Merino Sheep Breeding

Trainer Guide

Nicole Sallur (DPI&F, Qld),
Michael Williams (NSW TAFE) and
Tony Hamilton (DPI&F, Qld).

Editor: Stan Jacobs (ByteDisk Pty Ltd)

May 2008

Authors:

Nicole Sallur   (Department of Primary Industries and Fisheries, Queensland)

Michael Williams   (NSW Tafe)

Tony Hamilton   (Department of Primary Industries and Fisheries, Queensland

Editor:

Stan Jacobs   (ByteDisk Pty Ltd)

Merino Sheep Breeding Trainer Guide

© Sheep CRC Ltd

Requests and inquiries concerning reproduction should be addressed to;

The Communication Officer
Australian Sheep Industry CRC
CJ Hawkins Homestead
The University of New England
Armidale NSW 2351
sheepcrc@sheepcrc.org.au

ACKNOWLEDGMENTS

The development of the Merino Sheep Breeding Trainer Guide has drawn on the work undertaken by various organisations and individuals in the application of breeding and genetics across the Australian sheep and wool industry. In particular, acknowledgement is made of information drawn from:

- *Merino Breeding and Selection – a commercial focus* (1999), S. Hatcher and D. Bayley, The Woolmark Company and Department of Primary Industries, NSW

- *Money-making Merinos* (2005), EDGE network, Meat and Livestock Australia and Department of Primary Industries, Victoria

- *$electing $tuds for $uccess* (2001), R. Lewer and N. McLennan, Department of Primary Industries and Fisheries, Queensland

A number of people also gave their time and expertise to provide comments and suggestions for improvements. In particular, the contributions of the following people are greatly appreciated:

- Roger Lewer (Department of Primary Industries & Fisheries, Queensland),

- Allan Casey (New South Wales Department of Primary Industries),

- Cheryl Pope New South Wales Department of Primary Industries),

- Gregg McCann (Macquarie Artificial Breeders),

- Richard Apps (Meat and Livestock Australia),

- Sam Gill (Meat and Livestock Australia),

- Brian Ashton (Rural Solutions, South Australia),

- Lock Butler (Department of Agriculture and Food, Western Australia) ,

- Shelly Carpenter (Interactive Wool Group),

- Richard Manning (Interactive Wool Group),

- Bill Johnston (Interactive Wool Group) and

- Anne Ramsay (Australian Wool Innovation).

1 CONTENTS

2 INTRODUCTION

This trainer guide has been developed to allow vocational and education trainers (primarily in the TAFE, Agricultural College and School systems) to deliver up to date knowledge and skills in the area of Merino breeding to their students.

It is designed to be used in conjunction with three power point presentations, also produced by the Australian Sheep Industry CRC on developing a breeding objective, selecting a stud and rams and selecting ewes.

**The trainer guide and power point presentations can be downloaded from the CRC website:
www.sheepcrc.org.au/msbtg**

This guide has been designed to meet the following two national competencies:

– RTE 5101A Develop and implement a breeding strategy
– RTE 5107A Identify and select animals for breeding.

This trainer guide is structured to cover:

– training outline including resources, purpose and a suggested approach;
– practical exercises including resources, purpose, instructions for trainers and student worksheets;
– short answer questions which include both a worksheet for students and the answers for trainers;
– assessment sheet; and
– resources.

It also contains a record of training and assessment for the two competencies RTE 5101A Develop and implement a breeding strategy and RTE 5107A Identify and select animals for breeding. This record covers knowledge, performance and assessment requirements completed and the assessment process and evidence.

As well as the purpose and detail for five learning objects:

– applied genetics
– developing a breeding objective
– gather and use performance data for sheep selection
– selecting a ram source
– selecting rams
– selecting ewes.

The training is designed to be run with students over a number of individual sessions spread over some months. The total contact time required is 20 hours.

This training covers the following topics:

1. Developing a breeding objective – what it is, why it is important, what to focus on and how much progress can be made

2. Selecting a stud and rams – why it is important, determining potential studs that meet a breeding objective and their genetic progress, information available on sale rams, use of performance benchmarking, how long it will take to make a change and relative value of rams

3. Selecting ewes – replacement ewes, ewes joined to non merino sires, using performance evaluation for selection.

After completing this training, students will be able to:

1. Develop a breeding objective for a flock.

2. Select the most appropriate source of genetics by using performance benchmarking information and industry information on genetic progress.

3. Select rams using selection indexes, EBVs and other performance and visual information.

4. Select ewes that are best suited to a breeding objective.

5. Integrate performance evaluation into sheep selection decisions.

3 DEVELOPING A BREEDING OBJECTIVE

3.1 Training outline for developing a breeding objective

Total time: **5 hours 15 minutes**

3.1.1 Introduction

Time: **30 minutes**

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	

Purpose

1. To give students an understanding of the detail that will be covered during this session – developing a breeding objective.

2. To give students an understanding of the current situation with the Australian wool and lamb industries.

Suggested approach

- Explain purpose of this session. **PPT 1**

- Clearly outline what will be covered in this session. **PPT 2**

- Outline that the session will now focus on an overview of the Australian wool and prime lamb industries. **PPT 3**

- Outline the Australian wool industry situation. **PPT 4**

- Outline the Australian prime lamb industry. **PPT 5**

    Note trainers should give the amount of detail on the wool and lamb industries as appropriate for their students.

3.1.2 What is a breeding objective and why is it important?

Time: 15 minutes

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	

Purpose

1. To give students an understanding of what a breeding objective is and why it is important.

Suggested approach

▭ Explain purpose of this session. **PPT 6**

— Explain what a breeding objective is.

▭ Summarise what a breeding objective is and what it includes. **PPT 7**

▭ Explain why a breeding objective is important. **PPT 8**

- Ask students if they can suggest reasons why a breeding objective is important.

- Record responses on white board or butchers paper.

- Discuss answers in relation to key points.

3.1.3   What should a breeding objective focus on?

Time: 2 hours

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	
Copies of worksheet 1	

Purpose

1.   To give students an understanding of economically important and heritable traits that can be included in a breeding objective.

2.   To give students an understanding of how to balance meat and wool traits, as well as fibre diameter and fleece weight, in a breeding objective.

Suggested approach

Explain purpose of this session. **PPT 9**

Practical Exercise 1: Part 1

- Direct students to worksheet 1 and explain practical exercise 1.

- Divide students into three groups and give them a case study property/flock to work with.

   Note if case studies are not appropriate for the group of students, then trainers need to develop their own.

- Ask each group of students to list the returns and costs for their case study enterprise in the first column of the table in worksheet 1.

- After the groups have recorded their answers, ask each group to share what they have written.

Explanation of traits, influence of heritability, what drives profitability of enterprises and economically important traits. **PPT 10-14**

- Get each group of students to identify on worksheet 1 table, those traits related to these returns and costs (column 2), then those that are heritable and hence can be influenced by selection (column 3).

- • After the groups have recorded their answers, ask each group to share what they have written. Brief discussion.

✏ Explanation of measurable traits, correlations and selection criteria. **PPT 15-17**

- • Ask each group of students to record for those traits that are heritable the selection criteria that will be used to assess the trait, if not the same as the trait, and whether they will use measured or visual information in selecting these traits. (columns 4 and 5 of table in worksheet 1).

- • After groups have recorded their answers, ask each group to share what they have written. Brief discussion to reinforce the use of measurement.

   For more detail see Practical Exercise 1 page 20.

✏ How to achieve a balance between meat and wool in a breeding objective? **PPT 18**

✏ How to achieve a balance between body weight and fibre diameter in a breeding objective? **PPT 19**

✏ How to achieve a balance between fibre diameter and fleece weight in a breeding objective? **PPT 20**

3.1.4 How much progress can be made towards a breeding objective?

Time: 2 hours 30 minutes

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	
Information on averages and top figures for the district	
Picture or drawing of a merino ram	
Copies of worksheet 1	
Copies of short answer question sheet for developing a breeding objective	

Purpose

1. To give students an understanding of the value of performance data, primarily EBVs and selection indexes, in achieving genetic improvement.

2. To give students an understanding of some of the other constraints to achieving a breeding objective.

Suggested approach

- Explain purpose of this session. **PPT 21**

- Explain the importance of genetic variation. **PPT 22**

– Show a picture of a merino ram and ask: "What affects a ram's body weight?" Write the things as they come up on white board or butchers paper (Source: MLA, Money-making Merinos 2005). Explain that the only way a ram can affect his progeny is via his genes.

  Trainers will need to obtain a picture or drawing of a merino ram for this exercise.

- Explain P = G+E and why it is important. Draw the progression from visual assessment to objective measurement. **PPT 23**

- Explain EBVs. **PPT 24-25**

✎ Brief discussion of some of the other constraints to reaching a breeding objective eg production environment, labour availability, market access etc. **PPT 26**

– Discussion of what is possible in the area most relevant to the students i.e. what are the top producers in the local district achieving and what is the district average?

Trainers will need to find out this information and give to students as a hand out.

✎ Go through examples of achievable objectives. **PPT 27**

– **Practical Exercise 1: Part 2**

- Arrange students back into case study groups, and direct them to part 2 columns 6 and 7.

- For their case study flock, ask each group of students to record current flock performance for traits that can be improved genetically and then their target in ten years time. (Columns 6 and 7 in worksheet 1). *Students will be given the current performance relevant to their case study and will be asked to estimate a target to aim for in each of these traits.*

- After groups have recorded their answers, ask each group to share what they have written.

- Brief discussion of current versus target performance and how they might achieve this target ie through selection and management.

- Ask students to use the information from practical exercise one to develop a breeding objective for their case study flock.

- After groups have developed their breeding objective, ask each group to share what they have written.

- Brief discussion of various breeding objectives.

  For more detail see Practical Exercise 1 page 20

✎ Summarise session on developing a breeding objective. **PPT 28**

– Review session using short answer questions (page 28).

- Ask students to individually complete questions on developing a breeding objective.

- Discuss answers.

- Collect answer sheets.

3.2   Key points for developing a breeding objective

What is a breeding objective?

1.   *What is a breeding objective?*

— A breeding objective is a statement that sets the target at which the breeder is aiming their breeding program. It provides a description to guide your choice of a source of genetics, and for selecting rams and replacement ewes.

2.   *What should be included in a breeding objective?*

— The traits that are to be changed (traits are characteristics you want to improve in your flock).

— The desired level of performance in each trait.

— The time frame in which the change is to be made.

Why is a breeding objective important?

3.   *Why is a breeding objective important?*

— It sets long term production goals.

— It helps make faster progress towards your goal.

— It sets a consistent breeding direction for your flock.

— It provides the basis against which you can measure the improvement of your breeding program.

What should a breeding objective focus on?

4.   *Traits to focus on?*

— Traits on which you focus your breeding objective should be heritable, economically important and measurable.

5.   *Heritable traits*

— Heritability is a measure of how much of the variation that you see between sheep in your flock is genetic in origin.

— The higher the heritability of a trait the more likely it is that the superior parental performance will be passed onto the progeny and the more easily you can improve that trait through breeding. The more heritable the trait, the larger the proportion of measured performance of parents will be passed onto their offspring.

High heritability	Medium heritability	Low heritability
0.3 or above	0.1 – 0.3	0 – 0.1
30% or above	10 - 30%	0 – 10%
Examples		
• Fleece weight • Fibre diameter • Staple length • Live weight • Carcase fatness	• Staple strength • Weaning weight • Internal parasite resistance	• Number lambs born or weaned • Footrot resistance

6. Economically important traits

– Profitability of enterprises is driven by the amount of wool and sheep/lamb produced per hectare and per ewe, price per kilogram, stocking rate, and cost of production.

– Effective selection can improve wool income (fleece weight, fibre diameter), fertility (number lambs produced per ewe), growth rate/body weight and increased disease resistance (worms, flies) – all leading to increased profitability.

7. Measurable traits

– Choose traits for your breeding objective based on their importance to your enterprise. This should be done whether they are easy to measure or not.

