Unit 23: Undertake Dairy Production

Unit code: K/600/9580

QCF Level 3: BTEC National

Credit value: 10

Guided learning hours: 60

Aim and purpose

This unit aims to introduce learners to the skills and knowledge in dairy production and how these can be applied in practice. It is designed for learners in centre-based settings looking to progress into the sector or onto further/higher education.

Unit introduction

The unit has been designed to enhance learners' practical skills as well as develop their critical analysis and reflective skills in relation to areas for improvement in a dairy enterprise. These skills are important to employers and farm managers and result in a positive outcome for both parties.

Theory learning will build on and enhance the practical learning to widen learner understanding in relation to many of the routine tasks undertaken in a typical modern dairy unit.

On completion of the unit, learners will have experienced most tasks carried out in a modern dairy enterprise, and understand the various issues associated with managing cows and calves. They will have been able to identify areas of weakness and to suggest positive improvements, skills that today's employers seek.

Learning outcomes

On completion of this unit a learner should:

1 Understand the principles of rearing dairy herd replacements

2 Know how to manage cows through the production cycle

3 Be able to select replacements and manage dairy cow reproduction

4 Be able to apply hygiene regulations and legislation to clean milk production.

Unit content

1 Understand the principles of rearing dairy herd replacements

Calf rearing: colostrum and its importance; welfare and codes of practice; feeding behaviour; navel care; housing and rearing systems (eg buckets, group pens, automatic feeders, hutches, ventilation and draught, bedding, pen dimensions); nutrition (eg milk powder, whole milk, oesophageal groove, feed amounts, roughage, concentrates, water); health and disease prevention (eg joint-ill, pneumonia, scours, bloat, ringworm); weaning (eg age, weight)

Heifer rearing: reasons for home rearing; numbers required (eg link to cow culling rate); growth targets; stocking rates; nutrition; health and disease prevention eg Bovine Viral Diarrhoea (BVD), Infectious Bovine Rhinotracheitis (IBR), Rhino Syncitial Virus (RSV), Leptospirosis, internal and external parasites, tuberculosis (TB); heat synchronisation (reasons, methods)

Calf and heifer tasks: handling and haltering; temperature; ear tags (eg passports and legislation); navels; disbudding; spare teat removal; stomach tube; dehydration and electrolytes; vaccination; handling and safety (eg zoonoses, manual handling, PPE)

2 Know how to manage cows through the production cycle

Calving: preparation of calving area; signs; equipment; calf revival

Lactation: lactation curve and milk yields; reasons for cow groups (eg high, mid, low yielders); drying off (eg timing, method)

Nutrition: types of feed (eg concentrates, roughages, minerals); importance of energy (eg energy levels in feeds, dry matter, metabolisable energy, energy levels in rations to match targets); protein (eg crude protein, protein levels in rations); forage analysis interpretation; ration calculations; dry cow and transition diets; body condition scoring (BCS); grazing (eg methods, grass height, stocking rates, feed intake)

Disease (other than mastitis): metabolic diseases (eg hypocalcaemia, hypomagnesaemia, acidosis and link to concentrate level); internal and external parasites; foot problems (eg treatment, foot-trimming, prevention); contagious and notifiable diseases (eg Johnes, brucellosis, TB, TB restrictions); disposal of deadstock

Housing: loose yards; cubicles; slurry and manure disposal; Nitrate Vulnerable Zones (NVZs)

3 Be able to select replacements and manage dairy cow reproduction

Select replacements: breeding requirements (eg linear assessment, bull selection); culling rate and numbers of heifers needed

Dairy cow reproduction: oestrus cycle; heat detection (eg signs, aids, frequency, relevance to calving interval and herd calving index); artificial insemination (AI); natural service; problems in re-breeding (eg disease, timing of AI, body condition); breeding records (eg computer based, breeding boards); use of artificial aids to conception (eg heat-mount detectors, injection such as Estrumate, intra-vaginal devices); pregnancy diagnosis (PD)

4 Be able to apply hygiene regulations and legislation to clean milk production

Clean milk production: constituents of milk; the mammary gland; milk let down; parlour preparation; machine milk cows; circulation cleaning; milking machine maintenance

