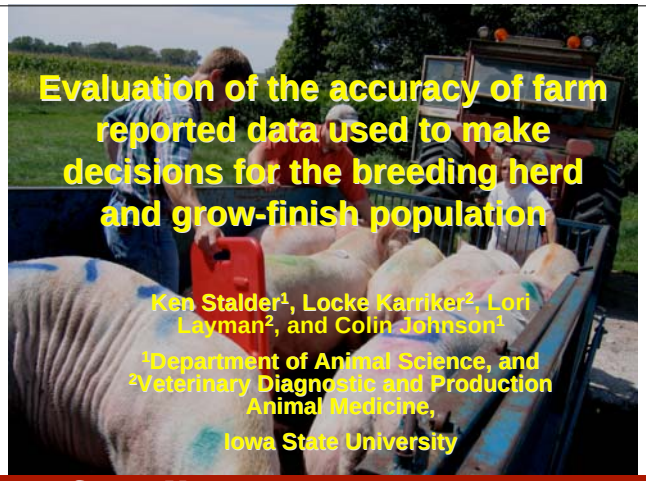

# Evaluation of the accuracy of farm reported data used to make decisions for the breeding herd and grow-finish population

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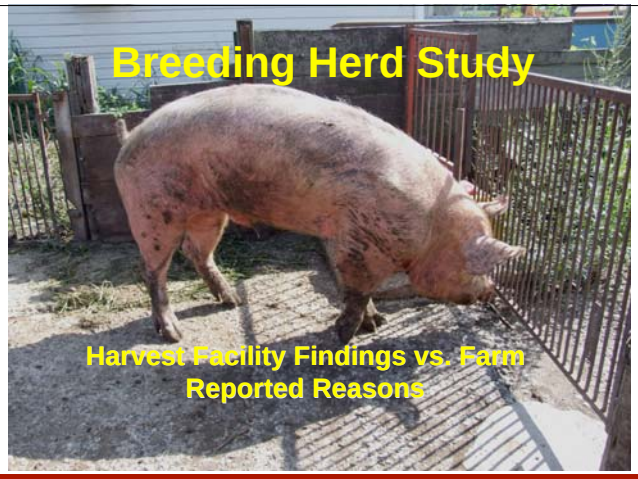
- ***All too frequently, decisions to modify a sow system or a grow-finish population are based on field-collected data and can lead to incorrect management decisions.***
- ***Accuracy of farm data is essential when it is used by producers to make business and management decisions.***
- ***Farm data also allows researchers to quantify the economic importance of culling factors and other key production indicators.***





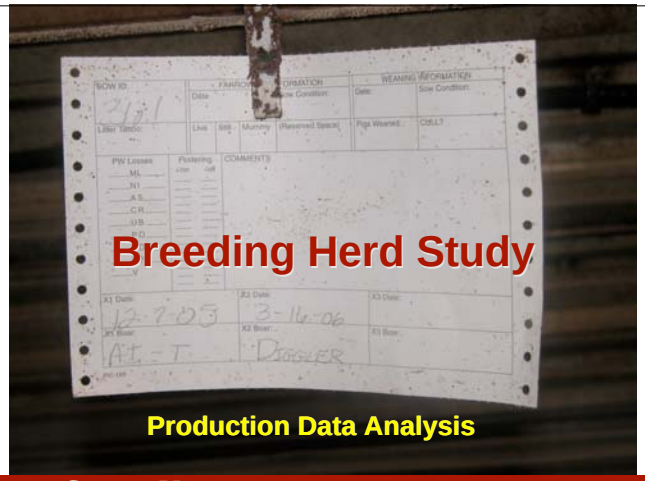
# Breeding Herd Study

Harvest Facility Findings vs. Farm Reported Reasons



## Breeding Herd Study

- **The objective of this study was to determine the accuracy of sow culling classifications.**
  - These classifications are made by lay personnel,
  - Constitute an evaluation of health status, and are
  - Frequently used to make management decisions on farms.
- **Sample Population**
  - A convenience sample of 923 sows from 8 conventional, farrow-to-wean farms from a single large production system.