8. Correlation

– Some pairs of traits are related to one another. You may set out to change a single trait in your breeding program, but at the same time this can cause changes in other traits without directly selecting for them. These traits are correlated, which means that some genes are common to both traits.

– This relationship between two traits can be a positive or negative one. A positive correlation means that as one trait increases, so does the other e.g. greasy fleece weight and clean fleece weight. A negative correlation means that as one trait increases, the other decreases e.g. greasy fleece weight and number of lambs weaned.

– You can use correlations as indirect selection criteria when related traits are difficult or expensive to measure.

9. Selection criteria

Selection criteria are measured or assessed to predict trait performance. They must be easy and cheap to measure and correlated with the traits in the objective. The selection criteria may the same as or different to the traits, although direct measurement is preferable.

How much progress can you make towards this breeding objective?

10. Genetic variation

There is huge genetic variation in the Merino flock. Therefore there is a huge opportunity to improve; you just have to identify the right sheep to select.

11. The value in performance data

Phenotype = Genotype + Environment (P=G+E). Genetics sets the potential and the environment controls what genes will be expressed and determines whether you will achieve the potential. The importance of understanding the difference between phenotype and genetics is that any advantage an animal has gained from the environment is not passed onto their offspring.

The only way a ram (or ewe) can affect their progeny is via their genes.

— Visual assessment and objective measurements, only give information on the individual sheep's performance and not how its progeny will perform.

— When selecting the best animal from which to breed it is important to be aware that only the genes are passed onto the next generation, so it is important to be able to estimate the genetic value of potential parents.

12. Estimated breeding value

— The genetic value of a ram (or ewe), is the value of its genes as a parent, and is usually expressed as an estimated breeding value (EBV). The EBV for a particular trait is a prediction of how the individual will perform as a parent for that trait.

13. Other constraints to reaching your breeding objective

— Labour availability.

— Production environment – what your country is capable of producing eg, the level of nutrition available throughout the year, and the likely amount of dust and vegetable matter in the clip.

— Market access.

3.3 Practical exercises for developing a breeding objective

3.3.1 Practical Exercise 1 – Breeding objective development made easy

Time: 3 hours 30 minutes

Introduction

This practical exercise is conducted in two parts:

— Part one: returns and costs, economically important and heritable traits, selection criteria and measured or visual information; and

— Part two: current and target performance for these traits, and the case study breeding objective.

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard markers	
OHP/Power point presentation and equipment	
Copies of worksheet 1	
Copies of three case studies	
Current performance figures for each case study	

Purpose

1. To improve students understanding of breeding objectives.

2. To get students to develop a breeding objective.

Instructions for trainers

Part one: Returns and costs, economically important and heritable traits, selection criteria and measured or visual information (2 hours 30 minutes)

— Direct students to practical exercise 1, worksheet 1.

— Explain this exercise will be conducted in two parts. Commence with part one of the exercise – i.e. returns and costs, economically important and heritable traits, selection criteria and measured or visual information.

—   Divide students into three groups and hand out case studies.

—   ***Note:***

   ·   ***If case studies don't appear relevant to your region or group of students, then more applicable ones may need to be developed.***

   ·   ***If students already have a flock on which they have some detailed knowledge, they can use this flock for the practical exercise.***

—   Explain that each group will fill out the table on worksheet 1 for their case study flock. To start off direct students to only fill in the first column titled 'returns and costs'. Explain the terms returns and costs.

—   Ask each group of students to list the returns and costs for their case study flock in the table in worksheet 1 (column 1).

—   After groups have recorded their answers, ask each group to share what they have written and discuss.

📖   Explain to students what drives profitability of enterprises, economically important traits, and the influence of heritability. **PPT 10-14**

—   Now get each group of students to identify in the table on worksheet 1 table, those traits related to these returns and costs (column 2), then those that are heritable and hence can be influenced by selection (column 3).

—   After the groups have recorded their answers, ask each group to share what they have written and discuss.

📖   Explain to students the following terms: measurable traits, correlations and selection criteria. **PPT 15-17**

—   Then ask each group of students to record for these traits that are heritable, the selection criteria that will be used to assess the trait, if not the same as the trait, and whether they will use measured or visual information in selecting these traits. (columns 4 and 5 of table in worksheet 1).

—   After groups have recorded their answers, ask each group to share what they have written. Brief discussion to reinforce the difference between traits and selection criteria and the use of measurement.

Part two: Current and target performance for these traits and case study breeding objective (1 hour)

—   Ask students to return to worksheet 1, practical exercise 1 and reform into case study groups. Explain that students are now going to finish filling out the table from part one – columns 6 (current trait performance) and column 7 (target trait performance).

— For their case study flock, ask each group of students to record the current performance for traits that can be improved genetically and then their target for these traits over the next 10 years. (columns 6 and 7 in worksheet 1). ***Students will be given the current performance relevant to their case study and will be asked to estimate a target for each of these traits.***

— After groups have recorded their answers, ask each group to share what they have written.

— Brief discussion of current versus target performance and how they might achieve this target ie through selection and management.

— Ask students to then use the information from practical exercise one to develop a breeding objective for their case study flock.

— After groups have developed their breeding objective, ask each group to share what they have written.

— Brief discussion of various breeding objectives.

Case study scenarios for practical exercise 1

Property 1 "Aglum Flats"

Background:

You own a 40 000 hectare property in the pastoral/rangeland area of western Queensland. It is predominantly mulga country with some creek frontage.

Enterprise:

Medium wool self-replacing Merino ewe flock of 8000 breeding ewes, producing 21-micron wool, with an average cut of 5 kg/hd.

Lambing rate is 65%.

Rams are purchased from a stud that uses EBVs and replacement ewes are bred on farm.

Product and source of income:

Sale of wool.

Sale of surplus young wethers.

Sale of cast-for-age ewes.

Expenses:

Worms are an occasional problem and you worm check after rain and treat if necessary.

Flies can be an issue and you regularly monitor the flytraps in your paddocks and treat for fly when numbers increase.

Due to the continuing dry season supplementary feed is required, particularly for your breeding ewes.

Property 2 "Redrob Place"

Background:

You own a 2000 hectare property in a reliable rainfall area of south eastern Australia, suited to pasture improvement.

Enterprise:

19 micron wool production and surplus sheep sales (cfa ewes, cull ewes and two tooth wethers)

4000 breeding ewes, and 1.5% rams.

Lambing is 95%.

Product and source of income:

Sale of surplus sheep. Cast for age ewes are sold at 5 years, some cull ewes are sold, and wethers are sold to either restockers or butchers at 18 months.

Wool sales – ewe flock averages 19-20 micron and hoggets 18-19 micron.

Expenses:

A worm control program of two summer drenches is followed, but Barber's Pole outbreaks are common in summer.

Flies can also be a problem as rainfall is summer dominant

Property 3 "Lafnair Downs"

Background:

You own a 3000 hectare property in a mixed cropping area of Australia.

Enterprise:

High quality medium wool and first cross lambs. Almost half of your Merino ewes go into a first cross lamb producing flock.

Product and source of income:

Sale of prime lambs.

Sale of merino wether lambs.

Wool sales.

Sale of cast-for-age and cull ewes.

Expenses:

Those normally associated with prime lamb and wool production in a mixed farming area.

🗒 *Worksheet 1* – Practical Exercise 1: Breeding objective development made easy

Name:				Date:		

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Returns and costs	**Economically important traits ie traits related to these returns and costs**	**Are these traits influenced by genetics ie are they heritable? (Y/N)**	**What selection criteria will be used to assess these genetic traits (may be the same or different to the trait)?**	**Will measured or visual information be used? (M/V)**	**What is the case study flocks current performance in these traits?**	**What is the target performance for the case study flock in 10 years?**
Example: wool	clean fleece weight	Y	greasy fleece weight	M	4.5 kg/hd	5 kg/hd

Name:				Date:		

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Returns and costs	Economically important traits i.e. traits related to these returns and costs	Are these traits influenced by genetics i.e. are they heritable? (Y/N)	What selection criteria will be used to assess these genetic traits (may be the same or different to the trait)?	Will measured or visual information be used?(M/V)	What is the case study flocks current performance in these traits?	What is the target performance for the case study flock in 10 years time?
Example: wool	clean fleece weight	Y	greasy fleece weight	M	4.5 kg/hd	5 kg/hd

Name:		Date:	

1. Using the previous information from Worksheet 1 develop a breeding objective for your case study flock.

3.4   Short answer questions for developing a breeding objective

Name:		Date:	

1.   Describe a breeding objective and what it should include?

_____

_____

_____

_____

_____

_____

2.   Which of the following is an example of a well-defined and achievable breeding objective?

   (a) Upstanding sheep with deep bodies and well-sprung ribs with stylish, white, waterproof wool.

   (b) Increase body weight by 10 kg, reduce fibre diameter by 2 microns and increase fleece weight 2 kg, in two years.

   (c) In 10 years decrease fibre diameter by 1 micron, increase fleece weight by 0.5 kg, increase staple strength by 5 N/ktex, while maintaining body weight.

   (d) We breed sheep with free growing, well nourished, excellent styled wools with good constitution, open draping fronts and deep bodies.

3.   Explain why a breeding objective is important?

_____

_____

_____

_____

Name:		**Date:**	

4. List the characteristics of traits that can be improved through breeding and selection.

_____

_____

_____

_____

5. Link the following words with their meanings.

Heritability	When you change one trait, another changes as well, even though you aren't trying to change it.
Correlated traits	A measure of how much of what you see in a flock is caused by genes.
Traits	A prediction of how the individual will perform as a parent for that trait.
Selection criteria	Characteristics you want to improve in your flock.
Estimated breeding value	Things you measure or assess in your sheep to predict the performance of their traits.

6. Explain how you can use correlated traits to your advantage in breeding and selection?

_____

_____

_____

_____

Name:		Date:	

7.   Fill in the blanks:

To be able to use selection criteria in your breeding program they must be:

_____ and _____ to measure; and

the   same as or _____ with the _____ you want to improve.

8.   Explain why genetic variation in the merino flock is important?

_____

_____

_____

_____

_____

_____

9.   What does P = G + E describe, and why is it important to consider in developing a breeding program?

_____

_____

_____

_____

_____

_____

Name:		Date:	

10. Describe EBVs and discuss why they are important.

_____

_____

_____

_____

_____

_____

_____

_____

_____

11. List three constraints (apart from the traits selected for) in achieving a breeding objective.

_____

_____

_____

_____

Answers to questions for developing a breeding objective

1.   Describe a breeding objective and what it should include?

A breeding objective is a statement that sets the target at which the breeder is aiming at. It describes your choice of stud, bloodline, rams and replacement ewes.

It should include:

–   Traits that you wish to improve.

–   Desired level of performance for each trait.

–   Time frame over which you are going to make the change.

2.   Which of the following is an example of a well-defined and achievable breeding objective?

The answer is "c" because it clearly defines the traits you want to improve, the level of improvement you are aiming for along with a time frame. Plus the traits are heritable, economically valuable and measurable.

(a)   Upstanding sheep with deep bodies and well-sprung ribs with stylish, white, waterproof wool.

(b)   Increase body weight by 10 kg, reduce fibre diameter by 2 microns and increase fleece weight 2 kg, in two years.

(c)   In 10 years decrease fibre diameter by 1 micron, increase fleece weight by 0.5 kg, increase staple strength by 5 N/ktex, while maintaining body weight.

(d)   We breed sheep with free growing, well nourished, excellent styled wools with good constitution, open draping fronts and deep bodies.

3.   Explain why a breeding objective is important?

A breeding objective is important as:

–   It sets long term production goals.

–   It helps make faster progress towards your goal.

–   It sets a consistent breeding direction for your flock.

–   It provides the basis against which you can measure the improvement of your breeding program.

4. **List the characteristics of traits that can be improved through breeding and selection**

    Heritable, economically important and measurable.

5. **Link the following words with their meanings:**

    – Heritability is a measure of how much of what you see in a flock is caused by genes.

    – When you change one trait, another changes as well, even though you aren't trying to change it. These traits are called correlated.

    – Traits are characteristics you want to improve in your flock.

    – Selection criteria are things you measure or assess in your sheep to predict the performance of their traits.

