


Thoughts on Breeding for Meat Production



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Selection

“Causing or permitting some kinds of individuals to produce more offspring than other kinds do is selection. It is the number raised and added to the breeding herd rather than the number born which matters, since those which are born but get no chance to reproduce cannot affect the composition of the future population.”


-Dr. Jay Lush

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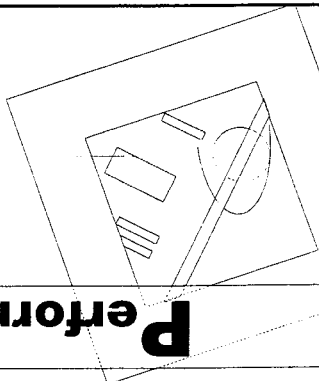
Upon what criteria should selection be based?

Performance

- Select for performance traits that are economically based, not "fancy points";



Performance



Selection should be based upon:

- Performance
- Physical/visual assessment
- Pedigree

Performance Traits

- Individual
 - birth weight
 - weaning weight
 - yearling weight
 - preweaning ADG
 - post-weaning ADG
 - feed efficiency
 - carcass quality
- Parental
 - litter size
 - sire's ADG
 - dam's maternal ability
 - litter birth weight
 - litter weaning weight (productivity)
 - efficiency

Selection Strategies

- Tandem
- Independent Culling Levels
- Index

Tandem

- selection for one trait at a time
- when the desired level is achieved, selection is practiced on another trait
- very effective if selection is for one or two traits
- ineffective for more than two traits or if one trait is associated with undesirable effect in another trait

Independent culling level

- Advantages
 - This is the simplest method to identify animals that meet the goals of a selection program

Independent culling level

- Independent culling level is a method by which the producer sets a minimum value for each trait in the selection program.
- Animals above the minimum for all traits are considered for selection.

Example

- Selection on weaning weight until desired level is achieved
- then selection on post-weaning average daily gain until desired level is achieved
- then selection on feed efficiency until desired level is achieved
- etc

Independent culling level

- Disadvantages
 - The first difficulty is to set the (minimum) standards.
 - An animal may be rejected for failure to meet one standard but may far exceed the minimum standards of all the other traits

Example

	WW	YW	Post-ADG
min level	30	140	0.40
Buck	WW	YW	Post-ADG
A	32		
B	36		
C	28		

Example

	WW	YW	Post-ADG
min level	30	140	0.40
Buck	WW	YW	Post-ADG
A	32	140	
B	36	130	
C	28	-	

Selection index

- Use of a selection index allows the ranking of animals based on a value calculated by giving each selected trait a "relative weight."
- The "weight" represents the importance that a producer chooses to give to a particular trait.

Example

min level	30	140	0.40
WW	YW	Post-ADG	
Buck	WW	YW	Post-ADG
A	32	140	0.41
B	36	130	0.35
C	28	150	0.45

Example

min level	30	140	0.40
WW	YW	Post-ADG	
Buck	WW	YW	Post-ADG
A	32	140	0.41
B	36	130	-
C	28	-	-

Selection Index

- Advantages
 - An index allows identification of animals that best fit the overall genetic goal without focusing on any trait in particular. Once an index is built properly, selection of animals is much simpler than independent culling levels because the best animals, simply, are the ones that rank at the top of the list.

Selection Index

- Disadvantages
 - Indices are difficult to build because it is difficult to choose the traits to include and the weight to assign to each trait.

Example

Index = .3 * feed efficiency

+ .3 * ADG

+ .2 * loin eye area

+ .2 * rear leg circumference

Pedigree

Physical/visual Assessment

- Conformation
 - structural correctness
- General Appearance
 - size and scale
 - depth and width
- Muscling
 - Finish

Physical/visual assessment

Pedigree

- Usually, a pedigree is just a list of names and does not contain production information
- Check for inbreeding
 - if the parents are related, then the progeny is inbred

Systems of Mating

- Inbreeding
 - mating of animals more closely related than the average in the herd
- Linebreeding
 - A form of inbreeding in which an attempt is made to concentrate the inheritance of some one ancestor, or line of ancestors, in a herd.

Systems of Mating

- Outbreeding
 - Mating of unrelated animals within a breed
- Crossbreeding
 - Mating of animals of two or more different breeds

<ul style="list-style-type: none">• In beef cattle, for every percentage increase in inbreeding<ul style="list-style-type: none">- birth weight decreased 12 pounds- ADG decreased .5 pound/day- weaning weight decreased 98 pounds	
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<ul style="list-style-type: none">- lifetime milk production decreased 390 pounds- lifetime fat production decreased 13 pounds- lifetime protein production decreased 12 pounds- age at first calving increased 1/2 day- productive life decreased 6 days- days in milk decreased 5 days	
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<p>Is inbreeding bad?</p> <ul style="list-style-type: none">• In dairy cattle, for every percentage increase in inbreeding<ul style="list-style-type: none">- lifetime income decreased \$15- 1st lactation milk production decreased 59 pounds- 1st lactation fat production decreased 2 pounds- 1st lactation protein production decreased 2 pounds	
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• In sheep, for every percentage increase in inbreeding

- 10-month weight decreased by .5 pound
- over 5%, prolificacy and lamb survival decreased

Inbreeding in the US Holstein Population

1.2%

Linebreeding

- A form of inbreeding in which an attempt is made to concentrate the inheritance of some ancestor, or line of ancestors, in a herd.

Misuse of inbreeding

- failure to objectively identify superior individual
- herd inferior to average of breed
- crossbred herd
- no selection practiced

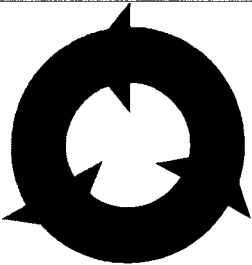
Uses of inbreeding

- concentrate inheritance
- uncover undesirable genes
- develop lines for crossbreeding
- animal no longer available (death)

When should inbreeding be used?

- When truly outstanding individual(s) have been identified in a purebred herd that is superior to the general average of the breed.

Method



Method

- Analyze past reproductive performance of does in herd
 - open last two breeding seasons
 - failed to wean kid(s) last two breeding seasons
 - broken-down udder
 - “poor-doer”

Method

- Set culling level and determine the number of does to be culled
- Determine current buck’s progeny performance
- Determine potential inbreeding if current buck is kept

Method	<ul style="list-style-type: none"> • Conduct PEDIGREE analysis and plan matings to minimize inbreeding; it is not necessary to cull at this point • If animals have been culled due to conformation flaws, then restart process using the remaining pool of animals • Repeat process until desired number of animals are procured
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Method	<ul style="list-style-type: none"> • Calculate a PERFORMANCE score • Select the top candidates to fulfill number needed • Conduct PHYSICAL/VISUAL ASSESSMENT on candidates and cull any with obvious defects
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Method	<ul style="list-style-type: none"> • Determine the number of replacement does/doesings and buck/bucklings needed <ul style="list-style-type: none"> - Determine the number needed from within the herd - Determine the number needed from outside herd
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