Breeding Objectives and Selection Strategies in the Stud Merino Industry

Produced for the CRC for Premium Quality Wool undergraduate program by;
Dr. Brad Crook, The University of New England.

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Breeding Objective

A statement of the traits which the breeder wants to *change*, the *direction* of change for each trait and the relative *emphasis* given to changing each trait.

- **Traits must be heritable**
- **Traits must be definable**
- **Traits must have economic value**
  - **contribute to profit:**
    - **increased quantity and quality**
    - **reduced costs of production**
  - **returns *vs* costs**
  - **current *vs* future market**
  - **number of expressions**

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Survey of 161 NSW Merino Ram Breeders

Breeding Goal	% of studs with breeding goal	% of studs with this goal, who wanted to:	
		Improve	Maintain
Fleece weight (FW)	100	91	9
Fibre diameter (FD)	100	34	66
Body weight (BW)	91	62	38
Reproductive rate (RR)	96	71	29
Wool quality (WQ)	86	77	23
Conformation (CN)	99	58	43
Fleece rot (FR)	76	53	47

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Relative importance of traits in the breeding objective of 161 NSW Merino Ram Breeders

	Superfine	Fine	Medium	Strong
FW	2	2	1	3
FD	1	1	2	2
BW	3	6	6	1
RR	6	7	7	4
WQ	1	3	3	5
CN	4	5	4	2
FR	5	4	5	6

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Source: Casey and Hygate (1992)

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Within-Flock Selection Strategy

- **Selection criteria**
  - traits used to identify individuals best suited for breeding objective
    - visually-assessed and measured information
  - must be genetically associated with breeding objective:
    - direct vs indirect

- **Selection method**
  - the way in which information is used to select individuals
    - independent culling levels, esp. wool/body faults
    - estimated breeding values (EBVs)
    - selection index

- **Selection timing**
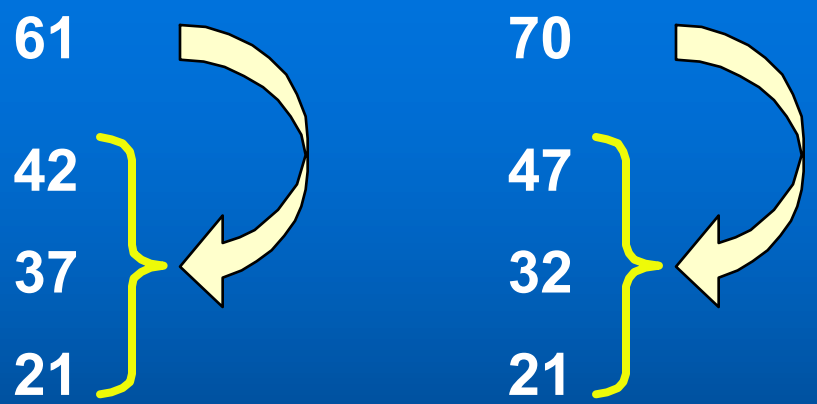 - age and wool growth

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Rams: Selection criteria and relative emphasis on visual & measured information