    – Estimated breeding value is a prediction of how the individual will perform as a parent for that trait.

6. **Explain how you can use correlated traits to your advantage in breeding and selection?**

    Because correlated traits are related to one another, you can use them as selection criteria when related traits are difficult or to expensive to measure.

7. **Fill in the blanks:**

    To be able to use selection criteria in your breeding program they must be:

    – cheap and easy to measure.

    – the same as or correlated with the traits you want to improve.

8. **Explain why genetic variation in the merino flock is important?**

    Because there is large variation in the Merino flock it means that there is a huge opportunity to improve.

9. **What does P = G + E describe, and why is it important to consider in developing a breeding program?**

    – P = phenotype, G = genotype and E = environment.

    – Genetics sets the potential and the environment controls what genes will be expressed and determines whether you will achieve the potential. The importance

of understanding the difference between phenotype and genetics is that any advantage an animal has gained from the environment is not passed onto their offspring.

— The only way a ram (or ewe) can affect their progeny is via their genes.

10. Describe EBVs and discuss why they are important

— The genetic value of a ram (or ewe), is the value of its genes as a parent, and is usually expressed as estimated breeding value (EBV). The EBV for a particular trait is a prediction of how the individual will perform as a parent for that trait.

11. List three constraints (apart from the traits selected for) in achieving a breeding objective

(a) Labour availability.

(b) Production environment – what can your country produce?

(c) Market access.

3.5   Assessment for developing a breeding objective

Student enrolment number	

Assessor to complete:

Students should be able to show evidence they can:	Assessment record	
	Short answer written questions	Practical exercise
1. Describe the role of genetics and the environment on the phenotype of an individual.		
2. Describe the use of estimated breeding values in a breeding program		
3. Develop a breeding objective for a flock.		

More evidence is required for:

1. ☐   2. ☐   3. ☐

Comments:

_____

_____

_____

_____

_____

Assessor's name		Date to be submitted by	
Assessor's contact details		Date	

3.6   Resources for developing a breeding objective

Resource	Topics covered		
	What is a breeding objective and why is important	**What should it focus on**	**How much progress can be made**
Department of Primary Industries and Fisheries, Queensland — Lewer, R. and McLennan, N.M (2001) *$electing $tuds for $uccess* • Meeting your market – why is it important?, p7-12 • How does selection work?, p13-19 • Breeding objective, p21-23 • Selection criteria and correlations, p27-28 • Production objective, p29 • Visual versus objective selection, p47-48	✓	✓	✓
Comments:			
• All topics partially covered but quite complex explanations. • Only focuses on wool. • Differentiates between stud and commercial flocks – stud has a breeding objective while a commercial flock has a production objective. • Good explanation of breeding objective, with good examples as well as selection criteria and correlations. • Extra detail on meeting your market (needs updating). • Explains estimated progeny values (EPV) as well as estimated breeding values (EBV).			

Resource			
The Woolmark Company and Department of Primary Industries, NSW — Hatcher, S. and Bayley, D. (1999) *Merino Breeding and Selection – A commercial focus,* • Module 1 Meeting your market needs, p1-23 • Module 2 The key features of profitable merino enterprises • Module 3 Developing a breeding objective to increase your profit, p2-15	✓	✓	✗
Comments:			

Resource	Topics covered		
	What is a breeding objective and why is important	**What should it focus on**	**How much progress can be made**

- Primarily focuses on wool.
- Lots of detail on meeting your market needs and key features of profitable merino enterprises (both of which need updating).
- Good explanation of breeding objective, traits, selection criteria, heritability, correlations.
- Little information on EBVs.

Meat and Livestock Australia, EDGE network (2005) **Money-making Merinos** • Workshop notes • Facilitators guide • Power point presentation	✘	✔	✔

Comments:

- Both meat and wool focus.
- Good general description of wool, sheep and lamb industries in Australia.
- Explanation and activities for determining profitability of sheep enterprises.
- Good explanation of P=G=E and EBVs.

Meat and Livestock Australia, EDGE network (2004) **Money-making Mums** • Workshop notes • Facilitators guide • Power point presentation	✘	✔	✘

Comments:

- Focuses on maternal genetics to improve reproductive rates and carcase weights to improve the profitability of the prime lamb enterprise.
- Good description of the prime lamb industry.
- Explanation of profitability and setting production targets for prime lamb enterprises.
- Good explanation of P=G+E, visual vs objective measurement and EBVs.

Meat and Livestock Australia, EDGE network (2005) **Effective Breeding for Lambs** • Workshop notes	✘	✔	✘

Resource	Topics covered		
	What is a breeding objective and why is important	*What should it focus on*	*How much progress can be made*
• Facilitators guide • Power point presentation			
Comments:			
• Good description of prime lamb industry and profitability of prime lamb enterprises. • Explanation and activities relevant to setting production targets. • Some examples of heritability of economically important traits. • Good explanation of P=G+E, visual vs objective measurement and EBVs.			
University of New England (2004) ***Wool 412/512, Sheep Production***	✔	✔	✔

Resource	Topics covered		
	What is a breeding objective and why is important	*What should it focus on*	*How much progress can be made*
• Ch 1: Profile of the Australian Sheep Industry, D. Cottle, p1.4-1.6 • Ch 2: Fleece weight and its component traits, T Schlink, p2.5-2.9 • Ch 3: Fibre diameter, staple strength, style, handle and curvature, T Schlink, p3.2, 3.7-3.8, 3.14-3.15, 3.18-3.19 • Ch 4: Wool colour and fleece rot, S. Mortimer, p4.1-4.3, 4.8-4.10 • Ch 5: Contamination – dark and medullated fibres and vegetable matter, M Fleet and C Langford, p5.41 • Ch 6: Lamb and mutton, NSW Agriculture, p6.3-6.12 • Ch 7: Sheep health, S Walken-Brown and B Beiser, p7.3-7.4, 7.13-7.14, 7.19-7.20, 7.28-7.30 • Ch 10: Benchmarking, husbandry calendars and precision sheep management, S McEachern, p10.2-10.4, 10.12-10.15 • Ch 11: Breeding merinos for profitable wool production: fleece weight and fibre diameter, P Taylor, p11.5-11.17 • Ch 12: Genetics of staple strength, style and skin-based selection, J Greef, p12.2-12.4, 12.7-12.9, 12.10, 12.11-12.14, 12.14-12.17 • Ch 13: Genetics of disease resistance, S Mortimer, p13.3-13.13 • Ch 14: Genetics of body weight and reproduction, G Hinch, p14.3-14.8 • Ch 15: Using genetics to improve lamb growth and meet target carcase specifications, N Fogarty, p15.5-15.14			
Comments:			

Resource	Topics covered		
	What is a breeding objective and why is important	*What should it focus on*	*How much progress can be made*

- Small parts in most chapters relating to economic importance, correlation, heritability and variation of most traits.
- Good description of sheep, wool and lamb industries in chapters 1 and 6.
- Chapter 11 is the chapter that is most relevant to these topics.
- Good description of EBVs in chapter 15.
- Chapter 1 general description of sheep and wool industry in Australia and determinants of wool enterprise profitability.
- Chapter 2 description of correlations and variations associated with fleece weight.
- Chapter 3 economic importance of fibre diameter, staple strength, style and curvature.
- Chapter 4 economic importance of wool colour and fleece rot.
- Chapter 5 economic importance of vegetable matter.
- Chapter 6 what consumers want from lamb, markets for lamb, live sheep exports.
- Chapter 7 economic impact of disease, internal parasites and flystrike genotype influence and control using genetic selection.
- Chapter 10 benchmarking, profitability and cost of production; precision sheep management.
- Chapter 11 heritability, correlation, breeding objectives, selection criteria, EBV, visual vs objective, economic importance of fleece weight and fibre diameter, balancing fleece weight and fibre diameter, genetic variation.
- Chapter 12 genetic variation, heritability and correlations of staple strength, style and skin traits, selection criteria for skin traits and SRS.
- Chapter 13 genetics of disease resistance.
- Chapter 14 correlations and EBVs for body weight and reproduction rate.
- Chapter 15 genetic variation for growth and carcase traits, EBVs.

Cottle, D.J. (ed.) (1991) **Australian Sheep and Wool Handbook** • Breeding objectives, p67-70	✓	✓	✗

Comments:

- First two topics partially covered but in textbook style.
- Covers objectives and traits for both meat and wool enterprises.

4 SELECTING A STUD AND RAMS

4.1 *Training outline for selecting a stud and rams*

Total time: **7 hours 45 minutes**

4.1.1 Introduction

Time: **15 minutes**

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	

Purpose

1. To give students an understanding of the detail that will be covered during the session – selecting a stud and rams.

Suggested approach

📖 Explain purpose of this session. **PPT 1**

📖 Clearly outline what will be covered in this session. **PPT 2**

4.1.2 Why is selecting the right stud important?

Time: 15 minutes

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	

Purpose

1. To give students an understanding of why selecting the right stud is important.

Suggested approach

Explain purpose of this session. **PPT 3**

Explain why selecting the right stud is important. **PPT 4-5**

- Ask students if they can suggest reasons why choosing a stud is so important.

- Record responses on white board or butchers paper.

- Discuss answers in relation to key points.

4.1.3 Determine potential studs that meet a breeding objective

Time: 1 hour 45 minutes

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	
Handouts of benchmarking options	
Copies of worksheet 2	
Practical exercise 1, worksheet 1 case study breeding objective	
Copies of Merino Bloodline Performance or other suitable benchmarking information	

Purpose

1. To give students the knowledge and ability to be able to use benchmarking information to help determine potential studs and rams that meet a breeding objective.

Suggested approach

📖 Explain purpose of this session. **PPT 6**

📖 Explain various ways to compare a stud and its rams with other sources. Trainers should explain in detail and have handouts for whichever benchmarking options are most applicable to the group. **PPT 7**

- Wether and ewe trials.
- Bloodline comparisons.
- On-farm trials.
- Central Test Sire Evaluation.
- Merino benchmark.
- Lambplan.
- MerinoSelect.
- Performance of the stud's own commercial flock.

- • Performance of a stud's clients flocks run under similar conditions to yours.

✍ Explain the role of Sheep Genetics (MerinoSelect) **PPT 8**

– **Practical Exercise 2: Part 1**

- • Direct students to practical exercise 2 worksheet 2 and explain that this practical will be conducted in three parts, the first of which we will do now.

- • Hand out copies of the Merino Bloodline Performance package.

  Note: If the Merino Bloodline Performance package is not suitable for students then trainers need to select another type of benchmarking information on which to conduct the practical

- • Explain bloodline performance package using an example breeding objective and stud.

- • Ask students to locate three potential studs that meet their case study breeding objective in the package and record how well these studs fit their breeding objective.

- • After students have recorded their answers ask several members of the group to share what they have written and discuss.

  For more detail see Practical Exercise 2 page 54.

4.1.4   Where are these studs heading?

Time: 1 hour

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	
Copies of worksheet 2	

Purpose

1.   To give students the knowledge and ability to determine the direction a stud is heading.

Suggested approach

📖   Explain purpose of this session. **PPT 9**

📖   Explain the studs breeding objective and why it should be similar to yours. PPT 10

📖   Explain how to determine a stud's likely progress. **PPT 11-15**

- How do they select rams for use in the stud – visual and objective selection criteria, selection index, EBVs.

- Selection differential for rams used in the stud.

–   **Practical Exercise 2: Part 2**

- Direct students back to practical exercise 2 worksheet 2 and explain that we will now be completing part 2 of this practical exercise.

- Ask students to record questions they will ask three potential studs to help determine their current performance and likely future progress.

- After students have recorded their answers ask several members of the group to share what they have written and discuss.

    For more detail see Practical Exercise 2 page 54.

4.1.5 Is the information you need available on the rams from these potential studs?

Time: 1 hour

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	
Example of a performance report from a relevant stud	

Purpose

1. To give students the knowledge and skills to be able to determine if the information they need (based on a breeding objective) is available on rams from potential studs.

