

Agri Leaders Wanted

EDUCATION
IN AGRICULTURE

Internal Assessment Resource
NCEA Level 1 Science AS 90949

KEEP CALM AND COUNT SHEEP

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Overview

This resource supports assessment against Achievement Standard **90949 version 3**

Standard title: Investigate life processes and environmental factors that affect them

Credits: 4

Resource title: Keep Calm and Count Sheep

This resource:

- Clarifies the requirements of the standard
- Supports good assessment practice
- Should be subjected to the school's usual assessment quality assurance process
- Should be modified to make the context relevant to students in their school environment and ensure that submitted evidence is authentic.

Authenticity of evidence

Teachers must manage authenticity for any assessment from a public source, because students may have access to the assessment schedule or student exemplar material.

Using this assessment resource without modification may mean that students' work is not authentic. The teacher may need to change figures, measurements or data sources or set a different context or topic to be investigated or a different text to read or perform.



Achievement standard: **90949**

Standard title: **Investigate life processes and environmental factors that affect them**

Credits: **4**

Resource title: **Keep Calm and Count Sheep**

Teacher guidelines

The following guidelines are supplied to enable teachers to carry out valid and consistent assessment using this internal assessment resource.

Teachers need to be very familiar with the outcome being assessed by the achievement standard. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing students against it.

Context/setting

This activity requires students to locate and select information relating to the life processes of **growth** and **reproduction** on a New Zealand sheep farm AND to make links to the environmental factors that impact on them. Students will submit evidence of their investigation in a report (choice of format to be negotiated with the teacher).

Conditions

It is suggested that approximately four hours should be sufficient in most circumstances for students to complete this activity, but this should be varied to suit students' needs. The time required will depend partly on how much practical work is to be carried out by the students.

The students could carry out practical aspects of this investigation in small groups, but will be assessed individually.

Resource provided (but not limited to)

- Resource A – Blank diagram of ruminant digestion system
 - Resource B – Blank diagram of the ewe and ram reproductive system in sheep
 - Resource C – Pasture quality at different stages of plant growth
 - Resource D – Effect of nutrition on reproduction of Romney ewes
 - Resource E – Pre-mating nutrition
- Teacher note: Add other resources you are providing to the list above.

Additional information

None.

Achievement standard: **90949**

Standard title: **Investigate life processes and environmental factors that affect them**

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Resource title: **Keep Calm and Count Sheep**

Student instructions

Introduction

The growth rate and reproductive abilities of sheep on New Zealand farms are very much affected by a number of environmental factors such as the quality of nutrient supplies and hormone levels in breeding ewes.

This assessment activity requires you to locate and select information on the life processes of **growth** and **reproduction** on a New Zealand sheep farm AND link these to the environmental factors that affect them.

You are to submit evidence of your investigation in a report. You may include evidence of your research as labelled drawings, diagrams, observations or notes. You must include appropriate citations/references of any research you carry out.

The following instructions will guide you with a way to structure your work to demonstrate what you have learnt to allow you to achieve success in this standard.

Conditions

- You will be provided with approximately 4 hours of class time in which to complete this assessment activity.
- All work is to be carried out during class time.
- You may choose to carry out practical aspects of this investigation in pairs, but you must submit an individual report for assessment.

- You have been provided with a few resources but will need to refer to others in your investigation.

Task

There are 2 parts to this assessment activity. To achieve this standard you need to complete BOTH parts

Part 1: Putting it on - Growth

This part relates to the environmental factor of nutrient supply and its impact on the growth rate of sheep.

Locate and select information so that you can:

1. discuss how the individual organs within the digestive system function to allow sheep to digest the food they eat
2. consider the different nutrients provided by sheep's food and what they are used for in the growth of the lamb
3. discuss how nutrient supply is an important environmental factor and how this affects the growth of lambs after weaning. You may wish to consider implications for managing pasture and animal health
4. explain how the quality of pasture can affect the supply of nutrients that can be gained by the sheep.

