Unit 37: Understanding Land-based Machinery Management

Unit code: Y/601/4273

QCF Level 3: BTEC National

Credit value: 10

Guided learning hours: 60

● Aim and purpose

This unit aims to introduce learners to the principles of utilisation and management of land based machines and how these can be applied in practice. It is designed for learners in centre-based settings looking to progress into the sector or onto further/higher education.

● Unit introduction

The need to manage the broad range of specialist land-based vehicles (LBVs) effectively has become more important as businesses analyse their machinery needs and costs. Manufacturers have developed land-based vehicles that are complex in design yet reliable and effective in operation. Those employed in the management of LBVs must have the knowledge and skills to ensure machines and their operators are suitable for the job, safe and cost effective.

This unit provides the knowledge and skills needed to enable correct methods of assessing specifications, costs and safety considerations to be used. Health and safety issues associated with the management of machinery will be stressed during the delivery of this unit.

Learners will examine factors that should be considered when selecting a piece of equipment and methods of paying for items. They will consider how the efficiency of machinery can be assessed and managed as well as the costs involved in running them. They will also look into the relevant legislation and codes of practice associated with land-based machinery management.

● Learning outcomes

On completion of this unit a learner should:

1 Understand selection criteria for machinery

2 Understand acquisition of land-based machinery

3 Understand measures for determining the efficiency and financial costs of machinery operation

4 Know regulation that affects the ownership and operation of land-based machinery.

Unit content

1 Understand selection criteria for machinery

Factors: working requirements for the machine eg work conditions, volume of work, expertise of operators; machine specification eg engine power, hydraulic power, operator comfort, suitability for work, fit for purpose, available machine options; business requirements eg costs (purchase cost, running costs, resale values, expected life); after-sales service eg warranty period and conditions, availability of spare parts, dealer support, operator training; relevant, current legislation

2 Understand acquisition of land-based machinery

Options: sources of finance eg personal capital, bank loan; purchasing options (direct purchase, bank loan, hire purchase, contract hire, leasing); list price and availability of discounts from suppliers and manufacturers; second-hand machinery purchase options eg direct from vendor, auctions; replacement options (resale value, trade-in value, varying contract types)

3 Understand measures for determining the efficiency and financial costs of machinery operation

Efficiency: measurement and calculation of efficiency; spot rate; effective rate; machine throughputs; factors affecting efficiency; methods of improving efficiency

Depreciation: straight line, reducing balance; importance of and relationship to business financial statements

Costs: purchase price; fixed and variable costs (tax, insurance, fuel, maintenance, labour); servicing schedules; fuel; servicing; repairs; record keeping; operator training; methods used to reduce costs

4 Know regulation that affects the ownership and operation of land-based machinery

Requirements of and reasons for relevant current legislation: health and safety eg Health and Safety at Work Act 1974 (HSWA), Provision and Use of Work Equipment Regulations (PUWER) 1998, Lifting Operations and Lifting Equipment Regulations (LOLER) 1998; consequences of accidents at work; environmental protection eg Environment Act 1995; vehicles on the highway eg tax, construction and use regulations, lighting regulations, safety, driver licensing requirements; other current legislation and codes of practice relevant to particular pieces of machinery; operator training eg initial, continuing professional development (CPD)

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 criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 explain the factors that should be considered when selecting appropriate land-based machinery [IE, CT]	**M1** select equipment for a given situation and explain the criteria used in the process	**D1** explain alternative acquirement options that will increase system margins and profitability
P2 determine selection criteria for land-based machinery [RL]		
P3 examine sources for obtaining machinery	**M2** for the equipment selected in M1 explain their sources and the financial options available to secure their use	
P4 discuss financial options for obtaining machinery [EP]		
P5 explain methods of measuring efficiency of machine operation [TW]	**M3** measure the efficiency of real time machinery operations and calculate the costs associated with the system	**D2** explain alternative systems that could be investigated or used that will improve efficiency and comply with current and future legislation.
P6 calculate costs associated with machine operation [SM]		
P7 explain how relevant codes of practice and legal requirements influence machinery ownership and operation	**M4** for the equipment measured in M3 describe how relevant codes of practice will affect their purchase and operation.	
P8 state the legal requirements for taking machinery on the highway.		