Suggested approach

Explain purpose of this session. **PPT 16**

Explain which information is best to use when selecting rams – selection indexes, EBVs, deviation from average, objective measurement or visual selection. **PPT 17-28**

Trainers should have a performance report available from a relevant stud to show students what the information may look like and how it will be presented.

Explain accuracy of ram selection. **PPT 29-30**

4.1.6 Other considerations when selecting a stud

Time: 30 minutes

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	
Copies of worksheet 2	

Purpose

1. To give students an understanding of some of the other considerations when selecting a stud.

Suggested approach

📖 Explain purpose of this session. **PPT 31**

– **Practical Exercise 2: Part 3**

- Direct students to practical exercise 2 worksheet 2, and location explain that we will now be completing part 3.

- Ask students what else they think should be considered when selecting a stud and get them to record their answers on worksheet 2, part 2.

📖 After all students have recorded their answers and discuss. **PPT 32**

For more detail see Practical Exercise 2 page 54.

4.1.7   How long will it take to make the change?

Time: 30 minutes

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	

Purpose

1.   To give students an understanding of what happens when you change breeding objective or ram source.

Suggested approach

Explain purpose of this session. **PPT 33**

Explain what happens if you change breeding objectives. **PPT 34-35**

Explain what happens when you change studs. **PPT 36-38**

4.1.8   The relative value of rams

Time: **2 hours 30 minutes**

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	
Copies of worksheet 3	
Copies of worksheet 4	
Copies of case study information	
Copies of short answer question sheet for selecting a stud and rams	

Purpose

1.   To give students an understanding of how to determine the relative value of rams related to a breeding objective.

2.   To get students to understand that EBVs predict economic differences in offspring.

Suggested approach

✎   Explain purpose of this session. **PPT 39**

✎   Explain how to determine the relative value of rams related to your breeding objective. **PPT 40-46**

–   **Practical Exercise 3**

•   Direct students to practical exercise 3, worksheet 3.

•   Ask students to form their case study groups again.

•   Explain that for this practical students will value rams with two vastly different EBVs for fleece weight for their case study property.

•   Using the given EBVs for fleece weight, ask students to calculate the difference in value for the two rams with these different EBVs for fleece weight. Record answers on worksheet 3.

•   After all students have recorded their answers, ask each group to share their answers and discuss.

- • Then ask students to record on worksheet 3 when it might not be the best option to buy the highest EBV ram.

- • After all students have recorded their answers, ask several members of the group to share what they have written and discuss.

  For more detail see Practical Exercise 3 page 61.

– **Practical Exercise 4**

- • Direct students to practical exercise 4, worksheet 4 and location where practical exercise will be conducted.

- • Ask students to divide into their case study groups and hand out the information they need for this practical.

- • Groups have to buy rams from the catalogue with suits their case study scenario. Give them 15 minutes to decide which rams they want. Record which rams they want (remember that they need to choose twice as many as they need) and how much they are prepared to pay for them on rams on worksheet 4.

- • Explain rules of Helmsman auction. Then the auction is run for 15 minutes.

- • Discuss the different requirements for rams and how each group approached it.

  For more detail see Practical Exercise 4 page 67.

✎ Summarise session on selecting a stud and rams. **PPT 47**

– Review session using short answer questions. (page 72)

- • Ask students to individually complete short answer question sheet.

- • Discuss answers.

- • Collect answer sheets.

4.2 Key points for selecting a stud and rams

Why is selecting the right stud important?

1. Why is selecting a stud important?

— Selecting a stud is the most important decision for commercial breeders. The genetic progress in the commercial flock is entirely set by the breeding program of the ram source. Commercial breeders can't have an independent direction from their stud's direction in the long term.

Determine potential studs that meet a breeding objective

2. How does the stud and its rams compare with other ram sources?

— Obtain benchmarking information on studs and rams to make comparisons such as:

- Wether and ewe trials – consist of teams of wethers or ewes selected at random from participants flocks. Teams are run together for the entire trial and their production is measured.

- Bloodline comparisons – wether or ewe trials in which each stud is represented by several teams.

- On-farm trials – trial matings of various studs rams to your ewes on your farm.

- Central test sire evaluation (CTSE) – a series of linked sites where sires are progeny tested. http://mss.csiro.au

- Merino Benchmark – uses links between CTSE's and studs to provide EPVs for both progeny tested and other rams in recorded flocks.

- Lambplan – across flock sire evaluation that relies on links formed through sires used in more than one stud as well as sires with progeny in more than one flock. It is primarily the service for terminal or maternal sires (meat focus breeds). www.sheepgenetics.org.au/lambplan/

- MerinoSelect – similar to Lambplan but it is the national system for supplying genetic information to Merinos and other wool breeds. www.sheepgenetics.org.au/merinoselect/

- Performance of studs own commercial flock – examination should cover a minimum of five years of production information to reduce the chance the results are due to a good or bad year.

- Performance of a studs clients flocks run under similar conditions to the commercial breeder – should be considered in conjunction with other information.

Where are these studs heading?

3. ***Does the stud breeding objective align with the commercial objective?***

— The stud's breeding objective should match the commercial objective. If not consider changing studs. If there is no similarity between these two objectives then no matter which rams you purchase, breeding will not contribute to the achievement of your objective.

4. ***How to determine a stud's likely progress***

— How are rams selected for use in the stud?

  • Better use of objective measurement by studs when selecting rams will lead to more genetic gain and have flow on effects to their clients.

  • Visual selection is useful to remove sheep that are reproductively or physically unsound.

  • If the stud selects the very best rams on economically important traits, client flocks will enjoy continuing economic benefits. These are the rams that have the highest EBV or selection index.

— What is the selection differential for rams used in the stud?

  • Selection differential is the difference between the performance of the selected rams and the group from which they were selected.

  • Genetic progress is maximised when the stud maximises its selection differential (based on a selection index) when choosing worker rams.

  • The higher the selection differential, the more returns to be gained from the rams progeny.

What information is available on the rams?

5. ***Which information to use to select rams?***

— The rams with the highest EBV or selection index will produce the most profitable progeny. If there are no EBVs or selection indexes then it may be best to go to a ram source who can provide this information.

— For multiple trait selection, using the studs index will be the best guide for the ram buyer. An index allows you to choose rams in the knowledge that they will breed the most profitable progeny.

— Direct production information is only useful if the group averages are known.

— Selecting only on visual indicators tells little about the genetic potential of the animal.

– Once short listed rams should be carefully examined for physical and reproductive soundness.

6. Accuracy of ram selection

– Environmental effects reduce the accuracy of measured and visual selections. These include:

- Birth status – single or twin.

- Age of dam – maiden or adult.

- Date of birth – early or late.

– Ask the following questions to ensure that your ram selections are accurate?

- Is the spread of age between the oldest and youngest sheep in the mob less than eight weeks?

- Have all rams been run together as one mob and received the same management?

- Did the rams have an even up shearing prior to measured assessment?

- Were the rams 10 months or older when assessed?

- Did the rams have 6 months or more wool growth before measured assessment?

- Has the performance indication taken account of birth type, age of dam or age effects?

- Has the performance information taken account of the pedigree of rams?

Other considerations when selecting a stud

7. Other considerations when selecting a stud:

– Locality of the stud.

– Disease status.

– Services the stud provides to their clients.

How long will it take to make the change?

8. What happens if you change breeding objectives?

– Nothing unless you change to a stud that matches the breeding objective. The commercial flocks genetic progress flock is set by the breeding program of the stud.

9. What happens if you change studs?

– If the new stud is genetically superior than the old one, then the ram buyers flock will slowly move up to a stable two generation lag period behind the new stud.

– If the new stud is genetically inferior than the old one, the ram buyer's flock will gradually fall to a new equilibrium.

— Large improvements can be made quickly by introducing a superior bloodline.

— Better selection of rams from the current stud will also give improvements (but not as large) over the longer term.

Value of rams

10. Value of rams

— The amount to pay for rams depends upon their estimated breeding value. It is worth paying more for rams if there is a good chance their progeny will be more productive and profitable.

— How much you should pay for rams depends on:

• How many lambs do you expect to produce per ram?

• The genetic merit of the stud that you are buying rams from.

• The EBV of the ram, which relates his performance to the average of the flock in which he was bred.

— What should be the average price for rams? There is no easy answer as:

• The magnitude of genetic differences between studs is not known.

• Studs for which there is a high demand can justifiably set their average higher.

• The stud will have used previous experience to balance sales against price to obtain an acceptable clearance rate.

• The average price is related to the quantity and quality of promotion.

— Buy the highest EBV or selection index ram available at the lowest price.

4.3 Practical exercises for selecting a stud and rams

4.3.1 Practical Exercise 2 – Selecting a stud

Time: 2 hours

Introduction

This practical exercise is conducted in three parts to give students experience in using benchmarking information to help select a suitable stud and an understanding of any other information that is required to help make this decision.

This practical is conducted using the Merino Bloodline Performance Package however trainers need to determine if this is the most appropriate benchmarking information to use with their students. If not then an alternative practical along similar lines can be designed using other relevant benchmarking information.

Preparation before the workshop

The first step in preparing for this practical is to determine if the Merino Bloodline Performance Package is the most suitable benchmarking information to use with your students, if not then alternative arrangements for a practical exercise need to be made. If it is then sufficient copies of the most recent Merino Bloodline Performance Package need to be obtained. Trainers then need to become familiar with the information in the package and how to use it.

Resources	Checklist(✓)
Copies of Merino Bloodline Performance Package or other suitable benchmarking information	
Copies of worksheet 2	
Practical exercise 1, worksheet 1 case study flock breeding objective	

Purpose

1. To give students experience in using benchmarking information to help select a suitable stud (and rams) based on a breeding objective.

2. To give students an understanding of any other information that is required to help make the correct choice of stud.

Instructions for trainers

Part one: Selecting potential studs that meet your case study flock breeding objective (1 hour)

— Direct students to practical exercise 2 worksheet 2 and hand out copies of Merino Bloodline Performance Package.

— Explain that this practical will be conducted in three sessions, with only the first part being completed now.

— Explain Merino Bloodline Performance Package using an example breeding objective and stud.

  • Example breeding objective: Increase fleece weight and body weight by 10%, while maintaining fibre diameter over 10 years.

  • Find the Hazeldean stud and see if it meets the breeding objective of the case study flock.

— Get students to locate three potential studs that meet the breeding objective they developed for their case study flock in practical exercise one, in Table 1 of the Merino Bloodline Performance Package. (If a stud of interest is not listed in this package, then the client could question why and perhaps some pressure should be put on them to become involved in benchmarking).

— Ask students to use the code from Table 1 to locate these studs on Figure 2 of the Merino Bloodline Performance Package.

— Ask students to record the positive and negative features of how well these studs fit the case study flock objective – considering all traits in the objective.

— After all students have recorded their answers, ask several members of the group to share what they have written.

— Briefly discuss using:

  • Other traits such as body weight and wool quality, and why this might exclude some bloodlines that had desirable values for fibre diameter and fleece weight.

  • Traits not listed in table 1 such as fleece rot resistance, reproductive rate and conformation also need to be considered.

Part two: Determining the progress of these studs (30 minutes)

— Re-direct students back to practical exercise 2 worksheet. Explain that we will now be completing part two.

— Ask them to record questions they will ask these three potential studs to help determine their current performance and likely future progress.

— After all students have recorded their answers, ask several members of the group to share what they have written.

— Briefly discuss using:

- Potential studs need to be investigated as their breeding objectives, selection practices, and genetic progress in the last 10 years and coming 10 years may alter their performance relative to the results presented here. There is a 5-10 year lag between the bloodline's current performance and the performance in these results.

- For bloodlines you consider as options discuss with the stud, the results from their own performance monitoring system and the likely rate of progress in the future. Without this information it will be difficult to adjust the performance in these results to account for breeding progress.

Part three: Other considerations (30 minutes)

— Re-direct students back to practical exercise 2 worksheet. Explain that part three will now be completed.

— Ask students to record any other questions they need to ask the three potential studs.

— After all students have recorded their answers, ask several members of the group to share what they have written.

— Briefly discuss using:

- Locality of stud.

- Adaptation of rams.