## Breeding Herd Study

- **Design**
  - A retrospective cohort study comparing production data reported reasons for culling with lesions observed at harvest.
  - Farm records collected included sow identification, genetic line, parity, lifetime pigs born alive, days from weaning until culling, and culling code



## Breeding Herd Study

- **Exclusion criteria, inconsistent with each culling classification reported by the farms, were developed based on the physiology of the sow, production system characteristics and procedures, and research literature.**
  - Each sow classified in each category was assessed for the exclusion criteria.
  - Sows that conformed to the exclusion criteria for their assigned culling classification were judged as inaccurately classified.



## Breeding Herd Study

Culling codes were established by farm management and were limited to the following categories:

- Old age,
- Did not conceive,
- Anestrous,
- Poor body condition,
- Lameness,
- Farrowing productivity,

7. Not found,
8. Caesarean section,
9. Prolapse,
10. Management,
11. Sudden death,
12. Other illness, and
13. Unknown.

## Breeding Herd Study

- **All farms culled breeding females on a weekly basis.**
- **No parity 0 females (female pigs not having farrowed a litter) were included in the study.**



## Breeding Herd Study

- **Harvest data was collected at the plant where normal culling and marketing procedures dictated which animals would be sold.**
- **Body condition, feet, shoulders, teeth, respiratory systems, and reproductive tracts were visually evaluated for lesions and abnormal conditions on harvested sows.**



## Verification of Culling Codes

- **Criteria were constructed to identify sows not matching the culling codes of old age, did not conceive, anestrous, poor body condition, farrowing productivity, and cesarean section.**
- **Old age, farrowing productivity, and cesarean section were determined to be correct culling codes if sows were culled less than or equal to 21 days after weaning.**
  - This number was created by allotting a period for the sow's udder to dry and time to cull the sow assuming a herd may miss a week of culling for various reasons (weather, transportation problems, or low cull numbers on smaller farms).



## Verification of Culling Codes

- **Old age was also determined to be an appropriate culling code if a sow was greater than parity 5.**
  - Sows have been shown to reach a maximum body weight at parity 5.
  - ***Sows culled at or before their mature size is reached are arguably not old*.**

## Verification of Culling Codes

- **Did not conceive was found to be an accurate reason for culling if sows were culled greater than or equal to 45 days after weaning.**
  - This number was created by adding 3 days for an early return to estrus after weaning and two normal, average 21 day estrus cycles.
  - Hence, sows would be given two consecutive estrus cycles to conceive before they would be culled.
  - This was consistent with reported farm procedures.



## Verification of Culling Codes

- **Anestrous was established to be an acceptable culling code if sows were culled greater than or equal to 8 days after weaning.**
  - This number was formed as 8 days has been suggested to be on the upper range of a normal weaning to estrus interval and anestrous could not be definitively determined prior to this time with available farm resources.
- **Body condition was determined to be a proper culling reason if sows had a body condition score less than 3.**



## Verification of Culling Codes

- **Farrowing productivity was also determined to be an appropriate culling code if sows were culled at parity 2 or greater.**
  - Farrowing productivity included poor number born alive, number weaned, or milking ability.
  - ***First parity sows should not be culled for poor litter performance as number born alive, number weaned, piglet mortality, and first parity 21 day litter weight are lowly heritable.***
    - Variation in litter performance is largely influenced by environmental factors.



## Breeding Herd Study

***'The presence or absence of lameness could not be determined as lameness was not recorded at the harvest facilities.'***

- **However, the presence or absence of front and rear foot lesions were evaluated and recorded by a trained technician.**
- **The presence of claw and hoof wall cracks (cracked hooves) included side wall lesions, cracks in the white line, and toes.**
- **Feet were examined for the presence or absence of abscesses on any surface of the foot and abnormal toe / dew claw growth.**
- **Missing dew claws were recorded where observed.**

## Breeding Herd Study

- The presence or absence of prolapses was not recorded in the current study, although some were noted when observed.
- The culling code "other illness" may have been related to a disease that was not possible to evaluate at the harvest facility.



## Breeding Herd Study

- Management was reasoned valid as bred gilts may be used to replace bred older sows that are relatively poor performing when breeding targets have been exceeded.
- The culling codes not found, unknown, and sudden death were not acceptable because the sows made it to the harvest facility and therefore they were found, actively chosen for culling for some reason, and did not die on the farm.



