Animal reproductive technology – Agriculture – stage 6

## Summary

This unit explores animal fertility and manipulation techniques used in industry. Students will explore the factors that limit fertility in livestock and the management techniques that farmers use to manipulate reproduction and improve reproductive performance.

## Duration

2 weeks or 6 hours.

## Outcomes

* **H1.1** explains the influence of the physical, biological, social, historical and economic factors on sustainable agricultural production.
* **H2.2** describes the inputs, processes and interactions of animal production systems.
* **H4.1** justifies and applies appropriate experimental techniques, technologies, research by methods and data presentation and analysis in relation to agricultural problems and situations.

[Agriculture Stage 6 syllabus](https://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/stage-6-learning-areas/technologies/agriculture-syllabus) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2019

## Unit overview

The aim of the Agriculture Stage 6 Syllabus is to develop students’ knowledge and understanding about the production and marketing of both plant and animal products. Farmers aim to manage the physical and biological processes in animals in order to produce agricultural products in an efficient and sustainable manner. In this unit, students will examine the ways in which farmers manage and manipulate these processes and systems to maximise their outputs.

## Resources overview

The resources and links listed below are referenced within the program but is not an exhaustive list of resources available. Teachers can add to these resources as needed.

### Physical resources

* Computer with internet connectivity

### Websites

* [A basic guide to breedplan EBVs](http://breedplan.une.edu.au/booklets/A%20Basic%20Guide%20to%20BP%20EBVs%20%28Complete%29.pdf)
* [Exam technique 1- BUG your questions](https://www.beaconsfield.bucks.sch.uk/attachments/download.asp?file=210&type=pdf)
* [What is the basic oestrus cycle of the cow?](https://dairy-cattle.extension.org/what-is-the-basic-estrous-cycle-of-the-cow/)

### Videos:

* [Chapter 2 anatomy and physiology](https://www.youtube.com/watch?v=Liu_S7MPRyA) (video duration 6:06)
* [What are estimated breeding values?](https://www.youtube.com/watch?v=Yhsw3HJDtf4) (video duration 4:00)
* [Estrous cycle of cattle](https://www.youtube.com/watch?v=9O3qxqTxxYg) (video duration 2:56)
* [Raising the steaks-the science of cattle breeding](https://www.youtube.com/watch?v=wtP7q6W8cvY&t=74s) (video duration 23:18)