- Management of rams at stud.

- Disease status.

- Client service.

- Price of rams.

- Availability of rams at the stud, numbers, and time of year available.

- Availability of relevant information to help you select rams.

📄 *Worksheet 2* – Practical Exercise 2: Selecting a stud

Part one: Selecting potential studs that meet your case study flock breeding objective

1. Find three potential studs that meet the breeding objective you developed for your case study flock (practical exercise 1) in Table 1 of the Merino Bloodline Performance Package. Record the names of these potential studs in the worksheet table.

2. Use the code from Table 1 to locate these studs on Figure 2 of the Merino Bloodline Performance Package.

3. Record in the worksheet table the positive and negative features of how well these potential studs fit the breeding objective for your case study flock.

Part two: Determining the progress of these studs

4. Record in the space provided the questions you will ask these potential studs to help you determine their current performance now and likely future progress.

Part three: Other considerations

5. Record in the space provided any other questions you need to ask these studs to help you make your decision on which stud to use.

Part one: Selecting potential studs that meet the case study flock breeding objective

Name:		Date:	

	Potential stud 1	Potential stud 2	Potential stud 3
Stud name			
Positive features			
Negative features			

Part two: Determining the progress of these studs

Name:		Date:	

1. List below questions to ask these potential studs to help determine their current performance and likely future progress.

Part three: Other considerations

Name:		Date:	

2. List below any other questions to ask these potential studs to help make a decision on which stud to use.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

4.3.2 Practical Exercise 3 – Using EBVs to value a ram

Time: 1 hour

Introduction

This practical exercise is designed to demonstrate to students that rams can be valued using EBVs. Students work in groups and, for their case study property, calculate the difference in value for two rams with vastly different EBVs for fleece weight.

Preparation before the workshop

The only preparation required before conducting this practical is to ensure the trainer is familiar with how to complete these calculations.

Resources	Checklist (✓)
Copies of worksheet 3	
Two copies of the EBV calculations table for each group	
Copies of the three case studies	
Calculators	

Purpose

1.   To demonstrate to students that rams can be valued using EBVs.

2.   To give students experience in valuing rams using EBVs.

Instructions for trainers

–   Direct students to practical exercise 3, worksheet 3 and ask them to form their case study groups again.

–   Explain that for this practical students will value rams with two vastly different EBVs for fleece weight for their case study property.

–   Using the given EBVs for fleece weight (EBV1 for fleece weight of +0.4 and EBV2 for fleece weight of +0.1), ask students to calculate the difference in value for the two rams with these different EBVs for fleece weight. Record answers on worksheet 3.

–   After all students have recorded their answers, ask each group to share their answers.

– Briefly discuss:

- EBVs can predict real differences in offspring.

- EBVs can be valued for your own production system.

- Remember that this exercise of valuing rams on their EBVs is to show that it can be done, but it only has application where the breeding objective is very simple. For a multi-trait objective, it must be emphasised that valuing the ram on his index is the better approach.

– Ask students to record on worksheet 3 when it might not be the best option to buy the highest EBV ram.

– After all students have recorded their answers, ask several members of the group to share what they have written.

– Briefly discuss as you can pay too much for rams (lower grade rams can be good value).

Case study scenarios for practical exercise 3
(Source: MLA, Money-making Merinos 2005)

Property 1 "Aglum Flats"

–   You use 3 rams per 100 ewes and rams survive for three years.

–   Lambing averages 65%.

–   Wethers are sold at two years old.

–   Your wool cut averages 5kg for adult sheep.

–   You expect the wool price to be around 500 cents per kilogram and micron premium 6%.

Property 2 "Redrob Place"

–   You use 1.5% rams and rams survive for about four years.

–   Lambing averages 95%.

–   Wethers are sold at one and a half year old.

–   Your wool cut averages 5.5kg for adult sheep and 4 kg for hoggets.

–   You expect wool price to be 850 cents a kilogram and micron premium 12%.

Property 3 "Lafnair Downs"

–   You use 1.5% rams and rams survive for about four years.

–   Lambing averages 100%.

–   Wethers are sold at one year old.

–   Wool cut averages 6kg for adult sheep.

–   You expect the wool price to be 600 cents a kilogogram and micron premium 6%.

📄 *Worksheet 3* – **Practical Exercise 3: Using EBVs to value rams**
(Source: MLA, Money-making Merinos 2005)

Name:		Date:	

1. Using the information from your case study property and the following two EBVs for fleece weight +0.4 and +0.1, calculate the increase in value for high EBV ram and then the low EBV ram.

EBV for fleece weight	+0.4	kg
Progeny will cut half that		kg more wool

Offspring expected

Rams mated to		ewes/year
Lambing expected		%
Lambs per year		
Years rams used		years
Total offspring		
Wether offspring		Ewe offspring

Fleeces expected

Times wethers shorn		=	fleeces
Times ewes shorn		=	fleeces
Total fleeces			fleeces

Returns from extra wool

Increase per fleece		kg greasy
Expected wool price		cents/kg greasy
Increase per fleece	$	

Total increase $

Name:		Date:	

(Source: MLA, Money-making Merinos 2005)

EBV for fleece weight	+0.1	kg
Progeny will cut half that		kg more wool

Offspring expected

Rams mated to		ewes/year
Lambing expected		%
Lambs per year		
Years rams used		years
Total offspring		
Wether offspring		Ewe offspring	

Fleeces expected

Times wethers shorn		=	fleeces
Times ewes shorn		=	fleeces
Total fleeces			fleeces

Returns from extra wool

Increase per fleece		kg greasy
Expected wool price		cents/kg greasy
Increase per fleece	$	

Total increase $

Name:		Date:	

2. List some of the possible reasons why it might not be the best option to buy the high EBV ram.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

4.3.3   Practical Exercise 4 – Helmsman auction

Time: **45 minutes**

Introduction

This practical exercise is designed to allow students to put into practice what they have learnt so far.

Preparation before the workshop

The helmsman auction is used only because it is quick, if the trainer has more time available they could run a normal auction. Before conducting this practical the trainer needs to decide if they want to run a normal auction or Helmsman auction.

This practical can also be conducted with or without sheep. If conducting it without real sheep, students just use the catalogue to select rams, on the assumption that there are no physical culls in the group. If the trainer decides to use sheep then they need to select suitable sheep for the auction, with EBV and selection index information available for the important traits (at a minimum body weight, fleece weight and fibre diameter).

Resources	Checklist (✓)
Nikkos or whiteboard pens	
Copies of worksheet 4	
Copies of the "Super stud" sale catalogue	
Copies of case study information	
Whiteboard or butchers paper – divided up into a column for each ram on sale	

Purpose

1.   For students to apply the theory they have covered in the workshop to a case study scenario.

2.   To get students thinking about the steps involved in using EBVs to buy rams.

Instructions for trainers

(Note these instructions are for a helmsman auction without sheep, however they only require minor modifications for sheep or a normal auction)

— Direct students to practical exercise 4, worksheet 4 and the location where the practical will be conducted.

— Ask students to divide into their case study groups and hand out the case study information for the helmsman auction and the "Super stud" catalogue.

— Groups are required to buy merino rams from the catalogue information that suits their case study scenario.

— Give the groups 15 minutes to choose the rams they want. Get students to choose twice as many rams as they need. If this practical is being conducted without sheep, then tell the students to assume that they have already visually inspected the rams and they all meet their requirements.

— While the groups are deciding which rams they want, divide the whiteboard up into a table, one column for each ram on sale. The rows will be to record students group name and bid amount.

— After everyone has chosen their rams, explain the rules of the Helmsman auction:

    • All rams are sold simultaneously so you can bid on any ram at any time. You will be able to see at a glance where your bids stand at all times.

    • When the auction starts, you call out your group name, ram number and bid amount and the auctioneer will record it on the whiteboard.

    • The auction will run for 15 mins and you will be advised when there is two minutes and then one minute to go. Bids will be recorded at the speed of the scribe – don't expect miracles in the last seconds.

— Ask if there are any questions.

— Run the Helmsman auction for 15 minutes.

— Briefly discuss:

    • The different requirements for rams and how each group approached it.

    • Ask groups how they felt and what they learnt.

    • You can't buy all the best rams. Don't get hung up on individual rams it is the overall team, over the years (the buying strategy) that is important. Sometimes lower ranked rams are very good purchases.

Case study scenarios for practical exercise 4
(Source: MLA, Money-making Merinos 2005)

Property 1 "Aglum Flats"

Your aim is to produce high quality medium wool and lots of it. You stock at rates well above the district average and as a result your lambing percentage and wool cut is not overly high. But that is not a concern as your major emphasis is wool income per hectare.

Budget: purchase three rams to a total value of $1500

Property 2 "Redrob Place"

You have medium fine ewes. As you average 95% lambing you have a contract to sell 50% of your ewe lambs to a prime lamb producer at $15 above the meat market price.

This producer wants good mothers that will mate at nine months of age, have high weaning rates and high growth rates. He wants (as you do) the ewes to be efficient to run i.e. easy care, high worm resistance and return a reasonable wool income.

Budget: purchase three rams to a total value of $1900

Property 3 "Lafnair Downs"

Your aim is to produce high quality medium wool and first cross lambs. Almost half of your Merino ewe lambs go into a first cross lamb producing flock. So lambing percentage and growth rate are important as well as wool.

As you average 100% lambing you have a contract to sell your crossbred wether lambs direct to butchers.

You expect to be able to normally sell your crossbred ewe lambs to a prime lamb producer at $15 above the meat market price. This producer wants good mothers that will mate at nine months of age, have high weaning rates and high growth rates. He wants (as you do) the ewes to be efficient to run i.e. easy care, high worm resistance and return a reasonable wool income.

Budget: purchase three rams to a total value of $1800

▤ *Worksheet 4* – **Practical Exercise 4: Helmsman auction**

Name:		Date:	

Identifying rams

You are required to buy merino rams from the catalogue information that suits your case study scenario. You have 15 minutes to decide which rams you want. Identify twice as many rams as you need and record the rams and what you're prepared to pay in the table below.

Ram number	Price	Ram number	Price

Helmsman auction

The rules of the Helmsman auction are:

–   All rams will be sold simultaneously so you can bid on any ram at any time and you will be able to see at a glance where your bids stand.

–   When the auction starts, call out your group name, the number of the ram you are interested in and the amount you wish to bid. The auctioneer will record the details on the whiteboard.

–   The auction will run for 15 mins and you will be advised of 2 and 1 minutes to go. Bids will be recorded at the speed of the scribe – don't expect miracles in the last seconds.

"Super stud" sale catalogue (Source: MLA, Money-making Merinos 2005)

Ram number	EBV and Index											
	YWT kg	HWT kg	HGFW kg	HCFW kg	HFD μm	HFDCV %	NLW %	YFEC	HSS N/kt	HSL mm	8% MP	8% MP DP
1	0.2	0.2	-0.3	-0.2	-0.9	0.2	-0.3	-0.2	0.2	-0.8		
2	3.3	2.8	-0.2	-0.1	1.2	0.1	6.1	-0.3	-1.1	2.5		
3	3.6	3.4	0.3	0.2	0.1	-0.3	4.9	0.0	0.0	-0.2		
4	-1.8	-1.6	0.1	0.0	1.3	0.3	1.2	-0.4	0.0	-0.2		
5	4.2	3.8	0.1	0.2	0.1	-0.2	1.7	0.1	-0.3	-0.5		
6	1.7	1.8	-0.1	-0.1	-0.8	-0.2	-0.9	-0.5	-0.3	-0.4		
7	0.9	1.1	-0.4	-0.3	0.2	-0.1	1.6	0.0	-0.1	-0.3		
8	-0.2	-0.2	0.3	0.2	-0.5	0.1	5.8	-0.6	-2.1	2.4		
9	0.2	0.1	0.5	0.3	0.2	0.2	-1.3	-0.1	0.2	-0.8		
10	4.8	3.8	-0.2	-0.1	-0.2	0.1	5.1	-0.3	-2.1	2.5		
11	-0.6	-0.6	0.1	0.0	-0.6	-0.3	1.9	-0.3	-0.5	-0.2		
12	1.5	1.6	-0.1	-0.1	-1.0	-0.3	2.2	0.1	0.0	-0.2		
13	3.7	3.8	0.3	0.2	0.3	-0.2	1.7	-0.1	-0.3	-0.5		
14	2.8	2.8	0.3	0.1	-0.4	-0.2	0.9	0.1	-0.3	-0.4		
15	1.3	1.1	0.2	0.1	0.0	-0.1	0.6	-0.2	-0.1	-0.3		

Note:

- YWT = yearling live weight
- HWT = hogget live weight
- HGFW = hogget greasy fleece weight
- HCFW = hogget clean fleece weight

- HFD = hogget fibre diameter
- HFDCV = hogget fibre diameter coefficient of variation•
- NLW = number of lambs weaned•
- YFEC = yearling faecal egg count•

- HSS = hogget staple strength
- HSL = hogget staple length
- MP = micron premium
- MPDP = micron premium dual purpose

4.4   Short answer questions for selecting a stud and rams

Name:		**Date:**	

1.   Explain why the commercial breeders' decision of which stud to use is so important?

_____

_____

_____

_____

_____

_____

_____

_____

_____

2.   The best way to compare studs is by:

    (a)   Using information from Central Test Sire Evaluation.