Part 2: Growing the flock - Reproduction

This part relates to the environmental factors of hormone levels and nutrient supplies and their impact on the reproductive capabilities of sheep.

Locate and select information so that you can:

5. discuss the function of the main organs in the reproductive systems of sheep



6. discuss how the environmental factors of hormone levels and/or the amount of pasture available (nutrient supply) can affect the number of lambs born. You may wish to evaluate the management practices that have the greatest impact on the number and/or weight of lambs
7. explain the effects of hormone levels or nutrient supply and how the success of reproduction (lambing percentage) can be affected.

Organise your findings

Organise your findings and report.

Include citations/references to any research material used.

Use your observations or findings and biological ideas to make significant links between the two major organ systems you have studied and the environmental factors that impact on them. You may wish to consider:

- the structure and function of the two major organ systems
- the environmental factors that impact on these two life processes.

Consider the implications for the sheep and the way the farmer manages them to ensure their optimum health and reproductive success.

Making significant links may involve justifying, relating, evaluating, comparing, contrasting, and analysing.

Present your findings and submit for assessment

- Present your findings as a report.
- You may wish to include labelled drawings, diagrams, observations, and notes.

Resource provided (but not limited to)

Resource A – Blank diagram of ruminant digestion system

Resource B – Blank diagram of the ewe and ram reproductive system in sheep

Resource C – Pasture quality at different stages of plant growth

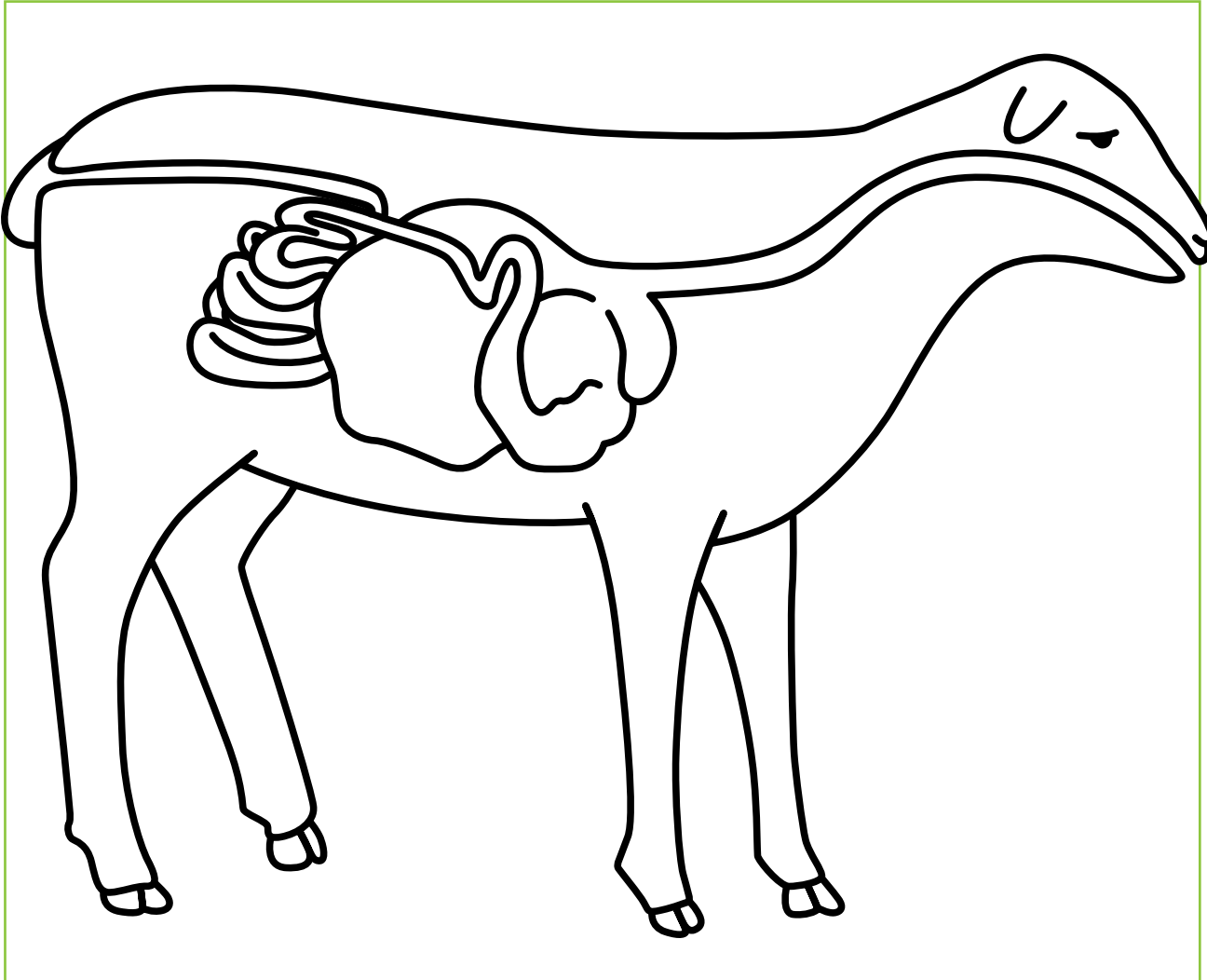
Resource D – Effect of nutrition on reproduction of Romney ewes