## Breeding Herd Study:

**RESULTS**



## Breeding Herd Study Results:

**Of the sows evaluated, 209/923 (23%) were found to have an inaccurate culling code.**

| Cull code | Frequency | % | Frequency of an improper culling code [a] | % |
|---|---|---|---|---|
| Old age | 322 | 35 | 62 | 19 |
| Did not conceive | 172 | 19 | 48 | 28 |
| Anestrous | 123 | 13 | 7 | 6 |
| Body condition | 90 | 10 | 31 | 34 |
| Lameness | 83 | 9 | 0 | 0 |
| Farrowing productivity | 73 | 8 | 23 | 32 |
| Not found | 18 | 2 | 18 | 100 |
| Cesarean section | 15 | 2 | 14 | 93 |
| Prolapse | 11 | 1 | 0 | 0 |
| Other illness | 8 | 1 | 0 | 0 |
| Unknown | 5 | 1 | 5 | 100 |
| Management | 2 | 0 | 0 | 0 |
| Sudden death | 1 | 0 | 1 | 100 |
| Total | 923 | 100 | 209 | 23 |

## *Old age* was improperly recorded in 62/322 (19%) sows

- **Of the 322 sows, 40/322 (12%) were culled greater than 21 days after weaning, 10/322 (3%) were less than or equal to parity 5, and 12/322 (4%) were culled greater than 21 days after weaning and less than or equal to parity 5.**
- **Sows from all parities (1 to 13) were culled for the culling code *old age*.**



## *Old Age*

- **Farms that automatically cull for *old age* at a specific parity force a higher percentage of young parity females into the herd.**
  - This management practice changes herd parity distribution and may make achieving the point at which the average sow pays for herself (approximately 3 parities) increasingly difficult.
  - Additionally, the younger sow herd can result in lower weaning weights, increased mortality, slower growth, and increased treatment costs associated with offspring from gilt litters.
  - In isolation and acclimation facilities with fixed capacities, a larger volume of replacement gilts results in an abbreviated isolation or acclimation period.



## *Did not conceive* was inappropriately recorded in 48/172 (28%) sows.

- **Of the 48 sows culled less than 45 days after weaning, 43/48 (88%) were culled 29 to 44 days after weaning, indicating they may have been provided one opportunity to conceive.**
- **Sows should be given at least two opportunities to conceive following weaning as farrowing interval has been found to be lowly heritable.**
- **Sows that failed to conceive and are rebred at parity one have not been shown to have higher rebreeding rates in parities 2 and 3 compared to those that conceived initially.**



## *Anestrous* was unacceptably recorded in 7/123 (6%) sows

- **Within 30 days of weaning 59/123 (48%) of sows were culled for anestrous.**
- **Delayed wean-to-first mating intervals have been associated with warmer season, lower parity, shorter lactation length, and lower average daily feed intake during lactation.**
- **Sows with long first litter weaning-to-service intervals have been shown to have comparable longevity to sows with short wean-to-service intervals.**
  - Dijkhuizen et al. developed the PorkCHOP replacement model to economically evaluate farmer's sow culling decisions and found allowing anestrous sows 45 days to rebreed after weaning (much longer than the current study) was the best economic decision.

## *Body condition* was not properly recorded in 31/90 (34%) sows. i.e. 31 sows were a body condition score of 3 or greater at slaughter.

- **Of the 90 sows culled for *body condition*, 63/90 (70%) were a body condition score greater than or equal to 2.**
- **Of the 73 sows observed as a *body condition* score 1 at the harvest facility, 27/73 (37%) had a culling code of poor body condition.**
  - *Body condition* score culling code criteria was set as acceptable if body condition score was less than 3.
  - However, assuming the sows are healthy, *body condition* score 1 and 2 sows can be fed to increase body condition score.



## 31 sows were a *body condition* score of 3 or greater at slaughter.

- **Sow with condition score 5**



## *Farrowing productivity* was not appropriately recorded in 23/73 (32%) sows

- **Of the 73 sows, 16/73 (22%) were culled greater than 21 days after weaning, 5/73 (7%) were parity 1 sows, and 2/73 (3%) were culled greater than 21 days after weaning and were parity 1 sows.**
- **In addition to the 23 sows with an improper culling code, 16/73 (22%) averaged more pigs born alive/litter/parity than the study average (10.93).**
- **However, since the *farrowing productivity* code used by several farms represented poor number born alive, number weaned, or milking ability, determining which of the underlying productivity reasons for removal using this culling code was not possible.**



