Length of Productive Sow Life

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Why are we concern with sow longevity?

- Economics – producers
- Welfare – public (non-ag and ag), producers, barn workers
- Worker morale – barn workers

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Female Culling Importance

- A sow remaining in the breeding herd for fewer parities is likely to produce fewer pigs in her lifetime, compared to a sow that remains in the breeding herd for a longer period of time.
- Reduces the opportunity for a sow to be sufficiently productive (pigs weaned and sold per lifetime) to achieve a return on the replacement gilt investment cost

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When does a sow pay for herself?

No. Born Alive /Litter	1	2	3	4	5	6
8.95	($131.11)	($130.55)	($103.87)	($71.19)	($39.90)	($16.51)
9.20	($120.92)	($110.60)	($74.58)	($32.96)	$6.88	$38.46
9.45	($110.72)	($90.65)	($45.29)	$5.27	$53.66	$93.43
9.70	($100.53)	($70.70)	($16.00)	$43.50	$100.45	$148.40
9.95	($90.33)	($50.74)	$13.29	$81.73	$147.23	$203.37
10.20	*($80.14)*	*($30.79)*	*$42.58*	*$119.96*	*$194.01*	*$258.34*
10.45	($69.94)	($10.84)	$71.87	$158.19	$240.80	$313.31
10.70	($59.75)	$9.11	$101.17	$196.42	$287.58	$368.28
10.95	($49.55)	$29.07	$130.46	$234.65	$334.36	$423.25
11.20	($39.36)	$49.02	$159.75	$272.87	$381.15	$478.22
11.45	($29.16)	$68.97	$189.04	$311.10	$427.93	$533.19

When does a sow pay for herself?

$/CWT for Hogs	1	2	3	4	5	6
$ 36.00	(231.00)	(330.75)	($410.58)	($482.72)	($551.75)	($621.74)
$ 38.00	(193.28)	(255.76)	($297.29)	($332.05)	($365.31)	($401.72)
$ 40.00	(155.57)	(180.77)	($184.00)	($181.38)	($178.87)	($181.70)
$ 42.00	(117.85)	(105.78)	($70.71)	($30.71)	$7.57	$38.32
$ 44.00	*(80.14)*	*(30.79)*	*$42.58*	*$119.96*	*$194.01*	*$258.34*
$ 46.00	(42.42)	44.20	$155.87	$270.63	$380.46	$478.36
$ 48.00	(4.71)	119.19	$269.17	$421.30	$566.90	$698.38
$ 50.00	33.01	194.17	$382.46	$571.96	$753.34	$918.40

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How long to sows have to remain in the herd?

- Using U.S. averages for feed, buildings, etc.
  - Farrow-to-Finish need to reach 3rd parity
  - Breed-to-Wean need to reach 4th parity
- Can calculate for your own herd using an excel spreadsheet available at:

http://www.ipic.iastate.edu/subjects.html

(near the bottom of the page)

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Female Culling Importance

- **Poor sow longevity requires larger replacement gilt pools, regardless of whether a pork production system raises or purchases these gilts.**
- **Costs of replacing a gilt**
  - **Initial purchase**
  - **Developing and acclimating**
  - **Disease risk**
  - **Poorer maternal production from younger sows**
  - **Poorer performance (reduced adg, higher mortality, etc.) of offspring from P1 females**

Reported Averages

	Replacement Rate, %	Culling Rate,%	Avg. Parity At Culling	Death Loss, %
PigCHAMP	60	42	3.8	7.8
Pigtales	53	47	Not Reported	

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Reasons For Culling

Reason	Percentage Culled
◆ Reproductive failure	30 - 35
◆ Old age	15 - 20
◆ Performance	15 - 20
◆ Feet and leg problems	10 - 15
◆ Death	5 - 10
◆ Post-farrowing problems	3 - 5
◆ Other	5 - 10

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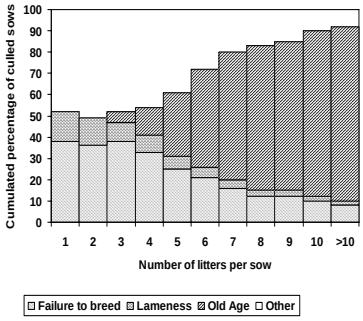
Incidence of failure to breed, lameness and culling for old age, in the sows according to litter parity *Dagorn & Aumaitre, 1978*



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How Do Top Herds Perform?