Resource E – Pre-mating nutrition

Teacher note: Add other resources you are providing to the list above.

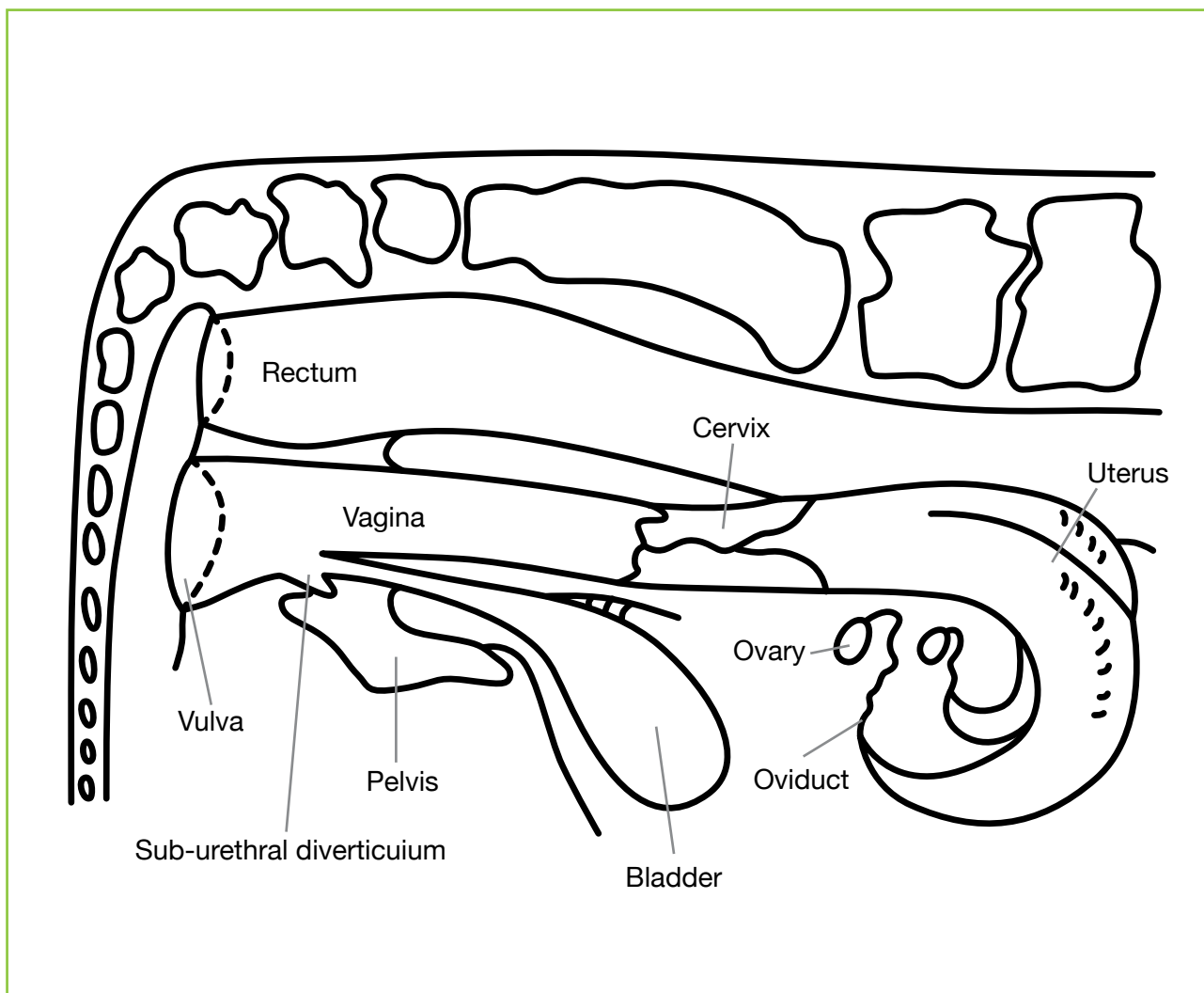