    (b)   Asking questions about their breeding objective, selection process and their involvement in genetic benchmarking.

    (c)   Inspecting their rams, ewes and individual sheep production records.

Name:		**Date:**	

3. Describe two different types of benchmarking information that can be used to compare studs.

4. If your studs breeding objective does not match your objective what should you do?

Name:		**Date:**	

5. List two questions you can ask a stud to determine their likely progress?

_____

_____

_____

_____

6. Cross out which ever is not applicable in the sentence below:

Commercial breeders should choose a stud that has <u>high / medium / low</u>

performance now, and the possibility of <u>long / medium / short</u> term genetic gains.

7. When selecting an individual ram is it more important to find out:

(a) his individual production figures eg 22 microns and clean fleece weight of 6 kg.

(b) his deviation from the average of the flock from which he came eg 1 micron below average and 0.5 kg clean fleece weight above average.

(c) his EBVs for particular traits eg –0.3 fibre diameter and +0.5 clean fleece weight.

(d) his selection index figure, based on EBVs.

Explain why you chose your answer above?

_____

_____

_____

_____

_____

Name:		**Date:**	

8.   List three environmental effects that can reduce the accuracy of selection.

9.   Describe the possible implications of changing studs for the genetic merit of your flock.

10.   Describe two ways you can genetically improve your current flock.

Name:		**Date:**	

11. To get the most value from ram buying, commercial breeders should :

    (a)   Balance bidding price with the rams EBVs and your breeding objective.

    (b)   Bid as high as possible for the lowest EBV ram.

    (c)   Bid as high as possible for the highest EBV ram.

    (d)   Buy to your budget limit for rams with the right physical characteristics.

12. Describe three things that influence how much you should pay for rams.

Answers to questions for selecting a stud and rams

1. **Explain why the commercial breeders' decision as to which stud to use is so important?**

   Selecting a stud is the most important decision for commercial breeders. The genetic progress in the commercial flock is entirely set by the breeding program of the ram source. Commercial breeders can't have an independent direction from their stud's direction in the long term.

2. **The best way to compare studs is by:**

   The answer is "b".

   (a) Using information from Central Test Sire Evaluation.

   (b) Asking questions about their breeding objective, selection process and their involvement in genetic benchmarking.

   (c) Inspecting their rams, ewes and individual sheep production records.

3. **Describe two different types of benchmarking information that can be used to compare studs.**

   – Wether and ewe trials – consist of teams of wethers or ewes selected at random from participants flocks. Teams are run together for the entire trial and their production is measured.

   – Bloodline comparisons – wether or ewe trials in which each stud is represented by several teams.

   – On-farm trials – trial matings of various studs rams to your ewes on your farm.

   – Central test sire evaluation (CTSE) – a series of linked sites where sires are progeny tested.

   – Merino Benchmark – uses links between CTSE's and studs to provide EBVs for both progeny tested and other rams in recorded flocks.

   – Lambplan – across flock sire evaluation that relies on links formed through sires used in more than one stud as well as sires with progeny in more than one flock. It is primarily the service for terminal or maternal sires (meat focus breeds)

   – MerinoSelect – similar to Lambplan but it is the national system for supplying genetic information to Merinos and other wool breeds.

> – Performance of studs own commercial flock – examination should cover a minimum of five years of production information to reduce the chance the results are due to a good or bad year.
>
> – Performance of a studs clients flocks run under similar conditions to the commercial breeder – should be considered in conjunction with other information.

4.   If your studs breeding objective does not match your objective what should you do?

The stud's breeding objective should match the commercial objective. If not consider changing studs. If there is no similarity between these two objectives then no matter which rams you purchase, breeding will not contribute to the achievement of your objective.

5.   List two questions you can ask a stud to determine their likely progress?

> – How are rams selected for use in the stud? As better use of objective measurement by studs when selecting rams will lead to more genetic gain and have flow on effects to their clients. Visual selection is useful to remove sheep that are reproductively or physically unsound. If the stud selects the very best rams on economically important traits, client flocks will enjoy continuing economic benefits. These are the rams that have the highest EBV or selection index.
>
> – What is the selection differential for rams used in the stud? Selection differential is the difference between the performance of the selected rams and the group from which they were selected. Genetic progress is maximised when the stud maximises its selection differential (based on a selection index) when choosing worker rams. The higher the selection differential, the more returns to be gained from the rams progeny.

6.   Cross out which ever is not applicable in the sentence below:

Commercial breeders should choose a stud that has **_high_** performance now, and the possibility of **_long_** term genetic gains.

7. When selecting an individual ram is it more important to find out:

The answer is "d", because the ram with the highest selection index figure based on EBVs will produce the most profitable progeny.

(a) his individual production figures eg 22 microns and clean fleece weight of 6 kg.

(b) his deviation from the average of the flock from which he came eg 1 micron below average and 0.5 kg clean fleece weight above average.

(c) his EBVs for particular traits eg –0.3 fibre diameter and +0.5 clean fleece weight.

(d) his selection index figure, based on EBVs.

8. List three environmental effects that can reduce the accuracy of selection:

— Birth status – single or twin.

— Age of dam – maiden or adult.

— Date of birth – early or late.

9. Describe the possible implications of changing studs for the genetic merit of your flock.

— If the new stud is better than the old one, then the ram buyers flock will slowly move up to a stable two generation lag period behind the new stud.

— If the new stud is worse than the old one, then the ram buyer's flock will gradually fall to a new equilibrium.

— Large improvements can be made quickly by introducing a superior bloodline.

— Better selection of rams from the current stud will also give improvements (but not as large) over the longer term.

10. Describe two ways you can genetically improve your current flock.

— Changing to a superior stud.

— Buying better rams, based on EBVs, from your current stud.

11. **To get the most value from ram buying, commercial breeders should buy:**

The answer is "a".

(a) *Balance bidding price with the rams EBVs and your breeding objective.*

(b) Bid as high as possible for the lowest EBV ram.

(c) **Bid as high as possible for the highest EBV ram.**

(d) Buy to your budget limit for rams with the right physical characteristics.

12. **Describe three things that influence how much you should pay for rams.**

– How many lambs do you expect to produce per ram?

– The productivity of the stud that you are buying rams from.

– The EBV of the ram, which relates his performance to the average of the flock in which he was bred.

4.5 Assessment for selecting a stud and rams

Student enrolment number	

Assessor to complete:

Students should be able to show evidence they can:	Assessment record	
	Short answer written questions	Practical exercise
1. Choose an appropriate stud based on a breeding objective, the studs progress and any other considerations		
2. Use performance information to select rams for a breeding objective.		
3. Use EBVs to value a ram.		

More evidence is required for:

1. ☐   2. ☐   3. ☐

Comments:

Assessor's name		Date to be submitted by	
Assessor's contact details		Date	

4.6 Resources for selecting a stud and rams

Resource	Topics covered		
	Determine potential studs: • **benchmarking,** • **progress,** • **information available on rams,** • **other considerations**	**How long will it take to make the change?**	**Valuing rams**
Department of Primary Industries and Fisheries, Queensland — Lewer, R. and McLennan, N.M (2001) **$electing $tuds for $uccess** • Relationship between the tiers, p3-6 • Where should you buy rams?, p43-52 • Which rams to choose?, p52-53 • How much should you pay for rams?, p54-57 • How do you buy rams?, p57-59	✓	✗	✓
Comments:			
• All topics covered in good detail. • Only focuses on wool. • Extra detail on how to buy rams ie auction, private sale etc.			

Resource	Topics covered		
The Woolmark Company and Department of Primary Industries, NSW — Hatcher, S. and Bayley, D. (1999) **Merino Breeding and Selection – A commercial focus,** • Module 4: Benchmarking genetic performance • Module 5: Strategies for change • Module 6: Merino sheep selection, p1-16, 26-28	✓	✓	✓
Comments:			

Resource	Topics covered		
	Determine potential studs: • **benchmarking,** • **progress,** • **information available on rams,** • **other considerations**	**How long will it take to make the change?**	**Valuing rams**
• All topics covered in some detail. • Primarily focuses on wool. • Good detail on benchmarking, evaluating progress, what happens if you change studs and ram selection.			
Meat and Livestock Australia, EDGE network (2005) ***Money-making Merinos*** • Workshop notes • Facilitators guide • Power point presentation	✓	✗	✓
Comments:			
• Both meat and wool focus. • Some information about SARDI and QPLU$ trials. • Description of Lambplan and MerinoSelect. • Exercises about valuing rams using EBVs and Helmsman auction. • Detailed information about setting up an on-farm trial.			

Meat and Livestock Australia, EDGE network (2004) ***Money-making Mums*** • Workshop notes • Facilitators guide • Power point presentation	✓	✗	✗
Comments:			
• Some description of Lambplan and MerinoSelect.			

Meat and Livestock Australia, EDGE network (2005)	✗	✗	✓

Resource	Topics covered		
	Determine potential studs: • **benchmarking,** • **progress,** • **information available on rams,** • **other considerations**	**How long will it take to make the change?**	**Valuing rams**
Effective Breeding for Lambs • Workshop notes • Facilitators guide • Power point presentation			
Comments:			
• Exercises on estimating sire value and helmsman auction.			

Department of Agriculture and Food, Government of Western Australia (DAFWA)—Butler, L. (2003)				
	✓	✗		✗
Farmnote 47/2003 Benchmarking your sheep genetics and ***Ewe and wether trial manuals available from DAFWA web site*** www.agric.wa.gov.au				

Comments:
• Provide detailed coverage of conduct of Western Australia linked wether and ewe trials.
• Complement the information in Merino Bloodline Performance.

5 SELECTING EWES

5.1 *Training outline for selecting ewes*

🕐 **Total time: 6 hours 45 minutes**

5.1.1 Introduction

🕐 **Time: 15 minutes**

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	

Purpose

1. To give students an understanding of the detail that will be covered during the session – selecting ewes.

Suggested approach

📖 Explain purpose of this session. **PPT 1**

5.1.2   Replacement ewes

Time: **2 hours**

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	
Copies of worksheet 5	
Hand out containing objective measurements for 30 ewes	

Purpose

1.   To give students an understanding of the factors affecting replacement ewes.

2.   To give students the knowledge to be able to determine which ewes to cull under various scenarios.

Suggested approach

📖   Explain purpose of this session. **PPT 2**

📖   Discuss replacement ewes in terms of numbers, culling and selection and using measurements. **PPT 3-8**

–   Demonstrate repeatability and cumulative effects of genetics using OFFM $_{calculator}$.
      http://www.sheepcrc.org.au/offmcalculator

–   If possible show some examples of different outputs from service providers to students and explain what they mean. ***Trainers will need to obtain outputs from relevant service providers to demonstrate to students.***

–   **Practical Exercise 5: Part 1**

   •   Direct students to practical exercise 5 worksheet 5 and ask students to form their case study groups.