- **2002 PigCHAMP data Upper 10 Percentile**
  - Replacement rate 32.7%
  - Culling rate 22%
  - Death Loss 2.8%
  - Average parity at culling 5.5
- **Koketsu et al. (1999)**
  - A cohort of females born in 1990
  - Average lifetime pig production 67.2 pigs
  - Average parity at removal was 5.6 parities

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What is possible?

PARITY	NBA	BWT	FOSTER	NAT	WEANED	WEIGHT	AGE
1	10	20	1	11	9	75	15
2	13	38	-4	9	9	105	15
3	10	28	0	10	10	103	13
4	10	32	-1	9	9	90	15
5	11	34	-1	10	10	118	14
6	12	39	-3	9	9	95	15
7	11	33	-1	10	9	95	15
8	13	36	-4	9	9	86	21
9	14	42	-2	12	10	124	16
10	17	44	-6	11	9	111	20
11	11	40	-2	9	9	122	21
12	10	36	0	10	10	133	20
13	11	34	-1	10	9	127	17
14	13	37	-4	9	9	127	20
15	12	33	-1	11	9	97	16
16	8	24	2	10	9	127	17
17	13	40	-4	9	9	124	15
Avg.	**11.7**	**34.7**	**-1.82**	**9.88**	**9.24**	**109.4**	**16.8**

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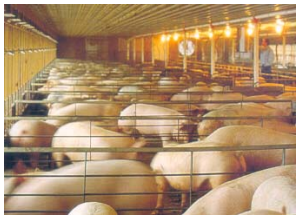
Changes in growth and body composition of gilts

Criteria	1975	2000
% Lean Carcass	**45**	**55-60**
% Fat	**27**	**15-18**
P2 at first service (in.)	**1.2-1.4**	**.70- .80**
Daily lean tissue growth rate (g/d)	**200**	**340**
Live-weight at third parity (lb)	**430**	**550**

Baidoo, Samuel K., 2001 Allen D. Leman Swine Conference (Adapted from Boyd, 1999)

Genetics



Heritability of Sow Longevity

- **Tholen *et al.* 1996 –**
  - stayability from parity one to two, one to three, and one to four
  - 0.05, 0.06 and 0.09
- **Yazdi *et al.* 2000 –**
  - longevity ranging from 0.11 to 0.27.
- **Serenius and Stalder 2004 –**
  - range of heritability from 0.05 to 0.19
  - depending on the model used to analyze the data.

Indirect Selection for Longevity

- **Buck kneed fore legs were shown to be negatively associated with:**
  - Age at first farrowing,
  - Farrowing interval,
  - Total number born, and
  - Piglet mortality from birth to weaning

Serenius et al. 2004.

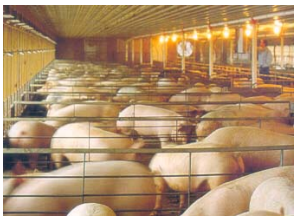
Indirect Selection for Longevity

- **Feet and leg evaluation**
- **Conditions shown to negatively impact sow longevity**
  - Buck-kneed front legs
  - Straight rear pasterns

Indirect Selection for Longevity

- **Conditions shown to positively impact sow longevity**
  - Weak front pasterns

Gilt Development



Sow Longevity and Backfat Relationship,

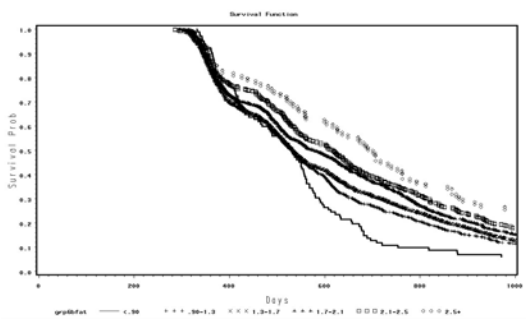
Brisbane and Chesnais, 1997

- Evaluated longevity in purebred Yorkshire and Landrace herds where backfat was measured on replacement gilts.
- Divided the gilts into 3 backfat categories.
  - Leanest - < 10 mm (.40 in.)
  - Intermediate - 10 to 18 mm (.40 to .70 in.)
  - Fattest - > 18 mm (.70 in.)
- Strong negative association between leanness and longevity.