Resource A - Blank diagram of ruminant digestion system



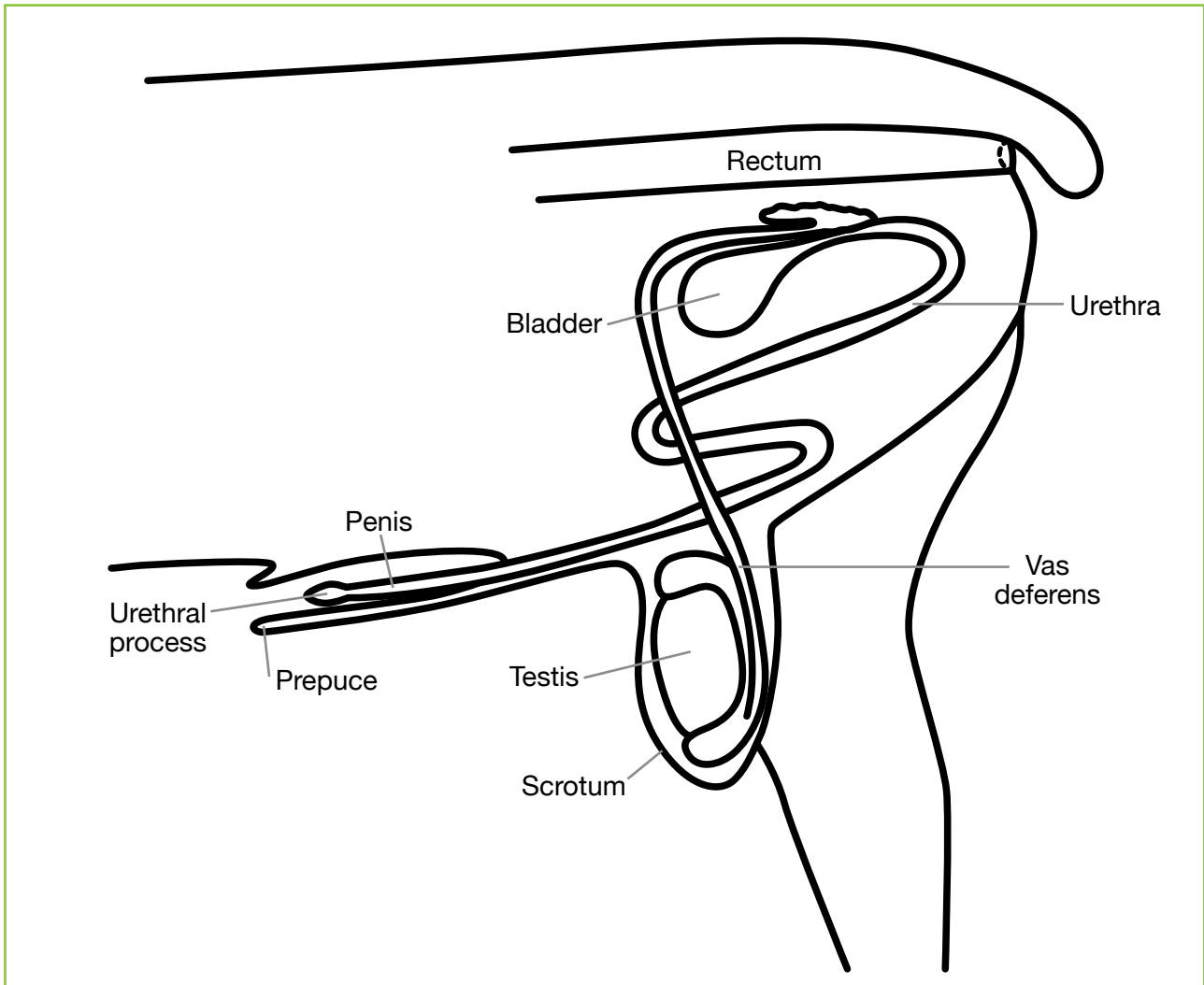
Modified from OpenStax Digestive Systems and Sheep and Goat Production Handbook for Ethiopia