   •   Explain that this practical is conducted in five parts.

   •   Ask students to record on part one of worksheet five the traits they would use to visually cull ewes and why.

   •   After students have recorded their answers ask one person from each case study group to share what they have written and discuss.

— **Practical Exercise 5: Part 2**

- Explain that this is the second part of this practical exercise.

- Hand out information containing objective measurements for thirty ewes.

- Ask students to record on part two of worksheet five the six ewes they will cull using this information and why.

- After students have recorded their answers ask one person from each case study group to share what they have written and discuss.

— **Practical Exercise 5: Part 3**

- Explain that this is the third part of this practical exercise.

- Ask students to record on part three of worksheet five what they would try and do to improve the 60% lambing percentage.

- After students have recorded their answers ask one person from each case study group to share what they have written and discuss.

— **Practical Exercise 5: Part 4**

- Explain that this is the fourth part of this practical exercise.

- Ask students to record on part four of worksheet five what percentage of ewes they would cull in a drought and which ewes these would be and why.

- After students have recorded their answers ask one person from each case study group to share what they have written and discuss.

    For more see detail Practical Exercise 5 page 92.

5.1.3 Groups joined to non-merino sires

Time: 1 hour 30 minutes

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	
Swan Calculator	
Copies of worksheet 5	
Hand out containing objective measurements for 30 ewes	

Purpose

1. To give students the knowledge and ability to determine which sheep in their flock should be joined to non-merino sires.

Suggested approach

– Demonstrate the Merino versus Terminal Sire Flock Model http://www.sheepcrc.org.au/flock_structure.php

– **Practical Exercise 5: Part 5**

• Direct students to practical exercise 5 worksheet 5 and explain that we will now be doing the fifth part of this practical exercise.

• Using the previously handed out objective measurements ask students to record on part five of worksheet five which twelve ewes they will join to a meat sire and why.

• After students have recorded their answers ask one person from each case study group to share what they have written and discuss.

For more see detail Practical Exercise 5 page 92.

5.1.4 Using performance evaluation for sheep selection

Time: 3 hours

Resources	Checklist (✓)
Whiteboard or butchers paper	
Nikkos or whiteboard pens	
OHP/Power point presentation and equipment	
Copies of worksheet 6	
Copies of short answer question sheet for selecting ewes	

Purpose

1. To give students the knowledge and ability to incorporate sheep performance information into selection decisions.

Suggested approach

–   Explain purpose of this session.

–   **Practical Exercise 6**

    •   Direct students to practical exercise 6 worksheet 6 and location for practical.

    •   Ask students to visually cull 10% of the sheep and record culled sheep on worksheet 6.

    •   Organise students into groups so some of them are body weighing sheep and others are fleece sample. Swap groups about half way through.

    •   Explain OFDA report.

    •   Ask students to select 60% of the sheep for wool and 30% for meat and record on worksheet 6.

    •   After students have recorded their answers ask several members of the group to share what they have written and discuss.

        For more see detail Practical Exercise 6 page 101.

    Summarise session on selecting ewes. **PPT 9**

–   Review session using short answer questions. (page 105)

    •   Ask students to individually complete short answer question sheet.

    •   Discuss answers.

•   Collect answer sheets.

5.2   Key points for selecting ewes

Replacement ewes

1.   Number of replacement ewes

—   In most self replacing merino breeding flocks generally between 60 and 90 percent of the hogget ewes are needed as replacements to maintain the size of the flock.

—   Cull any surplus ewes so that the overall quality of the commercial flock improves. The number of surplus ewes available to cull depends on the lamb weaning percentage.

—   The number of hogget ewes required as replacements in the commercial flock will depend upon:

- •   Number of hogget ewes available at classing.

- •   Number of adult ewes in flock.

- •   Number of ewes culled.

- •   Survival rate of ewes.

2.   Criteria to cull ewes on

—   Conformation faults and visual meat and wool traits:

- •   Skeletal faults such as sway backs, devils grip, deformed feet, undershot or overshot jaws.

- •   Small size for age, fleece rot and body strike, harsh handling and hair, excessive colour, face cover and body wrinkle, pigmented fibres and black wool.

—   Meat and wool traits related to the commercial breeding objective.

—   Health, teeth wear and udder abnormalities.

—   Failure to rear a lamb.

—   Age.

3.   Selecting hogget ewes

—   Hogget ewes are normally selected for the breeding flock before first joining when they are 12-18 months old.

—   In order to make a fair assessment, hogget ewes should be run together as one mob or under similar grazing conditions from weaning till classing. Also need to consider factors such as age, mother's age and birth type (as per ram selection).

4.   *Using measurements*

—   Measurement may be cost effective and beneficial for commercial ewe selection if:

  •   It is a good quality flock.

  •   There is an emphasis on improving economic return.

  •   There is the ability to class out 35 per cent or more of maiden ewes.

  •   Traits can be measured cheaply.

  •   Product prices are high and variable.

—   Collecting measurements needs to be integrated into management as it takes extra time.

—   Measurements are highly repeatable across a sheep's lifetime, therefore retesting is not necessary.

5.3 Practical exercises for selecting ewes

5.3.1 Practical Exercise 5 – Selecting ewes

Time: 2 hours 30 minutes

Introduction

This practical exercise is designed to give students experience in selecting and culling ewes for different scenarios such as:

– Classing to remove physically inferior sheep.

– Some basic objective information on body weight, fleece weight and fibre diameter.

– Low lambing percentages.

– Drought.

– Joining a percentage of the ewe flock to meat sires.

Preparation before the workshop

This practical exercise can be conducted with or without sheep. If conducting it without sheep, then students either state which sheep they would cull and why or use the information given to them to select or cull the sheep on paper.

If you decide to use real sheep, then you need to have available suitable sheep for each selection scenario.

Resources	Checklist (✓)
Previous case study information from practical exercise 1, 3 and 4	
Case study breeding objective developed in practical exercise 1	
Hand out containing objective measurements for 30 ewes (a minimum of fibre diameter, fleece weight and body weight).	
Copies of worksheet 5	

Purpose

1. To give students experience in selecting and culling ewes under different scenarios such as visual selection, using basic objective information, selection with a low lambing percentage, selection strategies for drought and joining a percentage of the flock to meat sires.

Instructions for trainers

Part one: Visual classing (30 minutes)

—   Direct students to practical exercise 5 worksheet 5 and ask students to split up again into their case study groups.

—   Explain that this practical will be conducted in five parts, for the first part students will be discussing how and why they will class out ewes using visual criteria for their case study.

—   Ask students to record on part one of worksheet 5, the traits they would cull ewes on visually for their case study and why.

—   After all students have recorded their answers, ask one member of each case study group to share what they have written.

—   Briefly discuss:

   •   Why they made particular decisions?

   •   Were they considering their breeding objective?

   •   Were they considering the package of traits?

Part two: Classing using basic objective measurements (30 minutes)

—   Now explain to students that the second part of this practical exercise will conducted now. Using some basic objective information on fibre diameter, fleece weight and body weight students have to class out, on figures, 20% of the ewes for their case study.

—   Hand out information containing measurements of fibre diameter, fleece weight and body weight for thirty ewes. ***This information could be the same for each case study and then it would reinforce that traits will have different emphasis depending on the objective.***

—   Ask students to record on part two of worksheet 5, which six ewes they will cull using these measurements and why.

—   After all students have recorded their answers, ask one member of each case study group to share what they have written.

—   Briefly discuss:

   •   Why is objective selection likely to be more effective?

   •   Do the objective criteria have individual economic value?

   •   Can the selection criteria be cost-effectively measured?

   •   Reinforce that traits will have different emphasis depending on the objective.

Part three: Selecting and culling ewes when there is a low lambing percentage (30 minutes)

— Now explain to students that the third part of this practical exercise will be conducted now, which involves determining what to do if the lambing percentage is only 60% and all ewes are needed for replacements.

— Ask students to record on part three of worksheet 5, what they would do to improve the low lambing percentage.

— After all students have recorded their answers, ask one member of each case study group to share what they have written.

— Briefly discuss:

  • What improvement can be achieved with no culling?

  • If they are buying in rams, where does their genetic gain come from? How much?

Part four: Selecting which ewes to cull in a drought (30 minutes)

— Now explain to students that the fourth part of this practical exercise will be conducted now, which involves determining which ewes to cull in a drought.

— Ask students to record on part four of worksheet 5, what percentage of ewes they would cull in a drought and which ewes these would be and why.

— After all students have recorded their answers, ask one member of each case study group to share what they have written.

— Briefly discuss:

  • What opportunities are there for improvement when heavily culling during drought?

Part five: Joining a percentage of the ewe flock to meat sires (30 minutes)

— Now explain to students that the fifth part of this practical exercise will be conducted now. This involves working out which 40% of ewes will be joined to meat sires.

— Using the previously handed out objective information ask students to record on part five of worksheet 5, which twelve ewes they will join to a meat sire and why.

— After all students have recorded their answers, ask one member of each case study group to share what they have written.

— Briefly discuss:

  • What were the criteria used to choose these ewes?

  • Whether the cull ewes could have been used as meat dams?

  • Under what circumstances might ewes destined to be

joined to meat sires be selected first?

📑 *Worksheet 5* – **Practical Exercise 5: Selecting ewes**

Name:		**Date:**	

Part one: Visual classing

1. Describe below the traits you would visually class ewes on for your case study flock and why?

Traits for classing ewes	**Why you would use these traits for classing?**

Part two: Classing using basic objective information

Name:		Date:	

2. Using the hand out on fibre diameter, fleece weight and body weight objective measurements given to you record in the table below which six ewes you will cull for your case study flock and why?

Ewe to be culled	Why?

Part three: Selecting and culling ewes when there is a low lambing percentage

Name:		**Date:**	

3. In the space provided below discuss what you would try and do to improve the lambing percentage above 60%?

Part four: Selecting which ewes to cull in a drought

Name:		Date:	

4. Describe below what percentage of ewes you would cull in a drought and your strategy for selecting the ewes to be retained?

Part five: Joining a percentage of the ewe flock to meat sires

Name:		Date:	

5.   Using the data on fibre diameter, fleece weight and body weight supplied, record in the table below the 40% of ewes you will join to a meat sire and why?

Ewes to be joined to a meat sire	Why?

Name:		Date:	

Ewes to be joined to a meat sire	Why?

5.3.2   Practical Exercise 6 – Using performance evaluation for sheep selection

Time: 3 hours (depending on number of sheep)

Introduction

This practical exercise is designed to give students experience in using performance evaluation for sheep selection.

Preparation before the workshop

Select a random group of about 30 to 100 sheep for this exercise (the number will depend on how many sheep the trainers have access to and how many the facilities will hold). It is not necessary to have any information on these sheep as it will be obtained during the practical.

The OFDA machine will need to be set up and calibrated before commencing this practical exercise. As will the sheep weighing scales. It would also be of advantage to obtain fleece weight measurements at this time as well, however this may not be practical.

Trainers will also need some experience and knowledge of the OFDA machine before commencing this practical exercise.

Resources	Checklist (✓)
Covered location with a sheep race and drafting pens so the exercise can be completed in all weather conditions eg shearing shed	
30-100 sheep that are individually identified	
OFDA machine and operator	
Sheep weighing scales	
Fleece weighing equipment (if necessary)	
Pencil, rubber, clipboard and calculator for each student	
Copies of worksheet 6	

Purpose

1.   To give students experience in using performance evaluation for sheep selection.

Instructions for trainers

— Direct students to practical exercise 6 worksheet 6 and location where practical exercise is to be conducted.

— Explain that this practical will be conducted to give students experience in using performance evaluation for sheep selection.

— The first step is to go through the sheep and class out 10% on visual traits. Record which sheep are culled on worksheet 6.

— The next step is to body weigh and fleece sample (using the OFDA) the whole group of ewes. Divide students up into groups to record body weights and take fleece samples. About half way through the sheep swap groups so students get experience in both body weighing and taking fleece samples.

— Once this information has been collected then an OFDA report will be generated showing the sheep ranked for a selection index. Go through and explain this report to the students, with the help of the OFDA operator.

