

Unit 16: Livestock Nutrition

Delivery guidance

Approaching the unit

Unit 16: Livestock Nutrition is an internal optional unit available to learners studying the Level 3 International Diplomas in Agriculture (at 540, 720 and 1080 GLH). It is both a knowledge and a skills-based unit, which learners will find invaluable when pursuing a career in any aspect within the agriculture industry.

Tutors should use a wide variety of methods in the classroom-based sessions to ensure that a good level of knowledge and understanding is achieved. This unit integrates knowledge with practical learning, and it is envisaged that tutors forge good connections and relationships with external feed companies. Tutors could also arrange for guest speakers from feed companies or nutritionists within the industry, which would also enhance learners' experience in the delivery of this unit.

Delivering the learning aims

Tutors can begin this unit by discussing the importance of a well-balanced diet, in order to maintain livestock health and wellbeing.

For learning aim A, learners are required to investigate the structure of biological molecules and their significance in livestock nutrition, drawing upon their knowledge from *Unit 9: International Poultry Production*, *Unit 10: Farm Livestock Husbandry*, *Unit 11: International Pig Production*, *Unit 12: International Sheep Production*, *Unit 14: International Dairy Production* and *Unit 15: Livestock Health and Diseases*. Tutors are to establish any prior knowledge that learners have regarding livestock nutrition.

Learners require a good knowledge and understanding of the importance of the nutritional needs of livestock; how these needs can be met; and the variation of both diet and nutritional needs throughout the life of various livestock.

For learning aim B, learners are required to examine the digestive systems of livestock species to allow appropriate nutrition. In order to deliver this learning aim, classroom-based sessions will be needed to ensure that learners have secured a thorough understanding of the different digestive system organs and their location, adaptations, structure and function, and digestive processes.

Tutors could deliver presentations, facilitate discussions and implement active learning sessions in these classroom-based sessions, in order to ensure that learners understand the digestive systems of a range of livestock; the different digestive processes of each breed; and how this can impact upon their diets.

For learning aim C, learners will be required to plan livestock diets to meet nutritional requirements. Initially, this learning aim would be best delivered in a classroom-based environment to ensure that a sound knowledge and understanding of nutritional needs and diet is secured through active learning sessions. To cover the practical considerations for feeding livestock, these sessions can be based in an agricultural setting with a variety of livestock.



Learners will then be required to produce a range of diet plans for a variety of different livestock breeds for different purposes. This learning aim would benefit from a visit to a livestock feed merchant or feed production supplier, as well as a guest speaker to discuss the nutritional requirements of livestock.



Assessment model

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	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.
C Plan livestock diets to meet nutritional requirements	C1 Nutrient analysis of feeds C2 Practical considerations for feeding livestock	

Assessment guidance

Unit 16: Livestock Nutrition is an optional internal unit, which is assessed using a number of independent tasks. The recommended assessment approach suggests that two different assignments are to be completed. The first suggested assignment, covering learning aims A and B, is a portfolio of evidence including a report on the nutritional requirements of livestock species in relation to the nutritional importance of biological molecules. In order to gather the evidence required for these portfolios, such as literature about the macronutrient and micronutrient content of different feeds, tutors should arrange visits to local feed merchants and talks from guest speakers (e.g. livestock nutritionists and/or vets) while delivering both learning aims A and B.

The second assessment covers learning aim C, and learners are required to build another portfolio of evidence, including analytical reports on the nutritional labelling of foodstuffs; fully annotated diet plans to highlight the importance of biological molecules in the diet; and assessments of dietary plans, taking into account deficiencies, excesses and toxicities. In order to gather this research for the assessment of the nutritional content of different feeds and the advantages and disadvantages of these different feeds, tutors can arrange for learners to visit a feed merchant and listen to a talk provided by a nutritionist. In addition, learners will be encouraged to collect and photograph feed packaging from working with their own livestock when on work experience placement, in a voluntary position or when in part-time work.

Getting started

This provides you with a starting place for one way of delivering the unit, based around the recommended assessment approach in the specification.

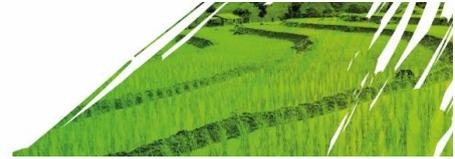
Unit 16: Livestock Nutrition

Introduction

This unit gives learners an understanding of animal nutrition and the nutritional requirements of farm livestock species. Learners will gain knowledge regarding different feed components; their function; and how vital diet is for maintaining the health and welfare of farm livestock species, in a variety of different digestive systems for a range of purposes.

