

Gilt Selection for Improved Longevity and Productivity

Advanced Swine Reproductive Management Seminar

March 3, 2005 – Waverly, Iowa

March 4, 2005 – Sheldon, Iowa

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Importance of Gilt Selection

- ◆ Genetic makeup of market animals is made up of ½ of the genes from the parent female
- ◆ Selection or lack thereof placed on parent females can impact the market animal
 - Growth
 - Leanness and muscling
 - Soundness
- ◆ Selection on replacement gilts is a must!

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Traits in which selection should occur on replacement gilts

- ◆ **Growth**
 - Gilts should be in the top 75% of the contemporary group
 - Adequate growth increases the probability of proper reproductive development
 - Slow growing females (within a group) can have delayed first estrus and be lifelong problem breeders
- ◆ **Backfat**
 - More important consideration if you are producing your own replacement females within herd
 - Using boars that vary considerably for backfat to produce replacement gilts
 - Consult NSIF Guidelines for Uniform Swine Improvement to obtain proper measurement and adjustment criteria
www.nsis.com/guidel/guidelines.htm

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Traits in which selection should occur on replacement gilts

- ◆ **Feet and Leg Soundness**
 - Feet and leg problems represent the second largest reason for sows leaving the breeding herd
 - Particularly true of parity 1, 2 and 3 females
- ◆ **Underline Soundness**
 - Underlines should be visually evaluated and scored on ALL replacement females
- ◆ **External genitalia**
 - Involves visually evaluating the vulva for size, shape, and injuries

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Feet and leg soundness

- ◆ **Feet and leg problems are a major reason for sow culling**
 - Particularly true of parity 1, 2, and 3 females
- ◆ **Feet and leg soundness should be evaluated on ALL replacement females**
- ◆ **Evaluation can involve a scoring process**
 - PIH-101 Feet and leg soundness in swine
 - NSIF Guidelines for uniform swine improvement
- ◆ **Gilts that score poor or unacceptable should be sold**

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Feet and leg evaluation

- ◆ **Conditions shown to negatively impact sow longevity**
 - Buck-kneed front legs



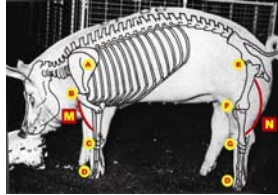
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Feet and leg evaluation – Front legs what are we looking at?

◆ **What to avoid**

- Angle M is too large (greater than 90°) and makes the gilt straight fronted and appears to have her front shoulder (A) tipped too far forwards
- The gilt is much too upright from her shoulder (B) through the knee (C) and can cause abrasions to the front feet (D)



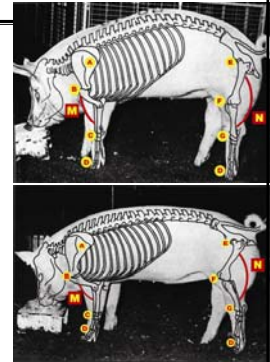
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Feet and leg evaluation – Front Legs, what are we looking at?

◆ **What is desirable**

- Notice that angle M in the lower picture is smaller providing a much more desirable angle to the front leg.
- Provides more cushion when the animal is standing and walking



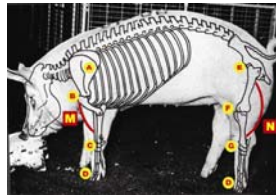
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Feet and leg evaluation – Rear Legs, what are we looking at?

◆ **What to avoid**

- Angle N is too large and makes the hip (E), stifle (F), and hock (G) joints lock in a straight line or post-legged position when walking on her rear legs
- Foot pad abrasions, swelling of the feet and joints, and lameness regularly occur in animals with these traits



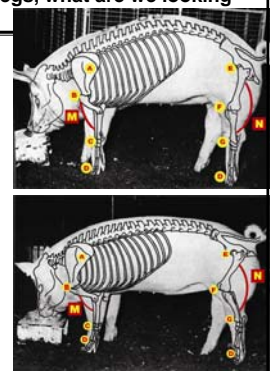
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Feet and leg evaluation – Rear Legs, what are we looking at?

