Tutors must continually stress the areas relating to safety and safe handling and also the relevance to sustainability issues and the challenges that farm enterprises are faced with in reducing waste and its cost. Tutors may also wish to consider learners being trained for relevant industry-related tests such as telescopic forklift, safe manual handling and safe use of pesticides and sprays (for example PA1, PA2, PA4, PA6).

Learners may need access to farm records for some of the assessments.

Learning outcome 1 involves learners being able to identify and appreciate waste products and the waste problem that farm enterprises are currently faced with. Learners need to assess quantities of waste produced for specific enterprises. This becomes especially relevant in a livestock enterprise where animals are housed, such as in the case of beef cattle or dairy cows.

For learning outcome 2, teaching legislation is often challenging, particularly in engaging and motivating learners, so any practical activities will help to stimulate and enforce the theory regarding legislation. Tutors should be able to use practical situations to show learners where farmers are having to deal with legislation relevant to solid manures or slurries.

For learning outcome 3 learners need to be reasonably familiar with the legislation from learning outcome 2 in order to appreciate issues that farm enterprises are faced with when complying with legislation. Learners may have had practical experience in farm activities where they had to comply with legislation that they did not know anything about. For example, the wearing of PPE, handling materials, or spreading slurry in an 'open-period'. All assessment criteria for this learning outcome can be viewed by learners in a different light to what they may have been used to, and the tutor should endeavour to reflect this in their delivery.

Learning outcome 4 requires learners to carry out various related farm activities safely, such as manure/slurry spreading, disposal of chemicals such as sheep dip, washing out chemical containers, disposal of dead-stock and disposal of veterinary medicine products after treating animals.

Outline learning plan

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

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

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

Topic and suggested assignments/activities and/assessment
Introduction to unit and unit overview.
Assignment 1: Types and Quantities of Farm Waste (P1,P2,M1,D1) Tutor introduces assignment.
Theory session: types of organic waste, amounts, hazards, chemical composition.
Theory session: types of inorganic waste, amounts, hazards, chemical composition.
Theory session: statistics for waste production, eutrophication and its effects, nitrogen cycle, carbon cycle, acidification, risk assessment.
Practical session: identify farm wastes, calculate amounts produced, carry out a risk assessment.
Assignment 2: Waste Legislation and Regulations (P3, P4) Tutor introduces assignment.
Theory session: major legislation, its effect on farms, COSHH.
Theory session: safe manual handling, health and safety issues, risk assessment.
Practical session: safe handling methods, visit farm enterprises.
Assignment 3: Managing Farm Waste (P5, P6, M2) Tutor introduces assignment.
Theory session: calculate amounts produced, storage methods, disposal methods, safety.
Practical session: identify farm waste storage, waste disposal, identify waste handling machinery.
Assignment 4: Plan for and Dispose of Farm Waste (P7, P8, M3, D2) Tutor introduces assignment.
Theory session: waste planning, methods of waste disposal, dead-stock, anaerobic digestion, recycling methods, records.
Practical session: carry out selected activities for disposing of organic farm waste, waste management planning.
Unit review.

Assessment

For P1, learners must include a livestock and an arable enterprise that cover both types of waste. Their description must include waste attributes, which means whether the wastes are hazardous or not, and other important criteria such as waste content and smell.

For P2, learners must describe the factors that influence the quantity of waste, so, for example, with regard to a livestock enterprise and organic waste, learners would need to describe how the animals are housed, length of time they are housed, type of diet and frequency of feeding. Where an arable enterprise is considered, learners will need to describe all the quantities of inorganic waste produced, such as seed and fertiliser bags, spray containers, machinery and workshop waste, and other items such as plastics and metal.

For P3, learners must describe current legislation that covers the storage, handling and disposal of farm waste. They are expected to state the main piece of legislation, the date it came into force and other relevant updated and amended legislation applicable to a farm business.