Legislation and hygiene regulations: milking routine in the parlour; current hygiene standards; importance of milk hygiene (eg Bactoscan, somatic cell count (SCC), antibiotics, taint, extraneous water); mastitis and its control (eg contagious and environmental pathogens, causes, treatment, prevention, 5-point plan)

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 discuss the husbandry and healthcare requirements of the newborn calf	**M1** compare two different calf or heifer rearing systems	**D1** produce costings for a specified calf or heifer rearing enterprise and identify areas for improvement
P2 discuss the rearing and management requirements of a herd of heifers [IE]		
P3 describe the management of cows during each phase of the production cycle [RL]		
P4 identify the feeding requirements of cows through the production cycle		
P5 describe the management of disease in cows through the production cycle		
P6 describe the breeding cycle in cows	**M2** monitor heat detection and insemination in a group of cows over a given period	**D2** assess the calving index for a specified group of cows and identify areas for improvement
P7 carry out activities to manage reproduction in dairy cows		
P8 select replacements and breeding stock [CT]		

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:**
P9 carry out activities to milk dairy cows	**M3** monitor the milk hygiene test results for a group of cows over a specified period.	**D3** identify areas for improvement in the control of mastitis in a specified herd.
P10 apply hygiene procedures to meet regulations and legislation [TW, SM, EP]		
P11 describe the symptoms, causes, prevention and treatment of mastitis in dairy cows		
P12 examine the requirements of farm assurance as applicable to dairy production.		

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, visits to suitable collections and will link to work experience placements.

Learners will need as much practical experience on a dairy unit as possible. This can take the form of work experience, practical sessions on the centre's own enterprise, and visits to local farms.

The unit has been designed to enhance learners' practical skills as well as to develop their critical thinking and reflection, especially when they are analysing enterprise performance. This might form useful feedback to a farm manager/employer and result in a positive outcome for both parties.

Theory sessions are meant to build on and enhance the practical sessions to widen learners' knowledge in relation to the many routine tasks that are carried out in a dairy unit. Tutors should decide whether these theory sessions are delivered before or after the practical sessions. Teamwork and health and safety must be an integral part of every session.

Learning outcome 1 needs to be delivered early on in the course, probably in the autumn, when learners can experience calf and heifer rearing activities. Tutors should endeavour to involve learners in the centre's own farm or in work experience locally.

Learning outcome 2 will give learners an overview of managing a dairy herd. The tutor will need to explain carefully the reasons for cow groupings, such as high-, mid- and low-yielders, so learners understand and experience the different production targets and achievements for the respective groups. It is essential that learners grasp this so that they are able to understand the management of the herd and the various assessments that follow for the other learning outcomes.

For learning outcome 3 learners will carry out breeding tasks such as linear assessment, heat detection and its monitoring, as well as identify strengths and weaknesses in re-breeding. Tutors need to decide the best time to deliver this learning outcome. Some herds calve all year round, others either mostly in the autumn or spring, and this will have an important bearing on heat detection activities. Tutors should also try to arrange for learners to observe and discuss a vet's farm visits so that they can witness pregnancy diagnosis and other breeding related topics.

Learning outcome 4 enables learners to milk cows and experience issues concerning the production of clean milk. They will need access to farm records in order to monitor the milk test results. This learning outcome is best delivered last, as it will bring into focus various aspects of the other learning outcomes. However, this should not mean that learners do not experience milking cows until this learning outcome is delivered. Tutors should ensure that learners understand the workings of a specific parlour and also arrange a visit to a different type, such as a rotary parlour or a robotic milking machine.