Backfat and Sow Longevity cont'

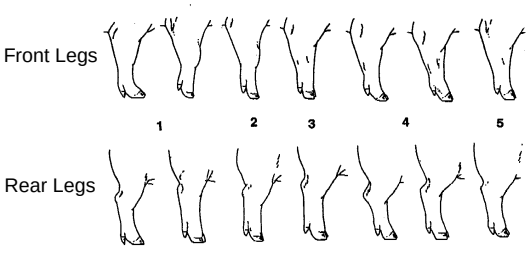
- Survival rate through the 4th parity of sows in the leanest category was poorer than those in the fattest category.
  - 30% in Yorkshire
  - 33% in Landrace

Backfat and Sow Longevity cont'



Feet and Leg Soundness

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



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

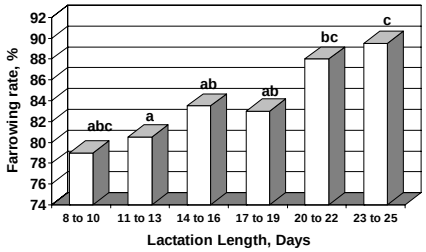
Gilt Selection Criteria - Soundness

- Small inside toes are common
- Want even toes that are spread apart.

- Proper toe size will ease movement and improve Stability
  - Less likely to get foot problems
    - Cracked toes
    - Abrasions of foot pads
    - Etc.

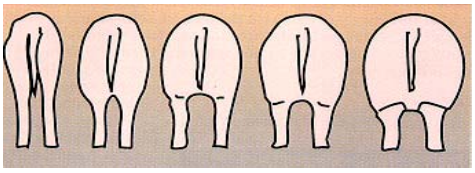
Lactation Length

Influence of Lactation Length on Farrowing rate, Dial et al., 1995



Body Condition at Weaning

Condition Scores of Sows, Patience and Thacker, 1989



Score	Condition	Body Shape
1	Emaciated	Hip, backbone prominent to the eye
2	Thin	Hips, backbone easily felt without applying palm pressure
3	Ideal	Hips backbone felt only with firm palm pressure
4	Fat	Hips, backbone cannot be felt
5	Over fat	Hips, backbone heavily covered

Effects of sow condition at weaning* on reproductive performance & herd longevity

	Liveweight at weaning		P2 backfat at weaning	
	High	*Low*	*High*	*Low*
Weaning-estrus interval (d)	**6.2**	**8.2**	**5.8**	**8.1**
Sow wastage (%)**	**11**	**37**	**9**	**39**
Subsequent litter size (live)	**10.9**	**8.8**	**11.4**	**8.9**

* Measured in mature sows (parities 3-7) where High = top one-third and low = bottom one-third of total.
** Consisting of sows anoestrus, failing to conceive, aborting or non-pregnant at term.

Gilt management to maximize lifetime productivity: Feeding from selection to culling. Dr. Paul Hughes, Pig & Poultry Production Institute, Aug. 2001.

Seasonal Variation

Seasonal Variation

- **Typical attributes of seasonal infertility**
  - 1) delayed onset of puberty
  - 2) prolonged wean-to-estrus intervals
  - 3) reduced farrowing rate, and
  - 4) increased abortions

Seasonal Variation

- **Seasonal effects on farrowing rate tend to not be as large of a problem when sows are individually stalled**
- **Sows housed in pens tend = larger problem with seasonal infertility**
- **Sow mortality during the summer months is higher than mortality in other seasons of the year**
  - Increased sow death is generally seen when temperatures rise to 24º C and higher
  - Increased risk of cardiac failure

Sow Housing

Sow Housing

- Feet and leg injuries can be problematic
  - Cement flooring has been poorly cast,
  - Improperly cleaned or managed, or
  - Has extensive wear

Caretaker Skills and Management

Caretaker Skills and Management

- **Management practices and the skills**
  - Observing for health changes
  - Treating for illness, etc.
- **3 Skills for a Good Stock Person**
  - Eyes that see
  - Knowledge to know what to do
  - Can do or a get after it attitude

Caretaker Skills and Management

- **Inexperienced labor force**
  - Very little training and little background with livestock
  - Sow observation skills
  - Off-farm employees
  - More training
  - Many of the skills necessary for maintaining successful pork operations just good husbandry knowledge
  - Appropriate employee training programs are essential

