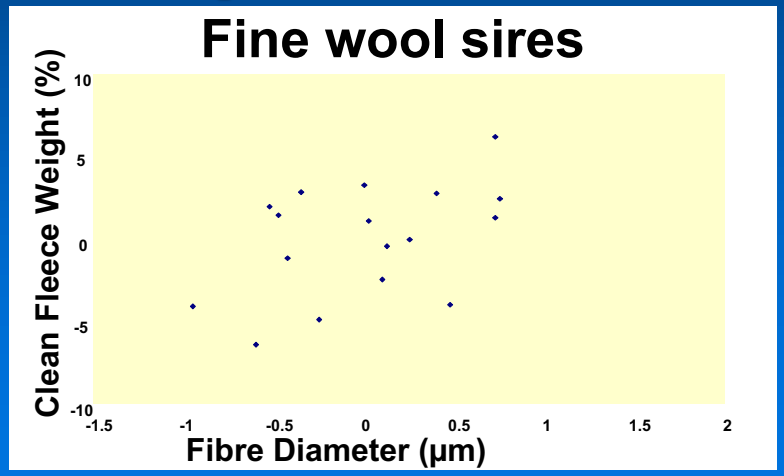
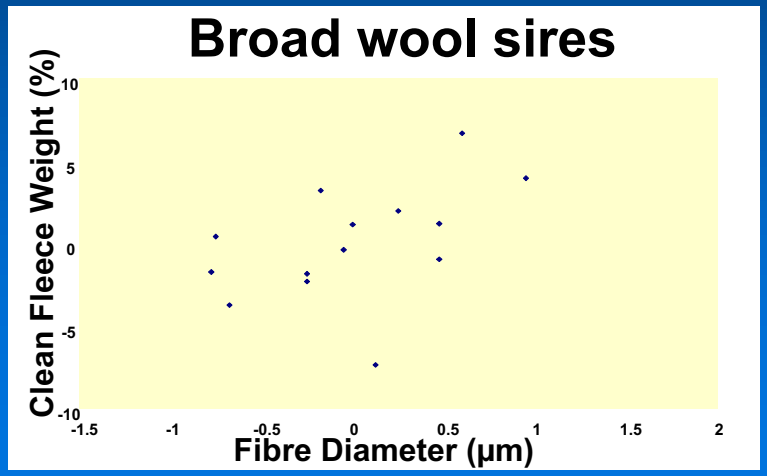
CRC for Premium Quality Wool

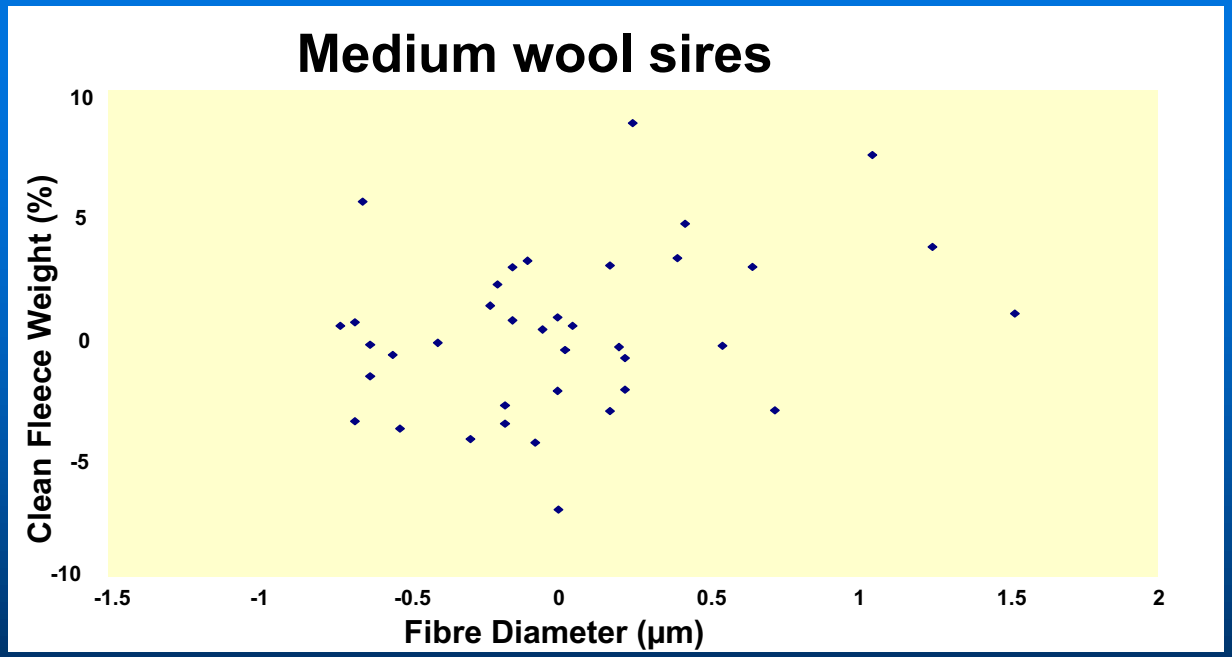
The Genetics Of Fleece Weight And Fibre Diameter: Within-flock variation