Outline learning plan

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

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

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

Topic and suggested assignments/activities and/assessment
Introduction and overview of the unit.
Assignment 1: Calf and Heifer Rearing (P1, P2, P3, M1, D1)
Theory session: welfare issues and codes of practice, safety issues, calf rearing from birth to weaning.
Theory session: heifer rearing from weaning to first calving.
Practical sessions: calf and heifer task that includes care of the newborn calf, handling, disbudding, spare teat removal, ear tagging, vaccination, weighing, drenching.
Assignment 2: Dairy Cow Production Cycle (P4, P5, P6)
Theory session: calving, lactation, drying off.
Theory session: feed classification, energy, dry matter, protein, ME and ration calculations, interpret silage analysis, grazing and grazing systems.
Theory session: diseases and classification, causes, symptoms, treatment of main diseases.
Theory session: types of housing for dairy cows, slurry and manure disposal, Nitrate Vulnerable Zone requirements.
Practical session: calving a cow, measuring quantity of silage/hay/straw in store, body condition scoring, foot trimming, assess grass and grazing fields, assess manure storage.
Assignment 3: Dairy Cow Breeding (P7, P8, M2, D2)
Theory session: the oestrus cycle, bull and cow selection, calving index, fertility problems, interpretation of breeding records, heat synchronisation techniques, pregnancy diagnosis.
Practical session: heat detection, linear assessment of cows, use of breeding boards, interpret breeding records.
Assignment 4: Milk Hygiene and Mastitis Control (P9, P10, P11, P12, M3, D3)
Theory session: function of mammary glands, hormones, milking parlour routines, identify milking machinery, circulation cleaning, types of parlour.
Theory session: hygiene standards and codes of practice, milk hygiene tests (Bactoscan, SCC, taint, water, antibiotics), mastitis and its treatment and control farm assurance.
Practical session: milking cows, identification and maintenance of milking machinery.
Unit review.

Assessment

For P1, learners need to describe the rearing of calves from birth to weaning, including husbandry and healthcare. Ideally, they should be familiar with rearing calves so that they can describe rearing from their own experience. P2 will take a similar format for heifer rearing over a specified period. For P7, learners are to carry out specified calf and heifer rearing tasks. It is likely that learners could be assessed during practical sessions and either work experience or farm duties.

For P3, learners could describe the management of a group of cows in the form of a table, chart or other similar format in order to avoid lengthy written descriptions.

For P4, learners need to understand energy and protein requirements at the various stages of the lactation and dry periods for a group of cows. They will need access to milk records in order to ascertain cow feed levels. For P5, learners will need access to dairy records to assess various disease treatments. Learners could monitor a group of cows for a specified period in order to record diseases. For P6, learners need to be able to describe the breeding cycle for a given time, which might be a whole year. Evidence could be presented in the form of a table, chart or presentation. Assessment could also be carried out during practical activities using a breeding board.

For P7, learners should be given a specified time to observe and record heat signs in cows. A period covering

24 hours would be ideal to imitate good industry practice. This can be assessed both during and after a practical activity. P8 requires learners to select replacements and breeding stock. P9 involves learners milking a group of cows. This could be carried out as part of a work experience/farm duty programme, provided the assessment criteria are standardised at the outset. P10 links with P9 and could be incorporated into the same assessment. For P10, learners could be given the contract details for a given herd of cows, as this will inevitably list the required hygiene standards and they can compare this with what takes place on a specified farm enterprise.

For P11 learners should be able to describe the mastitis treatment and control procedures for the cows they milk. P12 requires learner to examine the requirements of farm assurance as applicable to dairy production. These could be assessed through a report or assignment.

For M1 learners need to select either two different calf rearing enterprises or two different heifer rearing enterprises and compare the rearing methods used. They will need to describe the housing, feeding and health management of the two chosen systems.

For M2, learners must monitor heat detection for a specified group of cows over a given period of time, and record the cows that are inseminated. Learners will need to liaise with key people on the farm and have access to farm breeding records. For M3, learners must be able to understand the milk hygiene tests that are carried out, to be able to interpret and comment on the test results for the enterprise.

For D1, learners will select either a calf or a heifer rearing enterprise and produce a breakdown of the costs involved. The aim of this is to develop a business-like approach that imitates good industry practice. Learners will need access to specific financial records. For D2, learners interpret breeding records for a specified group of cows and identify the main areas of weakness in the herd's calving index. Learners are expected to have carried out the heat detection activities in P8 so that they are familiar with the farm's method and management of heat detection. For D3 learners must be familiar with how a dairy enterprise manages mastitis to be able to interpret milk hygiene test results, and from these results identify areas of weakness in the control of mastitis.

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, M1, D1	Calf and Heifer Rearing	Carry out various calf and heifer rearing tasks on a dairy/enterprise and produce a cost breakdown.	Practical observation and assessments. Written evidence.
P4, P5, P6	Dairy Cow Production Cycle	Monitor a specified group of cows from the moment they calve until they are dried off, with special emphasis on their nutrition and health.	Practical observation and assessments. Written evidence.
P7, P8, M2, D2	Dairy Cow Breeding	Carry out heat detection activities in a specified group of cows, interpret breeding information and assess a group of cows for their dairy characteristics.	Practical observation and assessments. Written evidence.
P9, P10, P11, P12, M3, D3	Milk Hygiene and Mastitis Control	Milk a group of cows, monitor their milk hygiene results and identify areas for improvement.	Practical observation/ work experience and assessments. Written evidence.

