University of Manitoba | Faculty of Agricultural and Food Sciences

Research Focused on Success for Group Housing of Sows

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Sow Housing: Risk factors and assessment techniques for lameness, productivity and longevity in group and individually housed sows. (SIP-CSRDC/AAFC,MB Pork, Sask Pork, ON Pork)

Assessment of risk factors affecting the productivity and longevity in gestating group housed sows, and over a variety of management systems, with a special focus on lameness and temperament

Agriculture and Agri-Food Canada
- Nicolas Devillers - Dairy and Swine R&D Centre, Sherbrooke,

Prairie Swine Centre
- Harold Gonyou/Jennifer Brown
- Denise Beaulieu

University of Manitoba
- Laurie Connor –Animal Science
- Gary Johnson - Agribusiness and Agricultural Economics

University of Guelph
- Bob Friendship - Population Medicine, OVC
- Paul Luimes - Animal and Poultry Science, Ridgetown Campus
- Renée Bergeron - Animal and Poultry Science, Alfred Campus

- Relative importance of lameness in sows, in different housing systems - productivity and longevity. (4 systems at 3 sites)
- The role of social factors - productivity and longevity in group housing systems. (3 systems, 2 sites)

Walk-in-lock-in Stalls
Slatted flooring - PSC

Floor-feeding - U. of Guelph
Partially slatted concrete flooring

Outline

- Introduction to Swine Innovation Porc collaborative project
- Highlight some outcomes of Swine Innovation-funded project
- Sow Barn Conversion project

With group housing - Identification of risk factors influencing sow welfare, productivity and longevity ⇑important to assure competitiveness

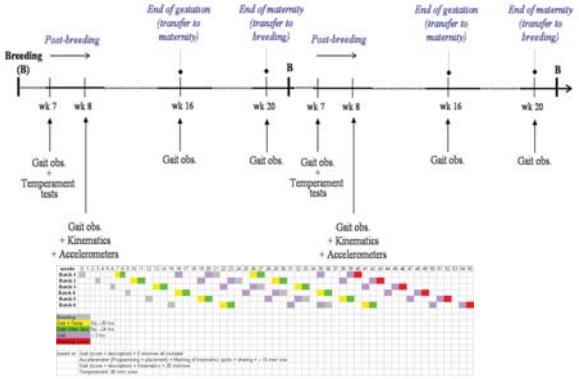
- Research project focus ⇨ conventional and new technologies to evaluate factors that may impact sow welfare and longevity in the sow herd
  - Sow lameness
  - Sow temperament
  - Calcium and phosphorus balance & bone density
  - Early reproductive management
- Use these identified factors to refine and validate a simulation model predictor of sow longevity and profitability

University of Manitoba GRS/NCLE - Gestation Housing

- ❑ **Conventional** ~ partially slatted concrete floor
- ❑ **Alternative** ~ straw over concrete floor

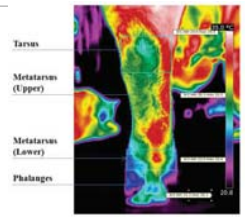
Electronic Sow Feeder (ESF)

To estimate the relationship between different lameness indicators including gait observations, kinematics and accelerometer methods



Comparison of Lameness Assessment Techniques

- Gait score = standard (0 -> 4)
- Detailed gait score (symmetry....)
- Kinematics
- Accelerometers (stepping and posture)
- Infrared thermography (IRT)
- Force-plate scale

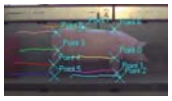


Infrared thermal images of the left hind leg and the right leg of a sow *(Friendship)*

Area of hind leg	Score 0	Score 1	Score 2	*P* value
	N=20	N=20	N=25	
Tarsal	30.44 (2.63)	31.31 (2.17)	31.67 (1.94)	0.3
Upper Metatarsal	30.96 (2.26)**a**	31.77 (1.82)**ab**	32.46 (1.42)**b**	0.06
Low Metatarsal	30.06 (3.18)**a**	31.57 (1.94)**b**	32.10 (1.35)**b**	0.04
Phalanges	29.54 (3.56)**a**	32.04 (1.75)**b**	32.39 (1.88)**b**	0.008

Mean temperatures (°C) (SD) of affected leg at various anatomical areas examined by infrared thermography (IRT)

Gait assessment



Accelerometer positioning

kinematics

Force-plate scale

IRT

Technology development & testing

- Development and validation of two new methods of measuring lameness: a scale with separated force plates to measure distribution of sow's weight on limbs (*AAFC & PSC*), and Infra-Red Technology (*UofG*).