Learning aim A – Investigate the structure of biological molecules and their significance in livestock nutrition

- Tutors could begin the delivery of this learning aim by facilitating a discussion to establish any prior learner knowledge regarding the diet and nutrition of livestock, considering the components of food and their contribution to the biological makeup of animals. Tutors can ask learners 'What are chemicals?' and discuss where different chemicals are found, as well as the chemical basis of life.
 - Learners could form into pairs and research organic (i.e. those containing carbon and hydrogen) and inorganic chemicals, focusing on the positive and negative associations between chemicals and food and the common functional groups (- COOH, -OH etc). This can be followed by a short discussion where learners feed back their findings to the rest of the class.
 - Tutors could show learners animations of 3D molecules and link these to the ways in which biological molecules are represented.
 - Tutors could deliver a presentation about energy changes including structural isomerism, and the relevance of these energy changes to animal nutrition.
 - Learners could form into small groups, and are given a molecular modelling kit. They could be tasked to build representations of biological molecules, including the common shapes of molecules; the similarities and differences between molecules; and the links between physical and chemical properties.
 - Give learners case studies of specific species and breeds so that they can conduct independent research into the biochemical makeup of different animals. They can feed back their findings in a group discussion, covering the links between lifestyle, nutrition and biochemical makeup of animals.
 - Tutors could give learners a short multiple choice or online interactive quiz about all of the earlier content, including molecules of animals and diet and energy changes in order to consolidate learning.
 - Tutors to deliver a presentation on macronutrients, including the sources, structures, features, digestion processes and functions of proteins, carbohydrates, lipids and fibre in the diets of monogastric, ruminant and poultry livestock species.
 - Learners to form into small groups and tutors to give them a macronutrient. They are then to produce a poster on that macronutrient by carrying out research into their role, structure, animal requirements, where we find them, and their effects on livestock. These posters can be used to give a short presentation, so that all learners can take notes on the different macronutrients to achieve a thorough understanding.
- Learners can remain in the same small groups (or allocate them to different groups) and give them a micronutrient. They are then to produce a factsheet on that micronutrient by carrying

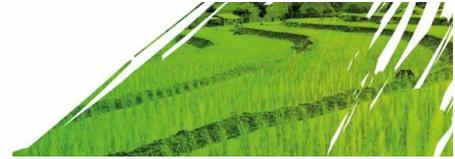


out research into their role, structure, animal requirements, absorption and effects. These factsheets can be copied and distributed to the rest of the class so that they have a comprehensive set of notes on all micronutrients for reference.

- Tutors can facilitate a short discussion on the different physical states of water and how this affects chemical bonding. Again, tutors could give learners modelling kits so that they can create models.
- Tutors to show learners video clips about the properties of water; its importance to the existence of life; and the impact that it has upon animal nutrition, i.e. allowing the movement of substances around the body, providing a medium for chemical reactions to take place and maintaining body temperature.

Learning aim B – Examine the digestive systems of livestock species to allow appropriate nutrition

- Tutors could begin the delivery of this learning aim with a short discussion, recapping and establishing any prior learner knowledge of digestive system adaptations, location, and the structure and processes involved for the digestion in ruminant, monogastric and avian livestock species.
- Tutors could deliver a presentation on ruminant digestive systems and the structure and function of the digestive system organs.
- Learners to form into small groups to research and prepare factsheets about ruminant digestive systems; which animals are classified as having a 'ruminant' digestive system; and the influence it has upon the planning and feeding of these animals.
- Tutors could deliver a presentation on monogastric digestive systems and the structure and function of the digestive system organs.
- Learners to form into small groups to research and prepare notes for a discussion about monogastric digestive systems; which animals are classified as having a 'monogastric' digestive system; and how this influences the way we feed them. This can be followed by a group discussion where learners feed back their findings.
- Tutors could deliver a presentation on avian digestive systems; the structure and function of the digestive system organs; and the differences compared to other digestive systems.
- Learners to form into small groups to research and produce posters about the avian digestive systems, and how this influences the way we feed them.
- Facilitate a class discussion on what a 'balanced diet' is and how it is achieved, as well as the effects of an 'unbalanced diet'.
- Tutors could deliver a short presentation on the nutritional deficiencies and the impact upon livestock health and wellbeing. Discuss the causes, symptoms and corrective measures of issues arising from nutritional imbalances and digestive system disorders, e.g. nutritional deficiencies, excesses, ingestion of foreign bodies and bloat specific to ruminant animals.
- Learners to form into pairs and are to be given a specific issue arising from an incorrect diet, e.g. nutrient deficiencies such as hypomagnesaemia, nutrient excesses such as obesity. They are to research and prepare a presentation to deliver to the class, with an accompanying handout so that they have a comprehensive set of notes for future reference.
- Learners to complete a sticky note activity where they jot down all the nutritional deficiencies that they can think of in livestock, including the ways of remedying them, in order to consolidate their learning.
Facilitate a short discussion on nutritional excesses and their impact on livestock health. Tutor to create a spider diagram on the board, collating all learner knowledge, which can then be uploaded onto the centre virtual learning environment (VLE) for future reference.
- Facilitate a class discussion on the effects of bloat and ingestion on livestock, including the ingestion of harmful items or an incorrect, unbalanced diet.