Resource B - Diagram of the ewe reproductive system



Modified from [FAO Anatomy and endocrinology of cow reproduction](#)

Resource B - Diagram of the ram reproductive system



Modified from *Reproduction and Breeding Management of Goats and Sheep* - FAMU

Resource C - Pasture quality at different stages of plant growth

Stage of plant maturity	Protein %	Cellulose %	Carbohydrate %	Lamb live weight gain per day (g)
Short leafy pasture	25	31	55	400
Long leafy pasture	20	39	45	350
Pre-flowering pasture	16	48	15	200
Flowering pasture	10	57	10	100

Adapted from ESA NCEA Level 1 Agriculture Learning Workbook by Shona Bain and Annalisa Turner



Resource D - Effect of nutrition on reproduction of Romney ewes

Quality of pasture	No of ewes	Mean body weight (kg)	% of pregnant ewes	% of ewes carrying twins	Overall lambing percentage
		At mating	Pre lamb scanning		Post lambing
High	100	49	81%	48%	118%
Med	100	43	54%	35%	101%
Low	100	38	46%	22%	87%





Resource E - Pre-mating nutrition

Flushing ewes

Ewe live weight gain (100 - 150g/d) during the 3 to 6 weeks pre-breeding will result in an increase in ovulation rate. Gaining live weight is better than being static. Loss of liveweight during flushing period reduces ovulation rate. Light ewes are more responsive to flushing:

- 51 - 57kg = 17 % more multiples
- 63 - 69kg = 8 % more multiples.

Light ewes are more responsive to flushing.

However, flushing correctly requires a lot of feed and, in autumn, we cannot often bank on a lot of (if any) good quality herbage. A safer goal is to ensure we minimise the number of poor condition ewes before the flushing period. Then, if feed is available, flush them in autumn.

If there is not enough feed to flush them all correctly (which is often the case), the best bet is to flush the poorer condition ones and hold the better condition ewes (i.e. a split flock approach with targeted feeding).

From Ewe Body Condition Scoring (BCS) Handbook (p. 15)



Nutrition prior to tupping

Nutrition prior to tupping is important to ensure that ewes have good ovulation rates and conception rates at joining. Studies have shown that ewes with low body condition scores at tupping have the highest return to service, lower incidences of twinning or triplets and higher embryo mortality. Therefore, it is important to ensure that ewes are in good condition, and on the correct plan of nutrition leading up to and through tupping to maximise the next season's lambing rates.

Reliance Pre-Tup Nut is a high performance feed that is designed to provide a nutritional boost to ewes prior to, and through tupping.