Current ISU longevity research

- **Evaluation of sows at harvest to determine the incidence of abnormalities that could lead to culling of breeding herd females**
  - Objectives are
    - Correlate postmortem observations and industry production records to validate current paradigms as to culling practices.
    - Provide updated physical and reproductive tract evaluations of culled sows regularly presented for harvest and identify potential areas for sow longevity interventions research.
    - Determine the relationship between cull sow postmortem observations and various farm related factors within a single production systems consisting of multiple sow farms.
- **National Pork Board Funded**
- **Data collection beginning in March 2005**

Current ISU longevity research

- **Evaluate sows at three sow harvesting facilities that use different purchasing criteria to obtain a representative sampling of the midwestern culled sow population.**
  - Survey these three facilities five different times – (a total of 15 plant visits).
  - At each plant visit we will evaluate approximately 100 sows selected as representative of the days' production - a total of 1500 sows evaluated.

Current ISU longevity research

Objective 2 of cull sow project

- **Sample 8 farms from large integrated system.**
- **Within each farm we will sample approximately 300 cull sows for a total of 2400 culls sows evaluated.**

Current ISU longevity research

- **Association of compositional, structural soundness, and health with the ability of a commercial line of young sows to successfully complete parity one**

Current ISU longevity research

- **Objectives**
  - Determine the associations between the ability to complete first parity including rebreeding for parity two as a measure of longevity and: 1) compositional traits (backfat, loin muscle area, age, and weight), 2) subjectively evaluated structural soundness, 3) health indicator measures, and 4) sow productivity.
  - Additional objectives are to determine heritability and genetic correlations between various longevity measures and compositional , structural soundness, and health traits, with sow longevity.

Current ISU longevity research

- **Tissue samples will be obtained and stored to obtain DNA and determine the association of improved sow longevity with genetic marker status in a future study.**
- **This is a comprehensive project designed to follow females from introduction to a commercial swine unit through culling at the end of their productive life.**
- **This will allow for the determination of factors that are associated with superior sow longevity and develop recommendations for compositional traits, including emphasis on structural soundness, and health to improve sow longevity.**
- **National Pork Board Funded (Tentatively)**
  - Designed to be the first year of funding and an additional 2-3 years of funding is being sought
  - Project will begin when the gilts arrive at the unit (Sept. 2005)

Current ISU longevity research

- **Genetic factors influencing sow removal rates in intensively selected pig populations**
- **Cooperative study between ISU, the Finnish Animal Breeding Association, and MTT Agri-food Research Finland**
- **Working with Finnish Post Doc Dr. Timo Serenius**
- **Objectives**
  - ***Estimate additive and non-additive genetic variation of longevity and prolificacy traits***
  - ***Identify the linear and non-linear relationships between longevity and the other economically important traits (backfat thickness, loin muscle area, daily gain)***
  - ***Compare different methods of longevity analysis of crossbred data, and to determine the best ways for breeding value estimation of longevity and prolificacy of crossbred sows.***
- **Data obtained from Finnish litter recording scheme.**
- **Determine the linear or non-linear relationships between longevity and other economically important traits of pig meat production.**

Current ISU longevity research

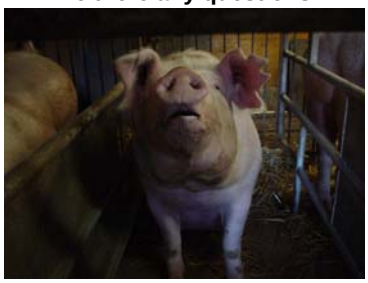
- **Can we select for sow longevity ?**
  - Genetic variation of sow longevity
    - additive and non-additive genetic effects
  - Trait definition
    - Length of productive life, lifetime prolificacy, number of parities produced, stayability, ...
  - Indirect predictors
    - leg conformation, prolificacy

Current ISU longevity research

- **Genetic / phenotypic associations?**
  - Indirect information of sow longevity
    - genetic correlations
  - Non-linear phenotypic relationships
    - CHAID-analysis
    - cubic and quadratic regressions
    - backfat thickness, daily gain, feed intake, ...

Thank You for Your Time and Attention

Are there any questions?



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