Produced for the CRC for Premium Quality Wool undergraduate program by;
Pat Taylor, NSW Agriculture.

Distributions of progeny values of purchased sires of each strain







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Source: Taylor and Atkins (1997)

Which selection criteria are best?

- Historically Merino breeders have relied on indirect criteria to improve wool cut and quality
- Indirect criteria can only be more effective than direct if they are:
  - more strongly inherited (higher h^2)
  - strongly genetically correlated with the traits to be improved
  - less expensive to measure

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As direct selection criteria CFW and MFD are highly heritable and relatively inexpensive at around $3 per head

Trait	Heritability (h^2)	sheep (%)
CFW	0.38 (0.23 - 0.62)	12
MFD	0.48 (0.25 - 0.75)	6

The genetic correlation between these two traits (0.15, range 0.05 - 0.31) indicates some genetic antagonism but is sufficiently weak to enable simultaneous improvement in both traits.

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Source: Davis and McGuirk (1987)

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Index selection

- A selection index is more efficient than independent culling on each trait.
- A selection index applies economic weights for each trait (determined by breeding direction) for each sheep. Sheep are then ranked on overall merit for both traits.
- This allows outstanding sheep for one trait to rank well even if slightly outside desirable limits for the other.
- These sheep make a valuable contribution to the gene pool of the next generation.

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Making the best use of CFW and MFD to predict breeding values

- Records need to be adjusted for non-genetic factors that affect performance
- In young Merinos these are:
  - birth and rearing status (singles or multiples)
  - age relative to cohorts when measured
  - age of dam (maiden or adult)
- Ideally full pedigree is also recorded so that breeding values of relatives can also be considered.

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Design of Trangie QPLU$ selection experiment

Strain	Line (MP)	No. Ewes	No. Sires	Description of Selection Emphasis
Fine	8.0 %	200	8	Equal emphasis on fleece weight and diameter
	Control	200	8	Random
Medium - Peppin	Industry (~4.5%)	200	8	Emphasis on fleece quality, conformation, fleece weight and diameter
	3.0 %	200	8	Emphasis on fleece weight, maintain diameter
	8.0 %	200	8	Equal emphasis on fleece weight and diameter
	15.0 %	200	8	Emphasis on diameter, maintain fleece weight
	Control	200	8	Random
Broad	8.0 %	200	8	Equal emphasis on fleece weight and diameter
	Control	200	8	Random