For P4, learners must describe how legislation, both current and proposed, imposes constraints on a farm business and its management. For example, the NVZ regulations impose strict limits on the amount and timing of slurry applications to a dairy enterprise, whereas a straw-based system has less of a storage problem than a cubicle system producing slurry.

For P5, learners must describe how a farm enterprise manages its organic and inorganic waste taking into account the constraints outlined in P4. For example, they should describe how often a slurry store is stirred and emptied, how often a straw-based system of housing is cleaned out and where the manure is stored.

For P6, learners must describe the storage and disposal method for organic and inorganic waste. For example, storage and disposal systems for slurry must include not only the main store, but also items such as a reception pit, pump, stirrer or agitator, machinery and equipment such as umbilical hoses, slurry spreaders, and relevant tractor power. Inorganic waste disposal might include containers for needles, syringes and bottles.

For P7, learners need to show competence in the safe disposal of organic waste. This might include practical assessment of safe slurry or manure application in a field.

For P8, learners must produce a farm waste management plan for both organic and inorganic waste. They could produce an organic waste plan as this is a legal requirement for a farm producing manure from a livestock enterprise and DEFRA has suitable instructions as to how to prepare a plan. For inorganic waste, learners could prepare a plan for a given farm enterprise where machinery or an arable crop using sprays produces the relevant waste.

For M1, learners are to assess the quantity of waste produced for a given farm situation. The waste chosen should be the same for all learners, to ensure fairness and equality of assessment. A useful scenario could be a livestock enterprise that needs to calculate the total amount of slurry or manure produced, for example in a herd of cows. If other waste is to be considered, it must include items such as dirty water and parlour washings, disposable materials such as needles, syringes, gloves, string, bale-wrap and plastic, plastic chemical containers, and milking machinery materials. For M2, learners are to carry out an audit using a suitable checklist such as from www.netregs.gov.uk, or a standard template supplied by the tutor. For M3, learners are to monitor the disposal of organic waste for a specified period. Where manure is used, learners must include the field incorporation of the manure.

For D1, learners must make realistic recommendations for reducing farm waste. This may include, for example, the purchase of an anaerobic digester for a dairy enterprise, but the plan must be realistic and commercially viable. Likewise, where recycling water is used the scheme must be commercially viable and practicable. Costs will need to be included and justified. For D2, learners must be able to describe how a specified farm's waste is currently disposed of, and how much this costs the farm. The recommendations will link in with those for reducing waste in D1.

Programme of suggested assignments

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

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, M1, D1	Types and Quantities of Farm Waste	You are to identify organic and inorganic farm waste in a given farm situation, monitor the amounts produced and discuss how these could be reduced realistically.	Written evidence. Monitoring/diary. Independent research.
P3, P4	Waste Legislation and Regulations	You are to describe the current legislation relating to the control, handling, storage and disposal of farm waste and how this legislation affects the farm.	Written evidence.
P5, P6, M2	Managing Farm Waste	You have been asked to carry out a waste management audit on your farm and, to this end, you should produce and complete a checklist that covers how a business complies with waste management, storage and disposal methods. On completion of the audit, you should make suitable recommendations for improvements.	Written evidence. Practical observation. Independent research.
P7, P8, M3, D2	Planning and Disposal of Farm Waste	In line with current legislation, you are to prepare a waste management plan for both organic and inorganic waste for a given farm situation. Following on from that, you must also demonstrate the safe disposal of specified organic waste.	Written evidence. Practical observation.

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

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

Level 2	Level 3
Undertake Work Related Experience in the Land-based Industries	Undertake Agricultural Livestock Production
Introduction to Farm Animal Production	Undertake Agricultural Crop Production
Assist with Agricultural Crop Production	Undertaking Farm Habitat Management

Essential resources

Learners will need access to farm enterprises covering livestock and arable/machinery, possibly in a farm situation, work experience and local farms . They will need to be aware of a farm's overall waste management programme with special regard to the environment. Learners must also be able to carry out certain field operations such as slurry/manure application in a safe manner, using tractors and relevant machinery.