High energy levels are provided in the form of both carbohydrates (grain) and rumen protected vegetable oils, along with good quality protein sources such as soyabean meal. A combination of both rumen degradable energy and protein helps rumen function so that ewes get the most out of pasture, and the by-pass fat provides additional energy that is directly available to the animal for weight gain, ovulation and embryo growth.

Vitamins and minerals are included to improve both the health and production of the flock. These include vitamin E for ewe health, follicle quality and conception rates, as well as improving sperm quality for rams, vitamin A for improving ewe ovulation and embryonic development, and vitamin D calcium to support bone maintenance and hormone production. Other trace minerals include selenium, cobalt, copper, zinc and iodine for both ewe and ram health and reproduction.

The Reliance Pre-Tup Nut also contains a mycotoxin binder to reduce the impact of mycotoxins in pasture and feed. Mycotoxins are toxins produced by moulds and fungi and some types can lead to decreased ewe fertility and embryo survival, miscarriages and an increase in infertility in rams. Mycotoxins can be found in pasture, silage, hay, straw and grains when these feeds are not handled correctly and mould is allowed to grow. Providing a mycotoxin binder provides extra insurance for the fertility of the flock at the time when mycotoxins can have the biggest impact on the next season's lambing.

Reliance Pre-Tup Nuts should be fed from four to six weeks prior to tupping. The feeding rates are a minimum of 200g/head/day for older ewes and up to 500g/head/day with hoggets. Ewes should be introduced to the feed at 100g/head/day and gradually increased up to 200g/head/day over seven days. Allow another seven days to increase up to 500g/head/day. It is important that an adequate source of fibre (pasture, silage, hay or straw) is available to the flock and that Reliance Pre-Tup Nuts are introduced gradually.

Slowly increasing the feeding rate gives the rumen time to adapt to digesting a high starch feed and decreases the risk of acidosis.

Reliance Pre-Tup Nuts need to be fed out in a manner that reduces the incidence of competition and ensures that all ewes receive an even intake of feed. This can be done by feeding out in a line or by making many small drops in paddocks.

Feeding Reliance Pre-Tup feed in a nut form decreases the amount of wastage in the paddock compared to grains, and the pelleting improves the digestibility for ewes. With the added vitamin and mineral benefits, Reliance Pre-Tup Nuts help to improve ovulation and conception rates in ewes with the aim of fewer returns to service and more twins and triplets at the next lambing. To maximise the benefits, Reliance Pre-Tup Nuts can be fed to ewes through tupping and also to rams as an extra boost.

[Article](#) provided by Christine Sydenham, Farmlands Nutritionist.