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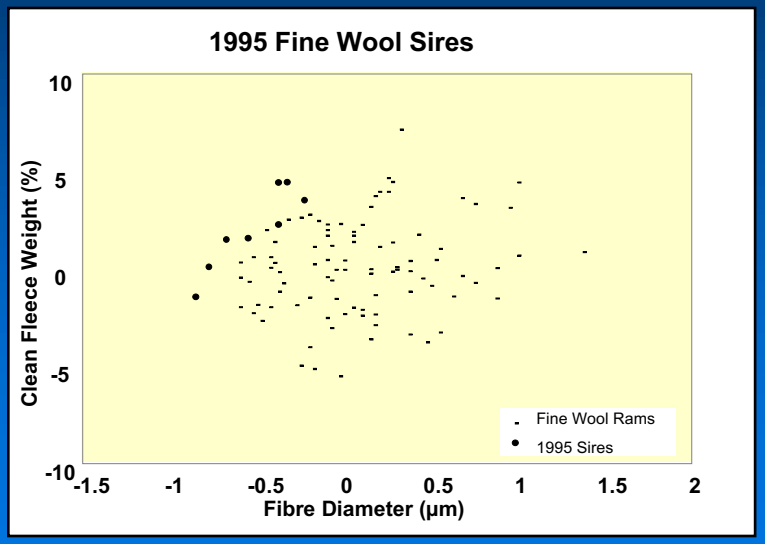
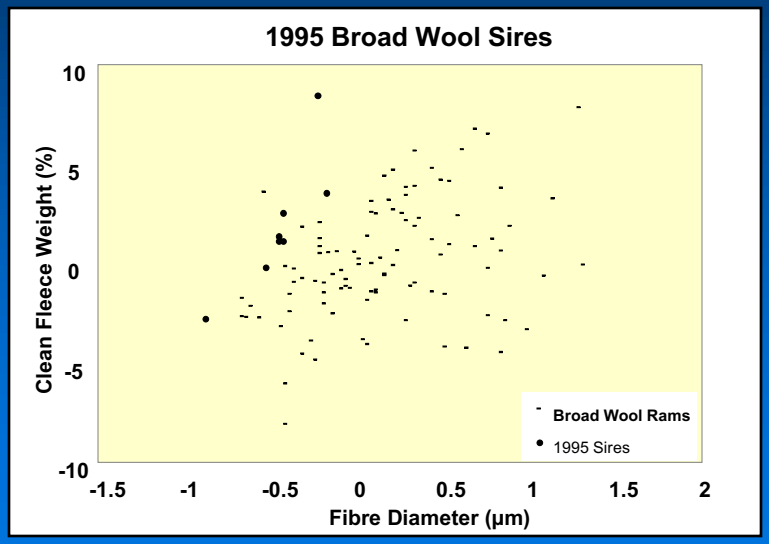
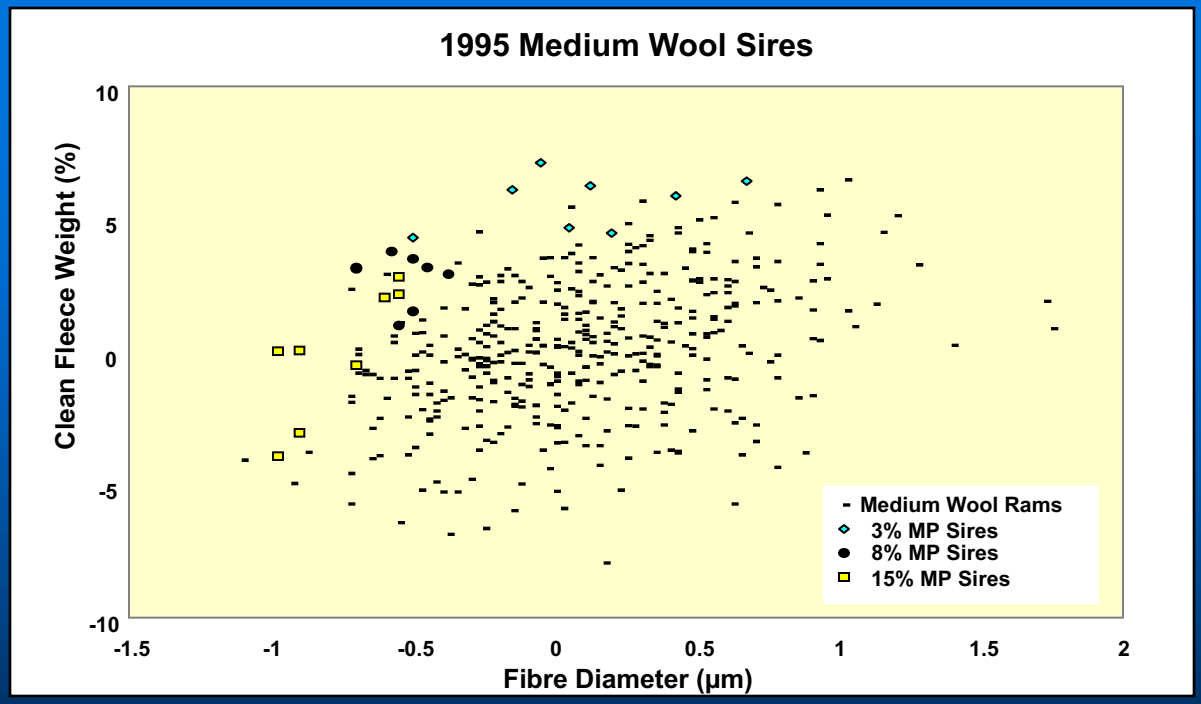
Source: Taylor and Atkins (1997)