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 assessments, written assessment, visits to suitable collections and will link to industrial experience placements.

Learning outcomes 1 2, 3 and 4 are directly linked. These are likely to be delivered through formal lectures, discussion, site visits and independent learner research. Learning should take place using practical situations based on realistic case study materials. Visits are recommended where learners can observe the commercial management of a range of machinery and equipment. Visiting expert speakers could add to the relevance of the subject for learners. For example, land-based machinery product specialists or management consultants could talk about their work, the situations they face and the methods they use

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 the unit.
Assignment 1: Acquiring Land-based Machinery (P1, P2, P3, P4, M1, M2)
Introduction to the assignment and learner-centred research.
Factors affecting machinery selection, source and financial options available.
Assignment 2: Land-based Machinery Costings and Efficiency (P5, P6, M3)
Introduction to the assignment and learner-centred research.
Measurement of field performance and efficiency and calculation of operating costs (fixed and variable costings).
Assignment 3: Land-based Machinery Legislation (P7, P8, M4)
Introduction to the assignment and learner-centred research.
Legislation affecting purchase and operation of land-based machinery including use of the public highway.
Assignment 4: Land- based Machinery – Alternatives and Options (D1, D2)
Introduction to the assignment and learner-centred research.
Comparisons of existing systems and suggestion of alternatives that show improvements in efficiency and profitability.
Unit review.

Assessment

For P1, learners must explain the factors which should be considered when selecting appropriate land-based machinery. Tutors should identify the machinery or agree it through discussion with learners. Where possible, to ensure fairness of assessment the size and complexity of the task should be the same for all learners. The machinery should be appropriate to their primary area of interest within the land-based industries.

As a minimum, learners should provide evidence for four machines. These must be machines that are used for different functions within the chosen land-based sector. For example, an agricultural learner could select a tractor, an all terrain vehicle, a combine harvester and a slurry spreader. Evidence could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector), an annotated poster or a written assignment.

For P2, learners should determine the selection criteria for the items of equipment selected in P1.

For P3, learners must examine sources for land-based machinery purchasing options to meet given situations. Tutors should identify the purchasing options and the situations, or agree them through discussion with learners. This could be evidenced by asking learners to compare purchasing options for particular pieces of land-based machinery that are relevant to their primary area of interest within the land-based industries. The situations may relate to finance availability or the availability of machinery with a trade-in value

P4 requires learners to discuss the financial options available for land-based machinery acquisition. Learners should provide evidence that covers the range of options listed in the unit content. They could choose a particular piece of machinery and prepare their evidence around that or use examples of machinery acquisition that they have seen during delivery of this unit. Evidence could be in the same form as for P1.

For P5, learners must explain how efficiency is measured, recorded and calculated. This should include measurement and calculation of spot rate and effective rate.

For P6, learners must calculate the costs of machinery operation including fixed and variable costs.

For P7, learners must explain the effects of relevant current legislation on the ownership and operation of selected land-based machines. The chosen machinery should relate to their primary area of interest within the land-based industries. The machinery may be the same as that used to provide evidence for other grading criteria.

For P8, learners must state the legal requirements associated with operating machinery on the public highway. The machinery may be the same as that used to provide evidence for other grading criteria.

For M1, learners must select land-based equipment to meet given objectives. Tutors should identify the machinery and the objectives, or agree them through discussion with learners. The chosen machinery should relate to learners' primary area of interest within the land-based industries. The machinery may be the same as that used to provide evidence for other grading criteria.

Where possible, the size and complexity of the task should be the same for all learners to ensure the fairness of assessment. As a minimum, learners should provide evidence for four machines. The objectives could be, for example, to calculate the costs for a given period of time or for the completion of a particular task. Evidence could be in the same form as for P1.