Learning aim C – Plan livestock diets to meet nutritional requirements

- Tutors could begin this learning aim by facilitating a short class discussion about what learners already know about the methods of nutritional analysis.
- Learners could complete an independent activity where they must research the nutritional analysis of feeds using feed packaging, i.e. looking up the nutritional values of macronutrients and micronutrients in formulated and naturally occurring feedstuffs.
- Facilitate a short discussion about the quantitative and qualitative methods and tests used to determine the nutritional analysis of feedstuffs and their importance, e.g. using iodine to detect starch and biuret test for proteins.
- Give learners a worksheet that outlines a research proposal, where learners are to find out the meanings of a selection of nutritional terminology, i.e. acid detergent fibre (ADF), metabolisable energy, non-protein nitrogen (NPN).
- Tutors could arrange for learners to carry out practical laboratory activities (subject to the laboratory facilities available) looking at reactions and tests, i.e. using Benedict's solution to establish the presence of sugars; dry matter determination using microwave drying; testing for starch using iodine; biuret test for proteins; emulsion test for fats and oils and calorimetry.
- Tutors could deliver a short presentation on the considerations required when planning diets for livestock, and how an animal's nutritional demands change throughout its various life stages, production requirements and health status.
- Facilitate a tutor-led discussion on the different methods of dietary calculations for poultry, sheep and cattle and pigs, and how to balance a diet. Learners can then form into pairs and are to complete some dietary calculations, e.g. Pearson square and computerised dietary calculations.
- Tutors could deliver a short presentation on the different types of feed storage and preparation including hygiene, recognition of poor quality feeds and the importance of feeding records.
- Learners could complete a practical activity where they must go into a feed room or feed preparation area, and carry out an assessment of the suitability of storage and preparation areas, which can be added to their portfolio of evidence. They can then feed back their findings to the rest of the class.
- Learners to form into small groups and are to be given a feedstuff. They are to research its properties, advantages, disadvantages and suitability in order to produce a 'promotional' leaflet highlighting its properties. These can then be uploaded to the VLE, so that learners have access to a comprehensive set of notes for future reference.
- Facilitate a class discussion on the advantages and disadvantages, suitability and effectiveness of different feeding methods and different types of feeding, linking this to the various animal life stages.
- Tutors could deliver a short presentation on the legislation and regulations governing the preparation and sale of livestock diet.
- Learners to look at a range of feed packaging and assess how easily interpreted they are and link these to the legislation and sale of livestock diet.

Details of links to other BTEC units and qualifications, and to other relevant units/qualifications

This unit links to:

- Unit 9: International Poultry Production
- Unit 10: Farm Livestock Husbandry
- Unit 11: International Pig Production
- Unit 12: International Sheep Production
- Unit 13: International Beef Production
- Unit 14: International Dairy Production.

Resources

In order to deliver this unit, centres will need access to a range of different livestock in order to carry out practical feeding activities. Resources for demonstration purposes and for practical work will include use of a laboratory for tests and molecule modelling equipment.

In addition to the resources listed below, publishers are likely to produce Pearson-endorsed textbooks that support this unit of the BTEC Internationals in Agriculture/Horticulture/Land-based subjects. Check the Pearson website (<http://qualifications.pearson.com/endorsed-resources>) for more information as titles achieve endorsement.

Textbooks

Callaway T and Ricke S, *Direct-Fed Microbials and Prebiotics for Animals: Science and Mechanisms of Action* (1st Edition), Springer, 2012 ISBN 9781493900572 – a useful text dealing with additives in feeds and their effects

McDonald P, Greenhalgh J, Morgan C, Edwards R, Sinclair L and Wilkinson R, *Animal Nutrition* (7th Edition), Benjamin Cummings, 2011 ISBN 9781408204238 – a comprehensive text covering all animal nutrition basics from biological molecules to dietary planning requirements

Websites

'BASF' – search the website for the 'Animal Nutrition' page, which is a good starting point for researching feed additives.

'Big Picture Education' – this Wellcome Trust website provides information on general biology and has some nutrition resources that may be useful.

'The European Pet Food Industry' – provides general information on pet food production and regulation in Europe, including some educational resources

'MSD Manual Veterinary Manual' – is a well organised and easy-to-read guide on managing animals and their nutrition

Pearson is not responsible for the content of any external internet sites. It is essential for tutors to preview each website before using it in class so as to ensure that the URL is still accurate, relevant and appropriate. We suggest that tutors bookmark useful websites and consider enabling learners to access them through the school/college intranet.