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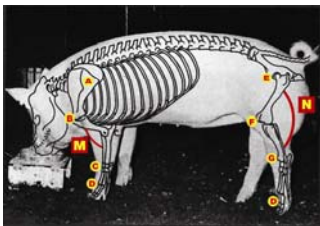
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Feet and leg evaluation – Rear Legs, what are we looking at?

◆ **What is desirable**

- The ideal animal is the one providing more cushion and flexion to the joints.
- These animals will have an easier time getting up and down.
- They will walk more fluidly and be less susceptible to stiff joints and arthritis as the result of constant stress on the joints.



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Feet and leg evaluation

◆ **Conditions shown to negatively impact sow longevity**

- Buck-kneed front legs
- Straight rear pasterns



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Feet and leg evaluation

- ◆ **Conditions shown to positively impact sow longevity**
 - Soft front pasterns



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Feet and leg evaluation

- ◆ **Leg conformation tends to conform to the shape and size of the toes**
- ◆ **It is critical to also evaluate toe size**
- ◆ **Ideal toes**
 - Big toes
 - Evenly sized
 - Spread apart
- ◆ **Better distribution of weight**



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Feet and leg evaluation

- ◆ **Toe size difference of 1/2 inch or greater should be discriminated against**
- ◆ **When the toes are uneven there is a greater risk of cracked hooves and foot pad lesions as the animal becomes older**



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Feet and leg evaluation

- ◆ **Small toes that have little if any spacing between them are undesirable.**
- ◆ **Weight is concentrated on a smaller surface area and there is a greater risk of cracked hooves and foot pad lesions as the animal becomes older**



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Feet and leg evaluation

- ◆ **Feet and leg injuries can be an issue**
 - Foot pad abrasions
 - Cracked hooves



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Feet and leg evaluation

- ◆ **Feet and leg injuries can be an issue**
 - Foot pad abrasions
 - Cracked hooves
 - Swollen joints
 - Dew claw injuries



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Feet and leg evaluation

◆ **Gilts should be culled if:**

- Toes size differs greatly, focus on inside toes
- Obvious injury that will impair timely mating or thriving in gestational environment
- Injury will impair long and productive herd life



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Feet and leg evaluation

◆ **Replacement should move freely with legs stationed soundly at the corners with adequate width between them.**



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Feet and leg evaluation

- ◆ **Gilts that are "narrow based" should be avoided**
- ◆ **Likewise gilts having excessive muscling or "tight-muscled" do not move free and easy and should be avoided**

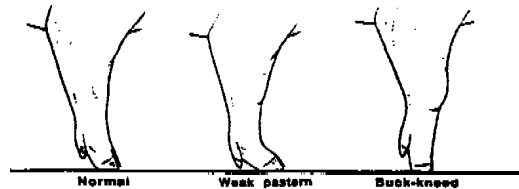


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Scoring system for evaluating feet and leg structure

Front Leg – Side View

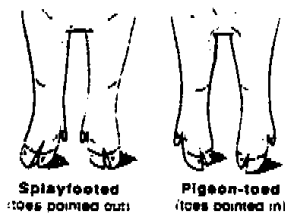


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Scoring system for evaluating feet and leg structure

Front Leg – Front View Abnormalities

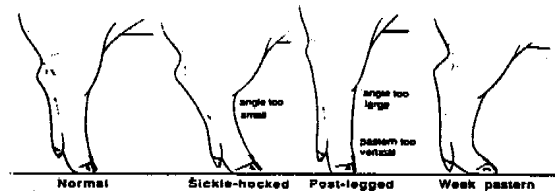


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Scoring system for evaluating feet and leg structure

Rear Leg – Side View




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Scoring system for evaluating feet and leg structure

Rear Leg
Abnormality

Hind legs

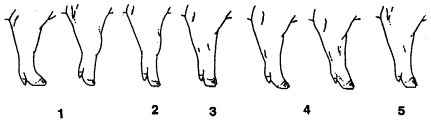


Cow-hocked

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Scoring system for evaluating feet and leg structure (NSIF, 1996)