## *Cesarean section* was unacceptably recorded in 14/15 (93%) sows

- **Of these 15 sows, 13/15 (87%) were pregnant at the harvest facility.**
- **Of the sows with a culling code of *cesarean section*, 15/15 (100%) were from a single farm and 14/15 (93%) were culled on a single date.**
- **The culling code *cesarean section* appeared improperly applied as often sows die or are euthanized following the procedure.**
- **The farm using the *cesarean section* code may have experienced a data entry problem or needed a culling code to remove excess sows.**

## *Lameness* was recorded as the culling code for 83 sows

- ***Lameness*** **was not measured at the harvest facility.**
- **Total number of front foot lesions in the *lameness* culling code tended to be higher (P < 0.10) than the other culling codes combined (0.70 vs. 0.58).**
- **However, total number of rear foot lesions was not different (P > 0.05) between the *lameness* culling code and the other culling codes combined (1.19 vs. 1.16).**
- **Unknown relationship between foot lesions and *lameness***



## *Prolapse, other, unknown, mgmt.*

- ***Prolapse, other illness, and management*** **were recorded as the culling codes for 11, 8, and 2 sows, respectively.**
- ***Prolapses*** **were confirmed in 4/11 sows from harvest facility research notes.**



## *Prolapse, other, unknown, mgmt.*

- ***Not found, unknown, and sudden death*** **were recorded as the culling codes for 18, 5, and 1 sows, respectively.**
- **Of the sows with a culling code of *not found*, 17/18 (94%) were from the same farm (different than the prior farm culling for *cesarean section*).**
  - In that farm, there appears to be a problem properly coding cull sows or an organizational problem.
  - Improved record keeping systems for culling could help eliminate organizational issues



## Breeding Herd Study: Data Summary

| Cull code | Frequency | % | Frequency of an improper culling code [b] | % |
|---|---|---|---|---|
| Old age | 322 | 35 | 62 | 19 |
| Did not conceive | 172 | 19 | 48 | 28 |
| Anestrous | 123 | 13 | 7 | 6 |
| Body condition | 90 | 10 | 31 | 34 |
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| Other illness | 8 | 1 | 0 | 0 |
| Unknown | 5 | 1 | 5 | 100 |
| Management | 2 | 0 | 0 | 0 |
| Sudden death | 1 | 0 | 1 | 100 |
| Total | 923 | 100 | 209 | 23 |

## Breeding Herd Study - Conclusions

- **Communicating with farm managers the proper reasons for culling based on science and farm economic conditions is important for farm data accuracy.**
- **Data integrity and transparency of culling reasons is of high importance for accurate farm management and business decisions.**



## Breeding Herd Study - Conclusions

- **Older parity sows should likely not be culled for old age.**
  - These sows should have recorded culling reasons of reproductive failure, poor litter performance, etc. in order to better understand the reasons for culling older parity sows.



## Breeding Herd Study - Conclusions

- **Improper and unnecessary culling increases genetic/gilt development costs and bio-security risks associated with more animal entries**



## Breeding Herd Study - Conclusions

- **Of the sows evaluated, 209/923 (23%) appeared to have an inaccurate reason for why they were culled from the production unit recorded.**
- **Herd investigations and veterinary treatment interventions rely heavily on farm reported assessments of conditions existing in the herd.**
  - Inaccuracies can have a significant impact on proper intervention.

## Breeding Herd Study - Conclusions

- Differences within and between farms, despite common management and standard operating procedures, suggest that developing health interventions in integrated systems will still require assessment of individual farm characteristics and management.
- Significant opportunity to educate and train farm personnel in the correct diagnosis and reporting of clinical conditions of sows exists.



## Breeding Herd Study - Conclusions

- Concern over the accuracy of farm records for culling is raised from the magnitude of errors observed in the present study.






## GF-Study

- Objective: To compare farm reported death reasons to post-mortem examination (necropsy) findings
- ~55,000 Sow Farrow-to-finish modern confinement system located in the Midwest
- Increased death loss in finishing system
- Hypothesized that farm reported death reasons not accurately representing true health status of herd

# GF-Study

- **Study design:**
  - Two veterinary students assigned to perform on farm necropsies of mortalities
  - Students trained on techniques and lesion presentation by Iowa State University Diagnostic Laboratory pathologist for two weeks at outset of trial
  - Students recorded all visible lesions, sex and weight for each pig necropsied – 82 point inspection
  - Post-mortem findings were compared to on-site farm records for same individual pigs



