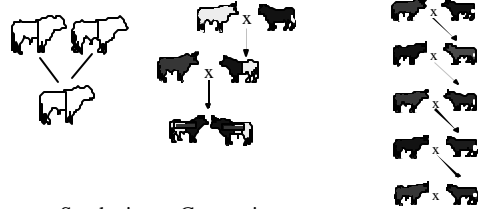


Crossbreeding

- crossbreeding structures
- estimating crossbreeding parameters

Crossbreeding structures

- 2-Breed Cross
- 3-Breed Cross
- Rotational cross

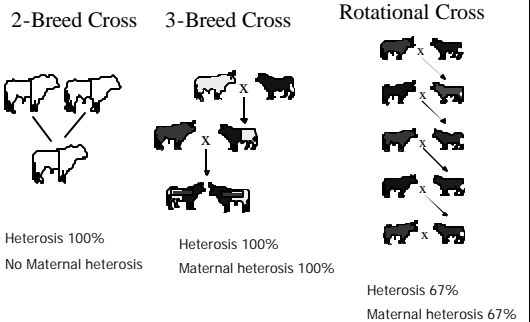


- Synthetics or Composites

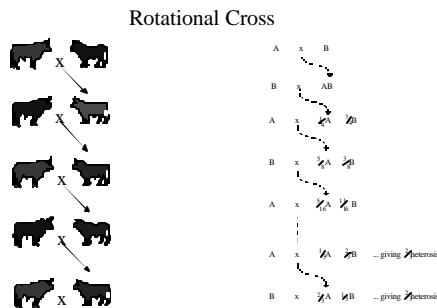
Predicting Crossbred Performance

- Additive direct breed effects
- Additive maternal breed effects
 - Proportional to breed proportion of animal / dam
- Direct heterosis
- Maternal heterosis
 - Proportional to heterozygosity of animal / dam

Predicting non-additive breed effects



Loss of heterosis and complementarity ...



Crossbreeding:

More 'structure' gives more merit ...

In general ...

The shorter the breed pedigree back to purebred parents:

- the more heterosis can be expressed. (e.g. F1 > F2, next slide)
- the more sire-dam complementarity can be expressed (next slide)

BUT: The more expensive the operation is to run (need more purebred parents)

A simple example

Maternal breed difference = 304 - 309 = 5

$$A_{m1} = -2.5$$

$$A_{m2} = +2.5$$

Direct Breed effect

$$\text{Mean Breed 1} = (A_{d1} + A_{m1}) = A_{d1} - 2.5 = 294 \rightarrow A_{d1} = 297.5$$

$$\text{Mean Breed 2} = (A_{d2} + A_{m2}) = A_{d2} + 2.5 = 279 \rightarrow A_{d2} = 276.5$$

$$\rightarrow A_{d1} - A_{d2} = 20 = \text{Direct breed difference}$$

Breed of Bull	Mean Yearling Wt. of progeny	
	Breed of Cow	
	1	2
1	294	309
2	304	279

A simple example

Heterosis

Mean of F1 crosses - Mean of Purebred (Parental) lines

$$= 306.5 - 286.5 = 20$$

Maternal Heterosis ?

Need both crossbred and purebred mothers

Breed of Bull	Mean Yearling Wt. of progeny	
	Breed of Cow	
	1	2
1	294	309
2	304	279

A simple example (another way of representation)

Cross	Ad1	Ad2	Am1	Am2	Dd	Dm	Merit
	296.5	276.5	-2.5	+2.5	20	?	
Pure1	1	0	1	0	0	0	294
Pure2	0	1	0	1	0	0	279
1 x 2	.5	.5	0	1	1	0	309
2 x 1	.5	.5	1	0	1	0	305
1 x (12)	?	?	?	?	?	?	?

A simple example (another way of representation)

Cross	Ad1	Ad2	Am1	Am2	Dd	Dm	Merit
	296.5	276.5	-2.5	+2.5	20	?	
Pure1	1	0	1	0	0	0	294
Pure2	0	1	0	1	0	0	279
1 x 2	.5	.5	0	1	1	0	309
2 x 1	.5	.5	1	0	1	0	305
1 x (12)	.75	.25	.5	.5	.5	1	

Summary

- Crossbreeding structures differ in
 - Breed composition
 - Amount of heterosis
 - Practical aspects
- Can estimate crossbred parameters by writing out the coefficients of the effects for different crosses