Farm visits/talks are to be encouraged to local farms and associated enterprises such as anaerobic digesters and recycling centres for learners to see and experience the full scope that the unit encompasses. A farm's physical and financial records should be available at relevant times for learners during the programme.

Employer engagement and vocational contexts

The unit focuses on the practical application of the theory associated with waste management. This will involve not only use of a centre's farm but also local farms. A useful reciprocal agreement might take place where a farm is used as a case study, and the farmer invited to listen to and comment on learners' views regarding the management of waste and their recommendations for waste reduction and improvement.

Indicative reading for learners

Textbooks

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

Davie T – *Fundamentals of Hydrology* (Taylor and Francis, 2002) ISBN 0415220297

Environment agency – *Recycling agricultural waste plastics, growing a greener business* (Environment Agency 2005) ISBN 1-84432 426X

Glasson J – *Introduction to Environmental Impact Assessment* (Spon Press, 2005) ISBN 0415338360

Goudie A – *The Human Impact on the Natural Environment* (Blackwell Publishing, 2006) ISBN 13: 978-1-4051-2704-2

Mason C – *Biology of Freshwater Pollution, 4th Edition* (Prentice Hall, 2002) ISBN 0130906395

Perry J and Vanderklein E – *Water Quality: Management of a Natural Resource* (Blackwell Science, 1996) ISBN 086542469 1

Pillay T – *Aquaculture and the Environment, 2nd Edition* (Blackwell Publishing, 2004) ISBN 1405101679

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

Other publications

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

DEFRA – *Protecting our Water, Soil and Air* (The Stationery Office Books, 2009) ISBN 978 0 11 243284-5

DEFRA – *Waste strategy for England* (HMSO, 2007)

LEAF Integrated Farm Management guide

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

Journals

Crops

Farm Business

Farmers Guardian

Farmers Weekly

Websites

www.defra.gov.uk	Defra is the UK government department responsible for policy and regulations on the environment, food and rural affairs.
www.adas.co.uk	ADAS is the UK's largest independent provider of environmental consultancy, rural development services and policy advice.
www.environment-agency.gov.uk	An Executive Non-departmental Public Body responsible to the Secretary of State for Environment, Food and Rural Affairs and an Assembly Sponsored Public Body responsible to the National Assembly for Wales.
www.leafuk.org	LEAF (Linking Environment And Farming) promotes environmentally responsible farming.
www.netregs.gov.uk	NetRegs provides free environmental guidance for small and medium-sized businesses in the UK.
www.nutrientmanagement.org	Tried & Tested Nutrient Management Plan, an aid to making nutrient planning and recording simple and practical for you and your farm.
www.wasterecycling.org.uk	NetRegs Waste Directory offers an easy way to find out where you can recycle or dispose of your business waste.
www.wrap.org.uk	WRAP works in England, Scotland, Wales and Northern Ireland to help businesses and individuals reap the benefits of reducing waste, develop sustainable products and use resources in an efficient way.

Delivery of personal, learning and thinking skills (PLTS)

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

Skill	When learners are ...
Independent enquirers	identifying and monitoring farm waste
Creative thinkers	monitoring and planning aspects of waste management
Reflective learners	monitoring and planning aspects of waste management
Team workers	engaged in practical activities, work experience and team planning an assignment to present to a farmer/farm manager
Effective participators	engaged in practical activities, work experience and team planning an assignment to present to a farmer/farm manager.

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

Skill	When learners are ...
Creative thinkers	producing a farm waste management plan
Reflective learners	making recommendations to reduce farm waste, visiting local farm enterprises
Team workers	carrying out practical waste disposal activities
Effective participators	carrying out practical waste disposal activities.

Functional Skills — Level 2

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

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	calculating organic farm waste production, storage and disposal for a relevant enterprise
Identify the situation or problem and the mathematical methods needed to tackle it	
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	producing written reports and audits to make judgements on, and recommendations for, the reduction or improvement of farm waste management.
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	