# GF-Study

- **On-site farm records completed by site personnel – varied levels of formal training**
- **On farm reasons were limited to a small number of possibilities**
- **Student diagnoses were unlimited**



# GF-Study:

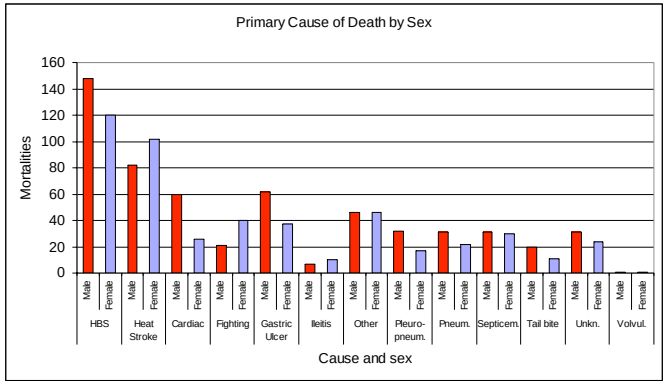
**Results**




# GF Study-Results

- **1062 total animals analyzed**

# GF Study-Necropsy Results






# Examples of Lung lesions & ulcers

**Reference ear tag in both pictures is sow sized tag ~3" W x 3" H*

Multiple lung lesions: edema, consildation, abscesses

Ulcer




**Relationship of lung lesions to hyperkeratosis or ulcers****

Odds Ratio
2.23

Ulcer/Hyperkeratosis

| Lung Lesion | Y | N | |
|---|---|---|---|
| Y | 290 | 310 | 600 |
| N | 46 | 166 | 212 |
| | 336 | 476 | 812 |

Lung edema excluded

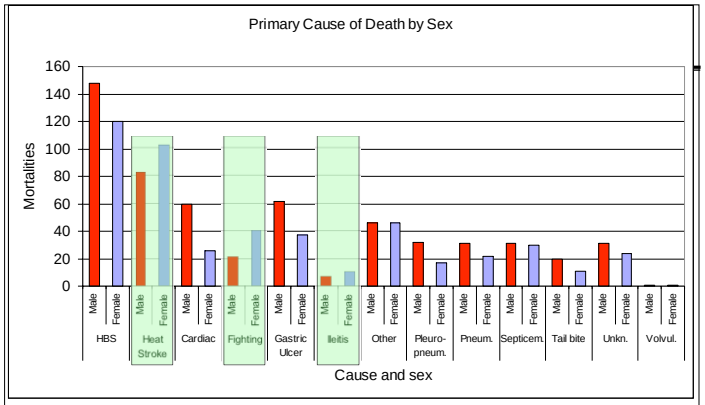
Pigs with any lung lesion were 2.23 times as likely to have an ulcer or hyperkeratosis as pigs that did not have any lung lesions.

**LUNG EDEMA PIGS WERE EXCLUDED REGARDLESS OF ULCER STATUS



# GF Study-Results

- **Interim conclusion:**
  - Presence of lung lesions (pneumonia) increased the chance of the occurrence and presence of gastric ulcers by 2 fold.
    - Pigs go on and off feed
    - Generalized stress




More barrows died than gilts for every cause except: Heat Stroke/Stress, Ileitis, and Fighting



## Example of HBS/Torsion

Displaced cecum, inflamed bowels

Should be on the pigs left side

Mesenteric torsion



## GF Study: HBS findings

Pigs that were diagnosed as HBS deaths died at a higher average weight than other deaths. This was consistent among both barrows and gilts.

| | Barrow | | Gilt | |
|---|---|---|---|---|
| | count | ave wt. | count | ave wt. |
| HBS | 148 | 169.46 | 120 | 165.46 |
| Remaining pigs | 424 | 144.83 | 366 | 148.26 |
| Difference | | 24.63 | | 17.2 |



Pigs that were diagnosed as HBS ... d at a higher average weight tha... is was consistent amon...