— Then get students to use this information to select 60% of the sheep for wool and 30% of the sheep for meat (excluding the 10% of visual culls). Record on worksheet 6 which sheep are selected for wool and those selected for meat.

— After all students have recorded their answers, ask several members of the group to share what they have written and discuss.

📋 *Worksheet 6 –* **Practical Exercise 6: Using performance evaluation for sheep selection**

Name:		**Date:**	

1. List below the tag numbers of the 10% of sheep visually culled and the reasons why these sheep were culled?

Tag no.	**Reasons why each of these sheep were culled?**

Name:		**Date:**	

2. List below the tag numbers of the 60% of sheep selected for wool and the 30% selected for meat.

    (a)   Tag numbers of 60% of sheep selected for wool.

_____

_____

_____

_____

_____

_____

_____

_____

_____

    (b)   Tag numbers of 30% of sheep selected for meat.

_____

_____

_____

_____

_____

_____

5.4 Short answer questions for selecting ewes

Name:		**Date:**	

1. Why is lamb weaning percentage important in relation to ewe selection?

_____.

_____.

_____.

_____.

2. List five criteria to cull ewes on?

_____.

_____.

_____.

_____.

_____.

3. List four factors that need to be considered in order to make a fair assessment of hogget ewes?

_____.

_____.

_____.

_____.

_____.

Name:		**Date:**	

4.   Describe the situation when measurement may be beneficial for commercial ewe selection?

_____

_____

_____

_____

_____

_____

_____

_____

5.   Discuss the benefit of repeatable measurements.

_____

_____

_____

_____

_____

_____

_____

_____

Answers to questions for selecting ewes

1.   Why is lamb weaning percentage important in relation to ewe selection?

The number of surplus ewes available to cull depends on the lamb weaning percentage. The more that can be culled the more the overall quality of the commercial flock improves.

2.   List five criteria to cull ewes on?

—   Conformation faults and visual meat and wool traits:

- •   Skeletal faults such as sway backs, devils grip, deformed feet, undershot or overshot jaws.

- •   Small size for age, fleece rot and body strike, harsh handling and hair, excessive colour, face cover and body wrinkle, pigmented fibres and black wool.

—   Meat and wool traits related to the commercial breeding objective.

—   Health, teeth wear and udder abnormalities.

—   Failure to rear a lamb.

—   Age.

3.   List four factors that need to be considered in order to make a fair assessment of hogget ewes?

In order to make a fair assessment, hogget ewes should be run together as one mob or under similar grazing conditions from weaning till classing. Also need to consider factors such as age, mother's age and birth type.

4.   Describe the situation when measurement may be beneficial for commercial ewe selection?

—   It is a good quality flock.

—   There is an emphasis on improving economic return.

—   There is the ability to class out 35 per cent or more of maiden ewes.

—   Traits can be measured cheaply.

—   Product prices are high and variable.

5. **Discuss the benefit of repeatable measurements.**

Only need to take one measurement on hoggets, provided they are of a similar age and at least nine months old and with at least six months of wool. This measurement is highly repeatable across a sheep's lifetime.

So the sheep selected at a young age as being the finest, will be the finest – with minor exceptions – each year after that.

If measured at a young age, the group of sheep may have a higher average fibre diameter as the group gets older, but relative to each other, the rank of the individual sheep for fibre diameter will remain very similar.

5.5   Assessment for selecting ewes

Student enrolment number	

Assessor to complete:

Students should be able to show evidence they can:	Assessment record	
	Short answer written questions	Practical exercise
1. Select and cull ewes to meet various objectives.		
2. Gather and incorporate performance evaluation into selection decisions for breeding sheep.		

More evidence is required for:

1. ☐   2. ☐

Comments:

_____

_____

_____

_____

_____

_____

_____

Assessor's name		Date to be submitted by	
Assessor's contact details		Date	

5.6   Resources for selecting ewes

Resource	Topics covered		
	Replacement ewes	*Groups joined to non-merino sires*	*Using performance evaluation for sheep selection*
The Woolmark Company and Department of Primary Industries, NSW — Hatcher, S. and Bayley, D. (1999) **Merino Breeding and Selection – A commercial focus,** • Module 6 Merino sheep selection, p5-6, 17-23	✓	✗	✗
Comments: • Topics covered in some detail. • Primarily focuses on wool. • Extra detail on classing including pre-classing assessment, classing process and post classing follow up and classing facilities.			

Resource			
Meat and Livestock Australia, EDGE network (2005) **Money-making Merinos** • Workshop notes • Facilitators guide • Power point presentation	✗	✗	✗
Comments: • No information on ewe selection. • Some information about managing high producing ewes.			

Resource			
Meat and Livestock Australia, EDGE network (2004) **Money-making Mums** • Workshop notes • Facilitators guide • Power point presentation	✓	✓	✗
Comments: • Mock ewe auction exercise. • Some information on maternal EBVs and indexes. • Some information about managing high producing ewes.			

Sheep CRC, International Fibre Centre and Australian Wool Innovation (2004) ***Making money from measurement – A practical guide to assist woolgrowers to make the best use of On-Farm Fibre Measurement,*** • Chapter 3 Practical benefits of OFFM, p18-32 • Chapter 4 Setting up for OFFM, p33-42 • Chapter 6 Software, p55-64	✔	✘	✔

Comments:

• All topics covered in some detail, primarily focuses on fibre diameter.
• Good information on repeatability, selection benefits, balanced selection, time taken for benefit, different times to use OFFM ie flock reduction, sheep marketing etc.
• Good information on sampling time, choosing a measurement system, choosing an ID system, data management systems and integrating OFFM on your farm.
• Good detail on various software options.

6 RECORD OF TRAINING AND ASSESSMENT

6.1 RTE5101A Develop and implement a breeding strategy

This competency standard covers the work required to develop and implement a livestock breeding program.

It requires knowledge of basic genetic theories, including knowledge of heritability of traits, economic assessment of production characteristics and testing procedures.

Trainee		Signed	

Knowledge requirements completed

Learning Objects

Applied genetics

Developing a breeding objective

Selecting a ram source

Gather and use performance data for sheep selection

Selecting rams

Selecting ewes

Performance requirements completed

Learner can…

Identify sheep with physical faults

Select rams with required physical traits and EBVs

Calculate number of replacement ewes required

Collect and record data to inform sheep selection decisions

Assessment requirements completed

Document a breeding program for a flock:

1. Provide details of the flock
2. Research actual income and costs for the sheep enterprise
3. Document predicted income and cost of production
4. Identify desired traits and selection criteria
5. Document the breeding objective
6. Select a source of genetics for the flock
7. Describe strategies for collecting data to use in selection
8. Provide reports from selection software to inform decisions
9. Calculate predicted genetic gain based on flock structure, identified ram source and breeding objective
10. Document contingency strategies for change in market or seasonal conditions

Assessment process	
Underpinning knowledge	
Skills application	
Contingency	

Evidence sources for assessment
☐ **Workplace observation**
☐ **Written/ oral questioning**
☐ **Practical skills test**
☐ **Third party report**
☐ **Project**
☐ **Other**

Who contributed to evidence collection?			
Name			
Address			
Industry role			
☐ **Competent**			
☐ **Not yet competent** ➜	**Further evidence required…**		
Assessor		**Signed**	
RTO		**Telephone**	**Date**

6.2 RTE5107A Identify and select animals for breeding

This competency standard covers the work involved in identifying and selecting animals for breeding.

It requires knowledge of basic genetic theories, including knowledge of heritability of traits, economic assessment of production characteristics and testing procedures**.**

Trainee	Signed	

Knowledge requirements completed

Learning Objects

Applied genetics

Developing a breeding objective

Selecting a ram source

Gather and use performance data for sheep selection

Selecting rams

Selecting ewes

Performance requirements completed

Learner can…

Identify sheep with physical faults

Select rams with required physical traits, using EBVs to meet a breeding objective

Select ewes required for breeding flock to meet a breeding objective

Collect and record data to inform sheep selection decisions

Assessment process
Underpinning knowledge
Skills application
Contingency

Evidence sources for assessment
☐ **Workplace observation**
☐ **Written/ oral questioning**
☐ **Practical skills test**
☐ **Third party report**
☐ **Project**
☐ **Other**

Who contributed to evidence collection?	
Name	
Address	
Industry role	
☐ **Competent**	
☐ **Not yet competent** ⟶	**Further evidence required…**

Assessor		**Signed**			
RTO		**Telephone**		**Date**	

7 LEARNING OBJECTS

7.1 *Applied genetics*

Purpose

Understand the application of genetics to a breeding program.

Detail

Describe the role of genetics and the environment on the phenotype of an individual.

Define and describe the following terms:

– Heritability

– Correlation

– Repeatability

– Selection criteria

– Selection differential

– Generation interval

– Reproductive rate.

Compare selection and culling as methods for choosing dams and sires.

Understanding of visual selection:

– Classing

– SRS/Elite.

Describe the use of estimated breeding values in a breeding program.

Outline the advantages and disadvantages of independent culling levels and selection indices.

Describe the use of performance data as part of genetic selection, and the factors which impact on the rate of genetic progress.

Compare visual with measured information.

7.2   Developing a breeding objective

Purpose

Gain an understanding of breeding objectives and be able to develop one for a flock.

Detail

Describe the essential ingredients of a good breeding objective.

Identify good and bad examples of breeding objectives and describe the reasons why.

Explain the importance of a breeding objective.

Describe the relationship of commercial breeding objective to a stud's breeding objective.

Understanding of past, present and future market requirements for wool and meat.

Based on an assessment of the market and the production potential of the property determine the most suitable traits to include in the breeding objective.

Develop a breeding objective for a flock.

7.3 Gather and use performance data for sheep selection

Purpose

Gain an understanding of performance data and be able to gather and use this information efficiently and effectively.

Detail

— Determine the technology best suited to the enterprise.

— Understand the working principles of the available technology.

— Collect data which measures individual performance and apply adjustment for environmental factors.

— Use software to process data to aid in selection.

— Evaluate the suitability of data for making selection decisions.

— Incorporate data into selection decisions for breeding stock.

— Use data to calculate the expected response to selection.

7.4 Selecting a ram source

Purpose

Gain an understanding of practices, information and benchmark performance of potential genetic sources and use this information to select the most appropriate stud.

Detail

Determine potential studs that align with the commercial breeding objective.

Compare studs using performance and benchmarking information.

Understand the selection processes used by studs:

– Balance of visual and objective selection criteria

– How rams are selected for use in the stud

– Selection differential.

Understanding of other considerations when selecting a stud:

– Locality

– Disease status

– Client service

– Information provided on sale rams.

Select the most appropriate stud.

7.5   Selecting rams

Purpose

Understand the principles of ram selection and select rams that can make genetic progress towards the breeding objective.

Detail

Knowledge of artificial and natural breeding methods:

—   Cervical AI

—   Laproscopic AI

—   Hand service.

Compare natural mating with artificial breeding and determine most feasible option.

Determine the number of replacements rams needed.

Explain how the standard of rams purchased influences genetic gain and commercial flock performance.

Knowledge of the issues affecting the value of a ram.

Value rams on their phenotype and measured performance to provide genetic gain towards achieving a breeding objective for a flock.

Knowledge and understanding of how to buy rams:

—   On-farm auction

—   Public auction

—   Private treaty.

Demonstrate use of selection information to select rams:

—   EBV, EPV

—   Selection indexes

—   Deviation from group average

—   Visual selection.

Select rams within a given price range to provide maximum genetic progress towards a breeding objective for the environment in which the flock is run.

7.6   Selecting ewes

Purpose

Understand the principles of ewe selection and select ewes that are best suited for breeding.

Detail

Determine the number of replacement ewes needed.

Identify the criteria (objective and visual) to use to cull or select ewe based on the breeding objective of the flock:

—   Age

—   Reproductive performance

—   Conformation faults

—   Meat and wool traits.

Understand the value of ewe selection to genetic gain.

Compare ewe selection methods:

—   Visual selection

—   Objective measurement.

Select ewes using a combination of objective measurement and visual selection.