## Content

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| **Content** | **Teaching and learning** | **Evidence of learning** | **Adjustments and registration** |
| Lesson 1* Identify the factors that limit fertility of farm animals including genetics, environment, pests and diseases, management and nutrition.
 | **Students:*** Unpack the syllabus content point. Use this as a checklist at the end of the section.
* Define fertility. What is a fertile animal according to farmers?
* Define infertility. What is an infertile animal according to farmers?
* Use a Venn diagram to compare infertility to reduced fertility.
* Each of the following factors can reduce the fertility of both male and female livestock, describe what it is and how it can reduce fertility. Include examples.
	+ Genetics
	+ Environment
	+ Pests and disease
	+ Management
	+ Nutrition
* Complete the following HSC past paper questions:
	+ 2015 HSC agriculture, question 21 c
 | * Students can articulate their understanding of industry specific terminology.
* Students demonstrate how different environmental, genetic or management factors can affect the fertility of livestock through use of appropriate examples that support explanations.
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| Lesson 2* Evaluate management techniques available to farmers to manipulate reproduction in farm animals including artificial insemination, multiple ovulation, flushing, embryo transfer and oestrus synchronisation.
 | **Students:*** Unpack the syllabus content point. Use this as a checklist at the end of the section.
* For each of the management techniques listed in the content point complete an information board including the following:
	+ Short definition for the process.
	+ A simplified flow diagram for a set of instructions explaining how it is carried out on a farm.
	+ A table outlining the advantages and disadvantages of using the process to improve reproduction in livestock.
	+ A boxed/highlighted section with a written evaluation of the techniques ability to improve/manipulate reproduction in livestock.
* Complete the following HSC past paper questions:
	+ 2017 HSC agriculture, question 24 b.
 | * Students use flow charts as a method of representing their understanding of the processes used in enhancing reproduction.
* Students can evaluate the use of management techniques in enhancing reproductive success through identification of advantages and disadvantages and attributing these to increased or decreased performance and productivity.
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| Lesson 3* Outline the role of objective measurement and heritability on the breeding programs of farms, using at least one specific industry program as an example.
 | **Students:*** Unpack the syllabus content point. Use this as a checklist at the end of the section.
* Define objective, subjective and heritability.
* Define objective measurement.
* Outline why objective measurement is beneficial to farmers.
* Watch the video [what are estimated breeding values?](https://www.youtube.com/watch?v=Yhsw3HJDtf4) (video duration 4:00)
* Explain what an estimated breeding value is and how it is calculated. Are there any limitations to calculating estimated breeding values?
* List the benefits of using estimated breeding values in a breeding program for livestock.
 | * Students can articulate their understanding of industry specific terminology.
* Students can articulate the purpose of objective measurement in livestock production and the benefits to the farmer.
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| Lesson 4* Outline the role of objective measurement and heritability on the breeding programs of farms, using at least one specific industry program as an example.
 | * Read [‘a basic guide to breedplan EBVs’](http://breedplan.une.edu.au/booklets/A%20Basic%20Guide%20to%20BP%20EBVs%20%28Complete%29.pdf). Make notes on the following:
	+ List the different breedplans available within the cattle industry.
	+ Create a quick reference guide describing the traits for birth weight, 400 day weight, calving ease, and days to calving and eye muscle area. Include information on how to interpret the numbers on the table.
* Complete the activities called breedplan bull selection exercises in [‘a basic guide to breedplan EBVs’](http://breedplan.une.edu.au/booklets/A%20Basic%20Guide%20to%20BP%20EBVs%20%28Complete%29.pdf).
* Complete the following past HSC paper questions:
	+ 2016 HSC agriculture, question 18
	+ 2019 HSC agriculture, question 27 a
 | * Students can recall industry examples of breedpans.
* Students demonstrate understanding of estimated breeding plans by answering scenario based questions.
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| Lesson 5* Describe how hormones regulate reproduction and behaviour in animals including testosterone, oestrogen, progesterone, prostaglandin, follicle stimulating hormone and luteinising hormone.
* Explain the interaction between hormones in an animal’s oestrus cycle.
 | **Students:*** Unpack the syllabus content point. Use this as a checklist at the end of the section.
* Define hormones, describe how they work and outline their effects on the body.
* Create study cards with definitions, where it is produced in the body, effects on reproduction and effects on behaviour for each of the following hormones:
	+ Oestrogen
	+ Testosterone
	+ Progesterone
	+ Prostaglandin
	+ Follicle stimulating hormone
	+ Luteinising hormone
* Watch the video [chapter 2 anatomy and physiology](https://www.youtube.com/watch?v=Liu_S7MPRyA) (video duration 6:06) and read through the article [‘what is the basic oestrus cycle of the cow?’](https://dairy-cattle.extension.org/what-is-the-basic-estrous-cycle-of-the-cow/) Use the information to develop a diagram explaining how the hormones work together during oestrus.
* Watch the video [‘estrous cycle of cattle’](https://www.youtube.com/watch?v=9O3qxqTxxYg) (video duration 6:06) to help you draw a timeline of estrous from day 0 to day 21. Include the names of the hormones present at each stage and the names of the stages.
 | * Students can explain the effects of hormones in reproduction and behaviour.
* Students use timelines and diagrams as a method of demonstrating their understanding of the role of specific hormones in oestrus.
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| Lesson 6 | * Watch the video [“raising the steaks-the science of cattle breeding”,](https://www.youtube.com/watch?v=wtP7q6W8cvY&t=74s) (video duration 23:18) and create an extended concept map demonstrating how each of the topics within this unit influence the farm managers decision making processes. Use a different colour to display other influences on the decision making process discussed that are not in this unit?
 | * Students will demonstrate their understanding of the complexity of farm decision making processes and the correlation between systems.
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## Evaluation

Evaluation of learning activities should be an ongoing process that happens throughout the delivery of this unit. Teachers should document their evaluation of learning activities throughout the program. The space provided below is to evaluate the overall unit of work.

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