MISLEADING!! SEE NEXT SLIDE!

| | | | |
|---|---|---|---|
| | | 120 | 165.46 |
| | 144.83 | 366 | 148.26 |
| | 24.63 | | 17.2 |

## GF-Study: Weight Data by cause

| Primary Cause | Avg Of Weight (lbs) | St Dev Of Weight (lbs) | Count |
|---|---|---|---|
| Heat Stroke/Stress | 194.09 | 59.81 | 187 |
| Ileitis | 191.18 | 61.12 | 17 |
| HBS | 167.60 | 48.27 | 269 |
| Pleuropneumonia | 152.96 | 64.90 | 49 |
| Fighting | 148.77 | 47.26 | 61 |
| Tail Bite | 144.06 | 53.92 | 32 |
| Pneumonia | 143.87 | 60.15 | 53 |
| Gastric Ulcer | 136.75 | 47.47 | 100 |
| Unknown | 129.82 | 47.54 | 55 |
| Other | 124.18 | 52.50 | 92 |
| Septicemia | 116.48 | 50.82 | 61 |
| Volvulous | 110.00 | 14.14 | 2 |
| Cardiac | 99.77 | 45.07 | 86 |



## Agreement of Necropsy and Diagnosis for HBS

69.3%

| Barn = 5 | Necropsy = HBS: Y | Necropsy = HBS: N | |
|---|---|---|---|
| Y | 241 | 281 | 522 |
| N | 20 | 440 | 460 |
| | 261 | 721 | 982 |

53.8% of pigs diagnosed by the barn crew as HBS deaths did NOT have HBS on necropsy.
20 pigs with HBS on necropsy were missed by barn diagnosis.



## Agreement of Necropsy and Diagnosis for HBS

69.3%

| Barn = 5 | Necropsy = HBS: Y | Necropsy = HBS: N | |
|---|---|---|---|
| Y | 241 | 281 | 522 |
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| | 261 | 721 | 982 |

Inflated due to the number of other options which increases this value and improves agreement

53.8% of pigs diagnosed by the barn crew as HBS deaths did NOT have HBS on necropsy.
20 pigs with HBS on necropsy were missed by barn diagnosis.



## Agreement of Necropsy and Barn Diagnosis for Ulcers

88.0%

| Barn = 6 | Necropsy = Ulcer: Y | Necropsy = Ulcer: N | |
|---|---|---|---|
| Y | 23 | 46 | 69 |
| N | 70 | 826 | 896 |
| | 93 | 872 | 965 |

66.7 % of pigs diagnosed by the barn crew as ulcer deaths did NOT have an ulcer on necropsy.
70 pigs with ulcers on necropsy were missed by barn diagnosis.

Agreement of Necropsy and Barn Diagnosis for Respiratory Problems

84.7%

**Necropsy = PN/PPN**

| Barn = 3 | Y | N | |
|---|---|---|---|
| Y | 24 | 81 | 105 |
| N | 67 | 793 | 860 |
| | 91 | 874 | 965 |

77.1% of pigs diagnosed by the barn crew as respiratory deaths did NOT die primarily as a result of pneumonia on necropsy.
67 pigs with pneumonia as primary cause of death on necropsy were missed by barn diagnosis.



If you accept that these equivalencies between the necropsy conclusions and the barn codes are valid…

| Necropsy Dx | Barn Code |
|---|---|
| Cardiac | 3 |
| Gastric Ulcer | 6 |
| HBS | 5 |
| Heat Stroke/Stress | 7 |
| Ileitis | 2 |
| Other | 7 |
| Pleuropneumonia | 3 |
| Pneumonia | 3 |
| Septicemia | 7 |
| Tail bite | 7 |
| Unknown | 7 |

…a maximum of 41.97% of the mortalities were correctly diagnosed.



# GF Study-

- **Conclusions:**
  - Incidence of lung lesions increases the likelihood of ulcers
  - HBS, twisted gut, torsion may be underrepresented as cause of death on farm records
  - However, pneumonia and ulcers as primary cause of death may be OVER represented by barn records
    - Results from a single system
    - Likely that other systems have similar issues



# GF Study- Conclusions

- **How to we improve the situation?**
  - Training of new and existing employees
    - Identification of actual conditions
    - Example –

      Divide up sow culling into Lameness / Structural soundness, Health, Performance, other and unknown.

      Have sub-categories within so at least when examining issues they can be narrowed into categories more easily

      Grow finish health could be addressed the same way

      is it respiratory, gastro-intestinal, locomotion, CNS, or some other issue.

      Training, training, training…
  - Do not place constraints on employees that result in inaccurate data recording

## GF Study- Conclusions

- **How to we improve the situation?**

  Training, training, training…

  - Do not place constraints on employees that result in inaccurate data recording



## Garbage in, Garbage out



## Thank You for Your Time and Attention