% of studs

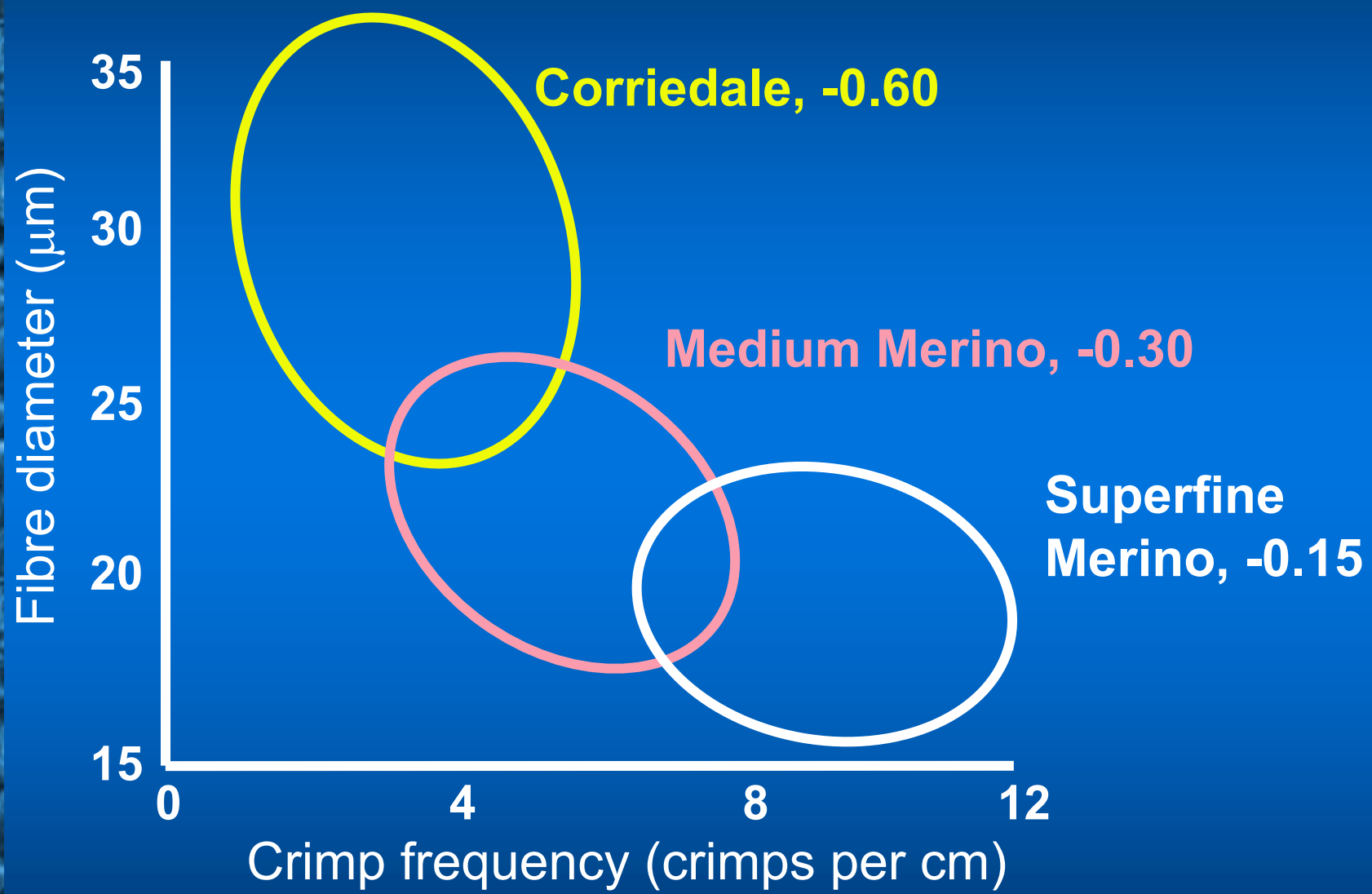| Selection criterion used:	Fleece weight	Fibre diameter
Measured	61	86
Visual	83	84
Relative emphasis:		
Using visual (V) and measured (M) info:	61	70
M > V	42	47
V > M	37	32
M = V	21	21

Crimp frequency

Corriedale, -0.60

Medium Merino, -0.30

Superfine Merino, -0.15

Fibre diameter (μm)

35
30
25
20
15

0   4   8   12

Crimp frequency (crimps per cm)

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Visual assessment vs measurement

- **6 groups of 20-35 classers**
  - stud-masters, professional classers, commercial growers and advisory officers

- **select the best 5 sheep from 25-35 on basis of commercial return**

- **after selection:**
  - greasy fleece weight and yield
  - wool classer valuation (price per kg)