Selected sires of each strain







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Source: Taylor and Atkins (1997)

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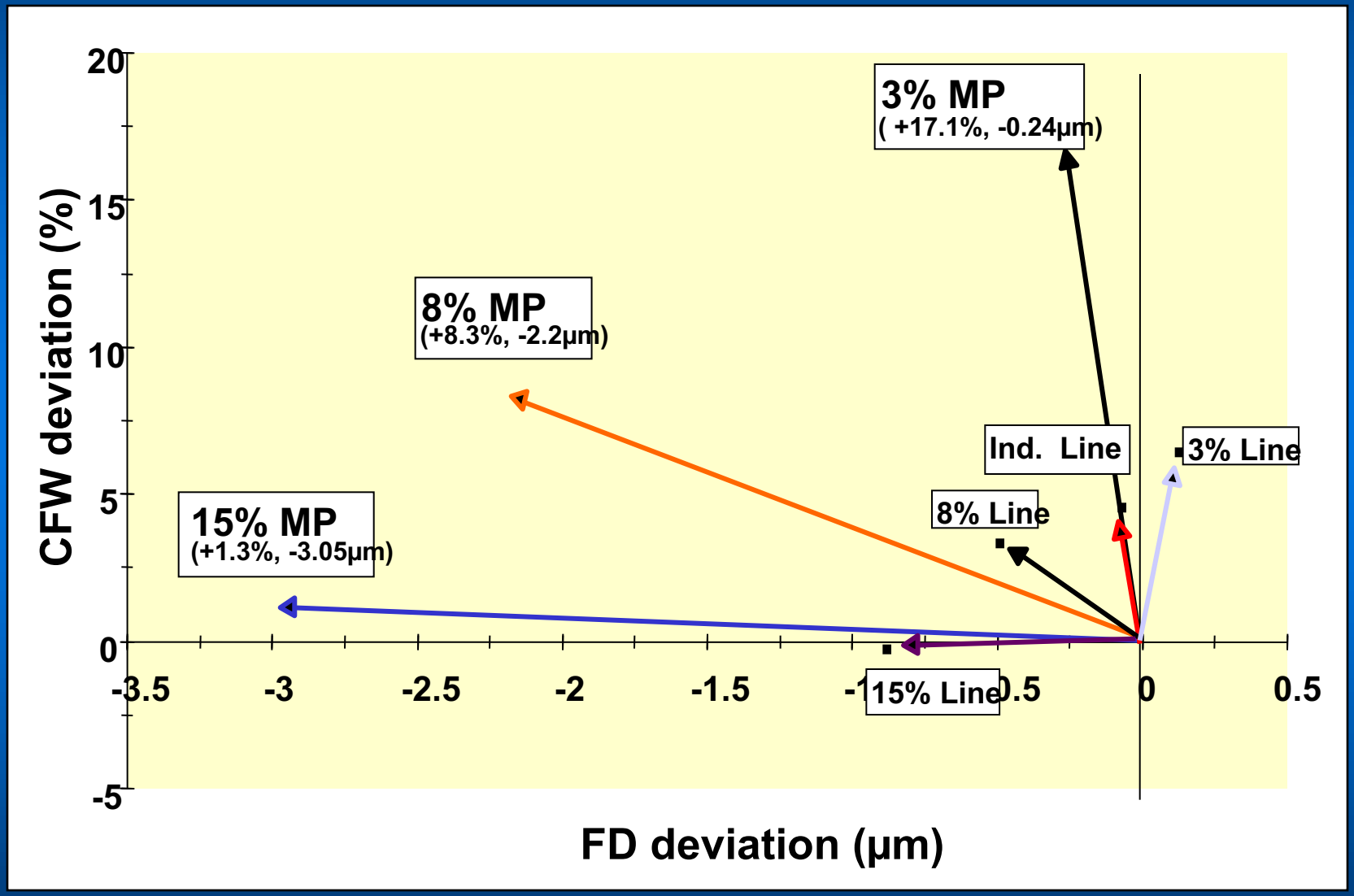
Response to selection in each of the Medium - Peppin lines