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

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

Level 2	Level 3
Introduction to Farm Animal Production	Element LP35.1 Prepare to milk livestock Element LP35.2 Monitor and maintain the milking of livestock
	Understanding Livestock Breeding and Nutrition
	Understand Animal Anatomy and Physiology

Essential resources

Learners will need access to a dairy enterprise with appropriate safe handling facilities, machinery and equipment. They will also need access to farm recording systems and relevant information used for recording, to monitor and analyse animal performance.

Employer engagement and vocational contexts

This unit focuses on how a dairy unit operates and so learners should have access to relevant commercial enterprises. This may include the centre's own farm, but should, where possible, include work experience farms, local markets, relevant industry links such as breeding centres, feed mills and local farms.

Indicative reading for learners

Textbooks

Blowey R – *A Veterinary book for Dairy Farmers* (Old Pond Publishing, 2006) ISBN 1 905523 29 7

Blowey R – *Cattle Lameness and Hoof Care,* (Farming Press, 1998) ISBN 0 85236 2528

Chamberlain A and Wilkinson J – *Feeding the Dairy Cow* (Chalcombe Publications, 1996) ISBN 0948617322

Hulsen J and Swormink BK – *From Calf to Heifer* (Roodbont, 2006) ISBN 10: 90 75280 95 5

Hulsen J – *A Practical Guide for Dairy Farm Management* (Roodbont, 2005) ISBN 90

Peters A and Ball P – *Reproduction in Cattle, 3rd Edition* (Blackwell Publishing, 2004) ISBN 1405115459

Nix J – *Farm Management Pocketbook, 39th Edition* (The Andersons Centre, 2009) ISBN 0954120159

Straiton E – *Cattle Ailments* (Crowood Press 2008) ISBN 978 1 86126 383 4

Thickett B, Mitchell D and Hallows B – *Calf Rearing* (Crowood Press, 2003) ISBN 186126643X

Journals

Dairy Farmer

Farm Business

Farmers Guardian

Farmers Weekly

Websites

www.bcms.gov.uk	British Cattle Movement Service
www.calfnotes.com	Calf Notes is your source for pertinent, non-commercial and unbiased information on raising young dairy calves.
www.dairyco.org.uk	DairyCo is a levy-funded, not-for-profit organisation working on behalf of Britain's dairy farmers. Our remit is to solve 'market failure' in the dairy industry – to tackle issues not currently being dealt with sufficiently to meet the needs of the industry.
www.defra.gov.uk	Defra is the UK government department responsible for policy and regulations on the environment, food and rural affairs.
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.ndfas.org.uk	The standards of Assured Dairy Farms (ADF) – formerly known as NDFAS - have been developed to address the concerns of all the interested parties in the milk supply chain.

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 farm information and other published statistics or relevant industry journals
Creative thinkers	suggesting appropriate replacement and stock
Reflective learners	considering dairy management processes
Team workers	engaged in taught practical sessions and in a small workforce
Self-managers	working to deadlines and being responsible for their own learning
Effective participators	engaged in taught practical sessions and in a small workforce.

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 ...
Independent enquirers	analysing farm information, both physical and financial, and observing the management of a specific farm enterprise
Creative thinkers	suggesting methods for improvement to a farm enterprise developing new skills such as foot-trimming, telescopic forklift handling
Reflective learners	identifying areas of weakness and suggesting methods for improvement to a farm enterprise
Team workers	engaged in taught practical sessions and in a small workforce
Self-managers	organising own work within a commercial environment
Effective participators	working within a small commercial workforce.

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	recording, identifying and analysing farm information such as milk hygiene test results, conception rates, calving intervals for individual cows
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	analysing conception rates measuring volumes of silage in store calculating financial gains/losses as a result of milk hygiene test results
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	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	presenting information in a variety of ways and situations recording and monitoring information in a specified format communicating and interpreting instructions within a small team.
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	