Front Legs



1 2 3 4 5

Rear Legs



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Feet and leg evaluation

Evaluation	Score	Comments
Unacceptable	1-3 points	Severe structural problems that will likely restrict the ability of the gilt to breed
Good	4-7 points	Slight structural and movement problems
Excellent	8-10 points	No obvious structural or movement problems

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Improving feet and leg soundness

- ◆ The heritability of feet and leg soundness has been shown to be .29 for improved soundness and .42 for increased unsoundness in an Iowa State University divergent selection study (Rothschild and Christian, 1988)
- ◆ Small inside toes are thought to be caused by a genetic abnormality
 - Mode of inheritance is unknown
 - Culling of affected animals is recommended

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Improving feet and leg soundness

- ◆ Challenges can occur if selection is not practiced on replacement gilts
 - Cracked hooves
 - Foot pad abrasions



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Improving feet and leg soundness

- ◆ Challenges can occur if selection is not practiced on replacement gilts
 - Excessive toe growth



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Other factors affecting soundness

Disease – organisms causing arthritic conditions

- ◆ Streptococcus
- ◆ Mycoplasma
- ◆ Actinobacillus pleuropneumonia
- ◆ Etc.

Floor surface

- Rough floors
- Slats with sharp edges
- Smooth wet floors



Nutrition

- Calcium
- Phosphorus
- Zinc
- Biotin
- etc.



Reproductive soundness

- ◆ Underline evaluation is another critical step in the evaluation of replacement gilt candidates
- ◆ Sows must have functional nipples to raise pigs
- ◆ Role that genetics plays in determining the spacing, prominence, and location is not well understood
- ◆ Traits do have a direct impact on production. It is recommended that all replacement gilts are evaluated



Reproductive soundness - Underlines

- ◆ An ideal underline should have six or more functional nipples on each side.
- ◆ The nipples should be well space and well developed
- ◆ NO blind or pin nipples should be present



Reproductive soundness - Underlines

- ◆ Discrimination should be applied when
 - There are fewer than six functional nipples are present
 - Blind or pin nipples exist
 - Poor spacing and / or placing is present
 - Inverted nipples are present



Reproductive soundness - Underlines

- ◆ Evaluation could occur at birth, weaning, or in the nursery
 - An initial evaluation and count
- ◆ Final evaluation should be made when selection of gilts occurs.



Reproductive soundness - Underlines

- ◆ Scoring of underlines can be done much in the same way that soundness is evaluated

Evaluation	Score	Comments
Unacceptable	1-3 points	Fewer that six functional nipples on each side or one or more inverted nipples or poor spacing and prominence.
Good	4-7 points	Six or more functional nipples on each side with adequate spacing and prominence.
Excellent	8-10 points	Six or more functional nipples on each side, well-spaced and well-developed with no pin or blind nipples.



Reproductive soundness - Underlines

◆ What can we do to improve underlines?

- Variation in nipple number exists (Willham and Whatley, 1963)
- Correlation between number of nipples per side was .97 (Willham and Whatley, 1963)
- Nipple number is moderately heritable (.20 - .47) (McKay and Rahnefeld, 1990)
- Selection against females with inverted nipples should reduce the incidence of this abnormality
 - Heritability of inverted nipples is approximately .20
- Care when evaluating underlines as a nipple can be surrounded by loose skin and only appear to be inverted

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Reproductive soundness – External genitalia

◆ The external genitalia should also be evaluated on all replacement gilt candidates.

◆ Gilts should have a well developed vulva that is not tipped up



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Reproductive soundness – External genitalia

◆ Avoid gilts having an infantile vulva



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Reproductive soundness – External genitalia

◆ Gilts having small vulva should be avoided

- Could have difficulty mating (particularly in a natural mating setting)
- Once mated could have farrowing difficulties



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Reproductive soundness – External genitalia

◆ Tipped vulvas should be avoided. It is thought that tipped vulvas may contribute to a higher incidence of metritis and cystitis.



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Reproductive soundness – External genitalia

◆ Injured vulvas should be avoided as they may impair mating.