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Source: Taylor and Atkins (1997)

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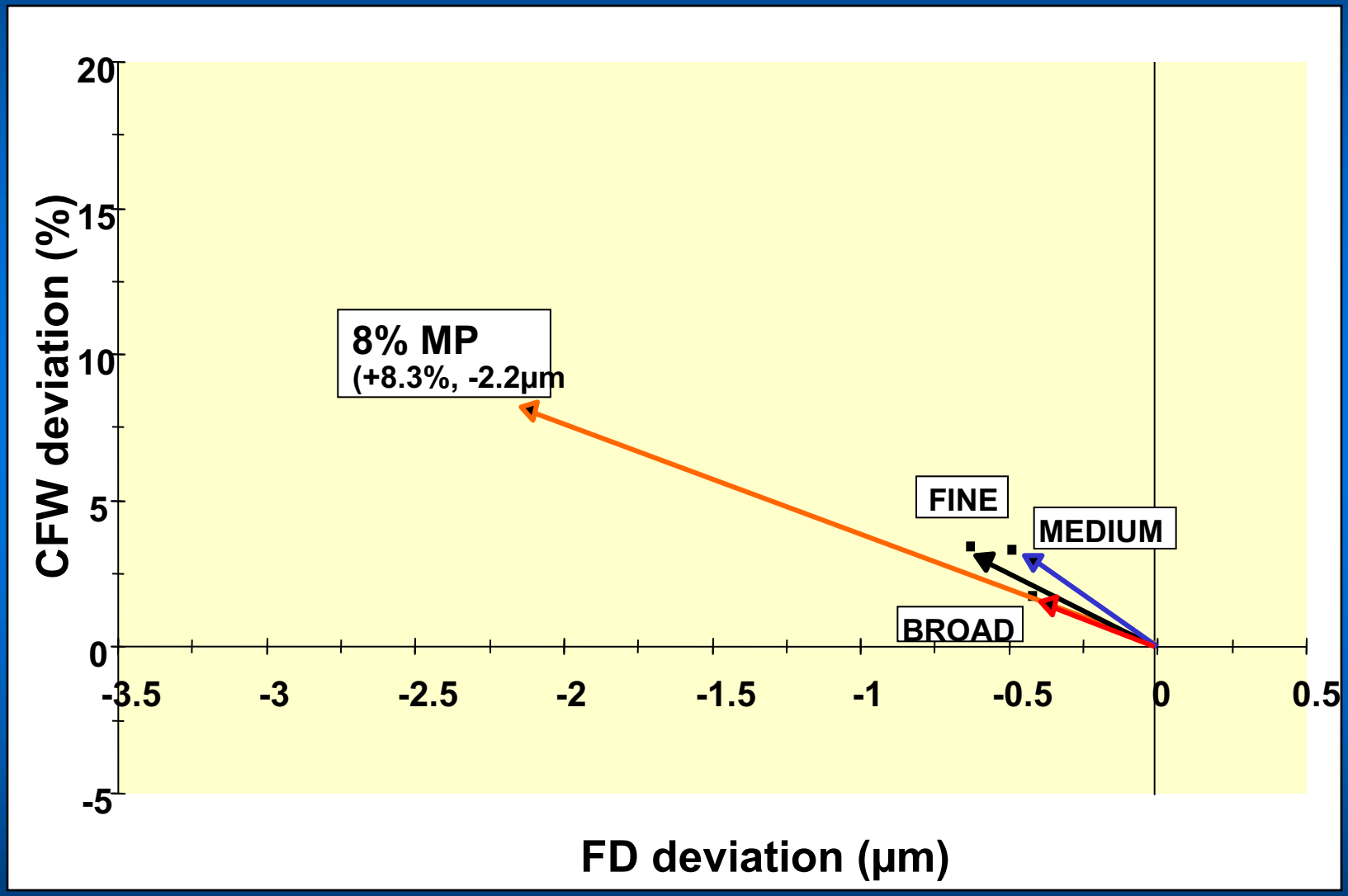
Response to selection in 8% lines in each strain