Assessment schedule

Science 90949 – Keep Calm and Count Sheep



QUALITY ASSURED
ASSESSMENT MATERIALS

Evidence/Judgements for Achievement	Evidence/Judgements for Achievement with Merit	Evidence/Judgements for Achievement with Excellence
<p>Investigate life processes and environmental factors that affect them.</p> <p>The student investigates the two life processes of growth and reproduction in sheep AND the environmental factor(s) that affect them.</p> <p>The student:</p> <p>can describe how nutrient supply affects the ability of a lamb to grow</p> <p>can describe how either hormone levels OR nutrient supply affects reproductive capabilities in sheep.</p> <p>For example:</p> <p><i>The rumen is where microbes release enzymes to break down the food.</i></p> <p><i>The poorer the quality of pasture, the harder it is for the digestive system to obtain nutrients from it.</i></p> <p><i>The ovaries are where the egg/ova are produced.</i></p> <p><i>When hormone levels are increased there is a higher chance of an egg or multiple eggs being released, which when fertilized will grow into a lamb.</i></p> <p>The examples above are indicative samples only.</p>	<p>Investigate, in depth, life processes and environmental factors that affect them.</p> <p>The student investigates in depth the two life processes of growth and reproduction in sheep AND the environmental factor(s) that affect them.</p> <p>The student:</p> <p>provides an explanation of how the quality of nutrients in the pasture plants can affect the ability of a lamb to grow</p> <p>OR</p> <p>provides an explanation of how the reproductive system of the sheep responds to changes in hormone levels OR nutrient supply.</p> <p>For example:</p> <p><i>The diet of a sheep in New Zealand consists mainly of pasture (grass and clover). Grass provides the sheep with carbohydrates and clover with protein.</i></p> <p><i>The cells in grass are made from cellulose, which is very difficult to digest and extract nutrients from.</i></p> <p><i>The 4 chambered stomach of a ruminant animal like a sheep allows it to process the cellulose by breaking down the cell walls to release the nutrients.</i></p> <p><i>The sheep will chew the ‘cud’, regurgitated material and mechanically break it</i></p>	<p>Investigate, comprehensively, life processes and environmental factors that affect them.</p> <p>The student comprehensively investigates the two life processes of growth and reproduction in sheep AND the environmental factor(s) that affect them.</p> <p>The student:</p> <p>makes significant links between the growth rate of lambs and the nutrient supply available to the lambs</p> <p>OR</p> <p>makes significant links between the reproductive system of sheep and the environmental factor of hormone levels OR nutrient supply.</p> <p>Making significant links may involve explaining, elaborating, applying, justifying, relating, evaluating, comparing and contrasting or analysing.</p> <p>For example:</p> <p><i>The reproductive system of a sheep involves the production of an egg/ovum in the ovaries and this is then fertilised by sperm from a ram, and the fertilised egg will implant in the uterus. This will develop and grow into a lamb over the gestation period of the sheep (152 days).</i></p> <p><i>The eggs will not be produced unless hormones are produced by the sheep. The main hormone involved in reproduction is called oestrogen</i></p>



	<p><i>down. This then enters the rumen where microbes release enzymes to break down the carbohydrates.</i></p> <p><i>Subsequent chambers remove the water and the final chamber, the abom asum, or true stomach, works like a human stomach, secreting enzymes that break down the protein.</i></p> <p><i>The older or lower quality the pasture is, the more difficult it is to break down and extract the nutrients, even with the four chambered stomach. Less carbohydrate can be extracted to be used as energy and less proteins can be made to help with muscle and wool growth. Therefore the less weight gain there will be for the lambs.</i></p> <p><i>As RESOURCE C shows, as the pasture becomes older and begins flowering, the levels of carbohydrates drop and the levels of cellulose, which is hard to digest, increases. The weight gains for the lambs begin to decrease as a result.</i></p> <p><i>[A graph may be produced and explained to highlight the information in RESOURCE C]</i></p> <p><i>The examples above are indicative samples only.</i></p>	<p><i>and it stimulates the uterus to produce an egg. When sheep are ill or under-weight, they do not produce as much oestrogen. Hence, an egg can not be produced and no lamb can be born as a result. Alternatively, eggs may only be produced sporadically and the ewe may miss the chance to be inseminated by the ram, also resulting in no pregnancy.</i></p> <p><i>As lambs are the main source of income for a farmer, it is in his best interest to ensure that all his ewes are producing eggs at the time the ram is introduced.</i></p> <p><i>One way to assist with success at mating time (tupping) is the use of a technique called ‘flushing’ which is a process done in the 4-6 weeks before the ram goes out. This involves feeding the ewes a diet, high in nutrients e.g. short, leafy pasture, as the weight they gain from this stimulates a higher production of oestrogen. The higher amount of oestrogen can often cause the production of multiple eggs, instead of just one. This then means that there is a higher chance of both of these eggs being fertilised and multiple lambs being born. This not only increases the lambing percentage of the farmer, it also increases his profit as a higher lambing percentage leads to higher returns when more lambs are sold.</i></p> <p><i>After weaning, it is important for lambs to be fed on high quality pasture containing good amounts of clover (for protein) and carbohydrates (for energy) so they can reach peak condition for sale. The earlier a farmer can have his lambs ready for market the higher the income gained.</i></p> <p><i>The examples above are indicative samples only.</i></p>
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Final grades will be decided using professional judgement based on a holistic examination of the evidence provided against the criteria in the Achievement Standard.