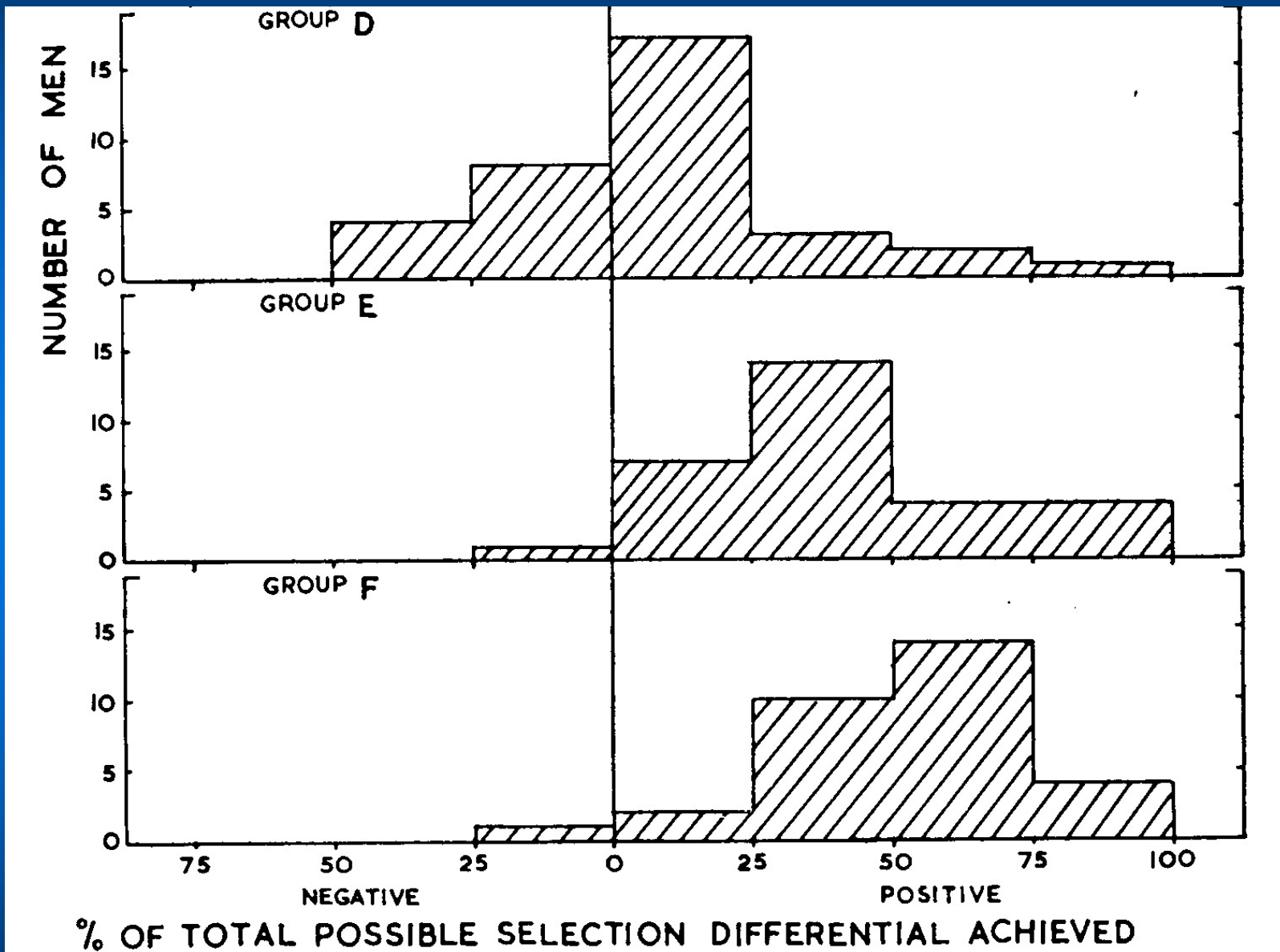- **selection differentials achieved by each classer were calculated**

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Visual assessment vs measurement

Visual assessment vs measurement:
accuracy of selection with and without fleece measurement as an aid to selection

% of total selection differential achieved on 4 different properties

Classer	Method	1	2	3	4
1	Visual	83	84	100	92
	Visual + measurement	94	94	100	96
2	Visual	78	78	94	83
	Visual + measurement	90	90	100	91
3	Visual	84	86	-	94
	Visual + measurement	92	92	-	100

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Source: Moule and Miller (1963)

If the goal is to select 3% of rams:

Selection criteria	Selection emphasis[#]	Index rank of selected rams
Index only	100%	Top 3%
Index selection after visual culling	70-80%	Top 9%
Measurements plus visual	50-60%	Top 21%
Visual only	30-40%	Top 43%

 # % achieved of the potential total selection differential

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Two-stage selection

7-15% of drop

First Stage

Culls	Grade	Reserves

10 mths test + 14 mths visual

17 mths test + visual (+ 10 mths info)

<2% of drop

Second Stage

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Reserve sales

95% as efficient as adult selection

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