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Source: Taylor and Atkins (1997)

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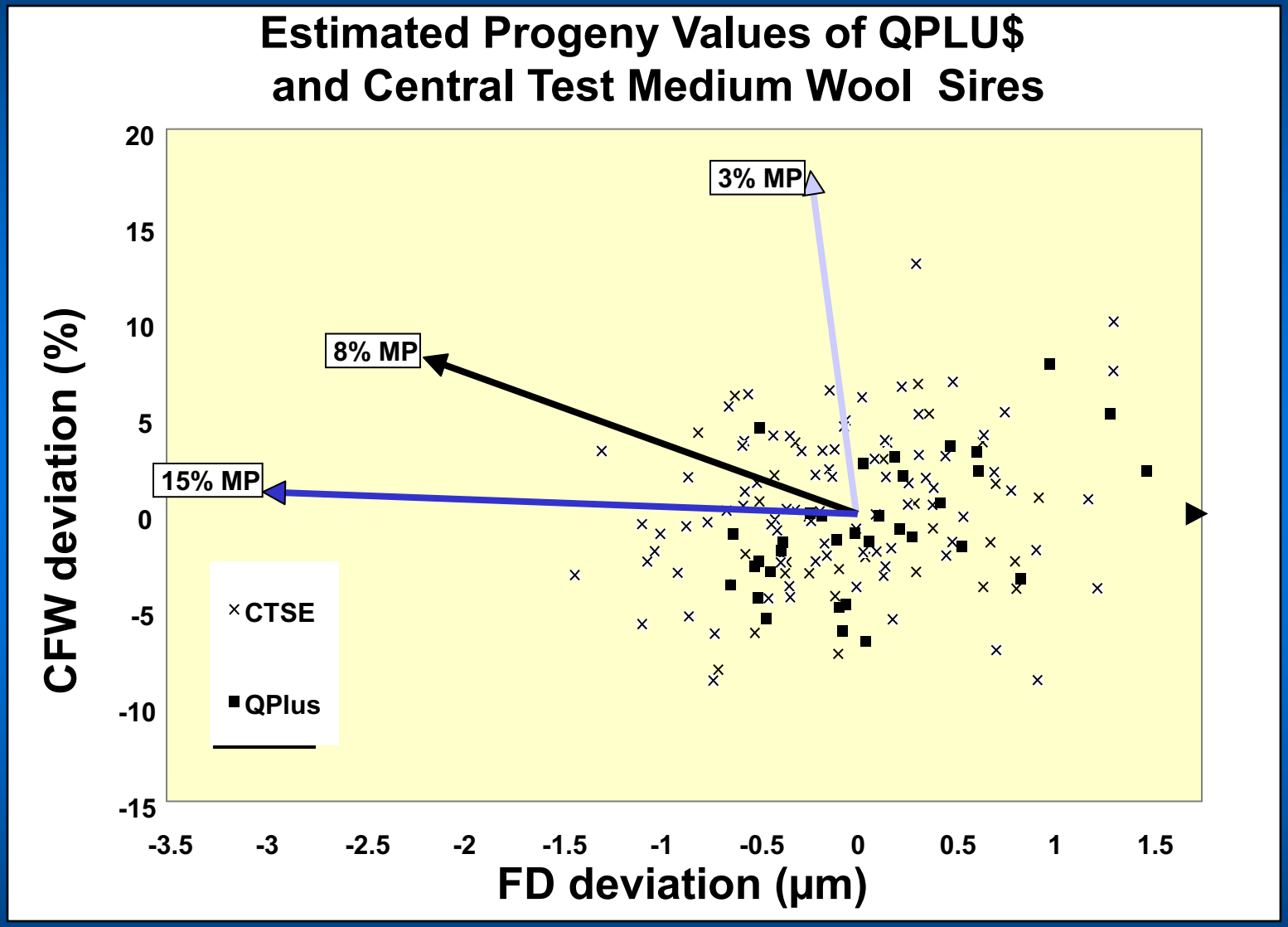
Genetic improvement in perspective



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Source: Taylor and Atkins (1997)