M2 requires learners to explain the sources and the financial options available to secure the use of the items of equipment identified in M1. Evidence should include an explanation of a range of purchase and ownership options.

M3 requires learners to measure the efficiency of actual operations and also to calculate the associated costs for selected land-based machinery to meet given objectives. The use of real examples in their evidence should be encouraged. Learners should provide evidence that is relevant to their primary area of interest within the land-based industries.

For M4, learners must consider the equipment used for M3 and describe how legislation affects their purchase and use. The use of real examples in their evidence should be encouraged. Learners should provide evidence that is relevant to their primary area of interest within the land-based industries.

For D1, learners are required to investigate alternative finance and purchase options used for the equipment selected for M1 and M2. These solutions should show increased margins and greater profitability within the system. The use of real examples in their evidence should be encouraged. Learners should provide evidence that is relevant to their primary area of interest within the land-based industries.

D2 requires learners to investigate alternative systems and equipment to those used in M3 and M4 that will indicate greater compliance with all current legislations and improve overall efficiency of the operations. The use of real examples in their evidence should be encouraged. Learners should provide evidence that is relevant to their primary area of interest within the land-based industries.

Programme of suggested assignments

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

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, P3, P4, M1, M2	Acquiring Land-based Machinery	You are working on a large farm enterprise and are asked to investigate methods and options available to establish a farm mechanisation system.	Assignment. Report. Presentation.
P5, P6, M3	Land-based Machinery Costings and Efficiency	You are required to establish accurate work rate and costings for a range of land-based machines and operations.	Practical report. Assignment. Presentation.
P7, P8, M4	Land-based Machinery Legislation	As part of the combined mechanisation plan you are required to have a clear knowledge and understanding of legislation affecting the use of land-based machinery.	Assignment. Report. Presentation.
D1, D2	Land-based Machinery – Alternatives and Options	You are to examine existing systems or review proposals for a planned system and offer appropriate, viable alternatives to improve efficiency and profitability.	Assignment. Report. Presentation.

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 and Review Work Related Experience in the Land-based Industries

Essential resources

Learners will need access to local facilities, for example businesses, farms and contractors, where issues surrounding the management of machinery can be seen, observed in action and commented on.

Indicative reading for learners

Textbooks

Bell B – *Farm Machinery* (Resource Management) (Old Pond Publishing, 2005) ISBN 1903366682

Culpin C – *Farm Machinery, 12th Edition* (Blackwell Scientific, 1992) ISBN 063203159X

Hawker M and Keenlyside J – *Horticultural Machinery, 3rd Edition* (Longman Higher Education, 1985) ISBN 0582408075

Journal

Profi

Websites

www.bagma.com	British Agricultural and Garden Machinery Association
www.defra.gov.uk	Department for Environment, Food and Rural Affairs
www.environment-agency.gov.uk	Environment Agency
www.howstuffworks.com	HowStuffWorks
www.hse.gov.uk	Health and Safety Executive
www.iagre.org	Institution of Agricultural Engineers
www.lantra.co.uk	Lantra Sector Skills Council
www.profi.com	Profi

Delivery of personal, learning and thinking skills (PLTS)

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

Skill	When learners are ...
Independent enquirers	researching factors that should be considered when selecting appropriate land-based machinery
Creative thinkers	developing ideas of the factors that should be considered when selecting appropriate land-based machinery
Reflective learners	considering selection criteria for land-based machinery
Team workers	working with others researching methods of measuring efficiency of machine operation
Self-managers	calculating costs associated with machine operation correctly when asked
Effective participators	persuading others of financial options for obtaining machinery.

● 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	
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	
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	carrying out research into methods and options for establishing a farm mechanisation system
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	producing a mechanisation plan
Bring together information to suit content and purpose	
Present information in ways that are fit for purpose and audience	
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	
Identify the situation or problem and the mathematical methods needed to tackle it	
Select and apply a range of skills to find solutions	calculating work rate and costings and operations measuring field performance and efficiency.

Skill	When learners are ...
Use appropriate checking procedures and evaluate their effectiveness at each stage	
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	
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	