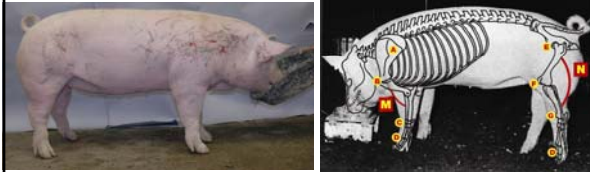
◆ Once they are healed the scar tissue that develops from a vulva injury could also cause farrowing difficulties.



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What does the ideal gilt look like?



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Examples of replacement gilt candidates to cull.



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Other genetic conditions to avoid

- ◆ Gilts producing offspring with or who are from litters where the following conditions occurred should not be selected as a replacement
 - Scrotal Hernia
 - Atresia Ani
 - Cryptorchidism
 - Hermaphrodites
 - Tremors
 - Splayleg
 - Bent legs
 - Polydactyly
 - Syndactyly
 - Thickened forelegs

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Culling of replacement gilt candidates

- ◆ The more traits that are evaluated and culling is practiced on, increases the number of replacement gilt candidates
- ◆ May not be a large problem if producers are purchasing their replacement females
 - Hopefully much if not all of the culling has occurred prior to a commercial producer receiving the replacement gilts
 - However, purchased gilts should still be carefully scrutinized before producers enter them into the breeding herd
- ◆ Number of gilts retained can have a great impact on the number of grand-parent females needed in an internal multiplication system.

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To calculate the number of replacement gilts needed

Item		Example
Average Sow Inventory	(A)	2500
Annual Replacement Rate	(B)	.50
Number Needed / Year	$A \times B = (C)$	1250
Number of Days in Isolation	(D)	60
Percent of Number Purchased that Farrow a Litter	(E)	.90
Time Needed to Clean Isolation Facility, Days	(F)	7
Number of Replacement Females to Purchase	$C / E = (G)$	1389
Number of Replacement Female Groups	$365 \text{ days} / (D + F) = (H)$	5.45
Number of Females Purchased per Group	G / H	255

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Replacement Gilt Needs

- ◆ Assuming 1389 replacement gilts are needed annually whether they are purchased or internally multiplied.
- ◆ How many gilts will be required once selection takes place?

Gilts needed for Breeding Purposes	Percentage of Gilts Selected	Total Number of Gilts to Produce
1389	80%	1736
1389	65%	2137
1389	50%	3472


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Replacement Gilt Needs

- ◆ Assume that 8 offspring reach market weight for each grand-parent female in production in an internal gilt multiplication system
- ◆ Of the 8 offspring each grand-parent female produced 4 (one-half of offspring) are females and each female has 2.2 litters per year (8.8)


Percentage of Gilts Selected	Total Number of Gilts to Produce	Grand-Parent Sows Needed (Assuming a 80% farrowing rate of GP females)	Percentage of Herd Devoted to Replacement Gilt Production
80%	1736	246	9.8%
65%	2137	303	12.1%
50%	3472	494	19.8%

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Replacement Gilt Needs


- ◆ Does not account for any disease outbreak, fluctuations in farrowing rate (summer vs. other season)
- ◆ Also must produce replacement grand-parent females
- ◆ It is clear that the cost of producing the replacement gilt in an internal multiplication system can vary quite easily

Grand-Parent Sows Needed (Assuming a 80% farrowing rate of GP females)	Percentage of Herd Devoted to Replacement Gilt Production	Grand-Parent Females Needed to Replace GP females (Assumes 50% replacement and 75% conception)	Total number of GP sows and % of herd
246	9.8%	75	321 (12.8%)
303	12.1%	92	395 (15.8%)
494	19.8%	132	626 (25.0%)

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Selection photos

- ◆ The majority of the photos used in this presentation were utilized in a series of three posters distributed by the National Hog Farmer
- ◆ They were developed in conjunction with the National Swine Registry, National Hog Farmer, National Pork Board, and Iowa State University
- ◆ Posters were designed for producers to assist them when evaluating replacement gilts

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I would like to thank the National Hog Farmer magazine for their contributions and for allowing use of the photos as well as the National Pork Board and National Swine Registry for Funding.

Photos courtesy of





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Thank You For Your Time and Attention!

Do you Have any Questions?

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