Temperament characteristics ⇨considered to influence how individual responds and copes with environment

Open Door Test (ODT)

3-4 animals tested together

Active	Passive
Fast to exit	Slow to exit

Novel Object Test (NOT)

tested as individuals

Active	Passive
Fast to contact	Slow to contact

Time continuum.....

Temperament characteristics ⇨considered to influence how individual responds and copes with environment

Pig Approaching Human (PAH)

Confident	Less Confident /Fearful
Fast Approach	Slow/no approach

Time to first contact, frequency of contact and time within 1m

Human Approaching Pig (HAP)

Confident	Less Confident /Fearful
High Score	Low Score

Scale: 4 - pig allows approach and interacts ⇢ 1-actively avoiding contact

EFS System comparisons

- No relationship noted btw temperament & incidence of lameness
- Temperament traits related to body lesions/injuries at 16 weeks of gestation were different
  - Partially slatted system → active sows had more injuries than passive
  - Straw bedded system → confident sows had more injuries than less confident/fearful sows
- No housing system effect on total pigs born & born alive

Body injury, temperament and lameness

0	No injury	skin unmarked: no evidence of injury from agonistic behaviour
1	Slight injury	< 5 superficial wounds
2	Obvious injury	5-10 superficial wounds and/or < 3 deep wounds
3	Severe injury	> 10 superficial wounds and/or > 3 deep wounds

	Straw-bedded	Part-slatted	Pooled mean	*P*
Body injury score (wk8)	1.48	1.34	0.05	<0.0001
Body injury score (wk16)	1.45	1.24	0.05	<0.0001

- *Severity of BIS at week 16*
  - *related to active/passive traits in partially slatted system; more active, higher BIS*
  - *related to confident/fearful traits in straw bedded; more confident, higher BIS*
- *No relationship btw temperament and incidence of lameness*

Temperament tests : Sow breed, age and housing type can influence responses in temperament tests

Sows in Free-access stalls (PSC)

- Younger sows
  - ⇓time within 1m of human (PAH)(c/f)
  - Touched novel objects sooner and more frequently (NOT)(a/p)
- No effect of pen configuration

ESF (UoM)

- Lower parity sows
  - ⇑time within 1m of human (PAH)(c/f)
  - Touched novel objects sooner(NOT)(a/p)
- Flooring system effect
  - Sows on partially slatted flooring –easier to approach (HAP), slower to exit test pen & to contact novel object (NOT)
  - 2nd gestation – sows on partially slatted – slower to contact human (PAH)
- In both Free-Access and ESF confident/fearful traits accounted for the most behavioural variation.

The incidence of lame and non-lame sows in straw-bedded and concrete part-slatted ESF housing systems over one gestation.

Straw-bedded ESF	Not lame	Lame	Total
Frequency	99	41	140
Percent (%)	35.7	14.8	50.5
Part-slatted ESF	**Not lame**	**Lame**	**Total**
Frequency	78	59	137
Percent (%)	28.2	21.3	49.5
Total (frequency)	177	100	277
Total (%)	63.9	36.1	100

- *Positive correlation between severity of body injury score and lameness on partially slatted floor*

Overall for SIP collaborative project

- *Outcome goal - development of reliable tools for early identification of lameness and temperament traits in order to improve animal selection for particular housing conditions, provide valuable data for validation of a sow investment longevity model and thereby contribute to economic viability of the pork sector*

Successful Conversion to Sow Group Housing Project

(Manitoba Pork, MRAC)

- *Animal Science – Laurie Connor, Jane Goodridge*
- *Biosystems Engineering – Qiang Zhang, David Wildeman*
- *Agribusiness/Ag Economics – Gary Johnson*
- *MPC Animal Care Specialist – Mark Fynn*



Part of Four Phase Project Concept

1. **Phase 1 →Options & Considerations**: *information tools for selecting the best option- Comprehensive Literature Review, Considerations, Consultations* and Economic Analysis.*

2. **Phase 2 → Engineering Design Scenarios** including:
   I. *Workbook (electronic) – computer program model*
   II. *Templates (plans).*
   III. *Design Example.*
   IV. *Workshop series.*

P2 - DEVELOPMENT SOW HOUSING CONVERSION DESIGN UTILITY

- An interactive computer program, Sow Housing Conversion Design Utility (SHCDU)
- The program has three key elements:
  1) collecting the information of the facility to be converted, including management parameters and existing floor layout;
  2) design of converted floor layout, incorporating guiding principles from Phase 1
  3) generate data for estimation of construction cost for conversion.

2 fundamental needs this project addressing

1) tools to determine the group housing system(s) that will work best for any given management system

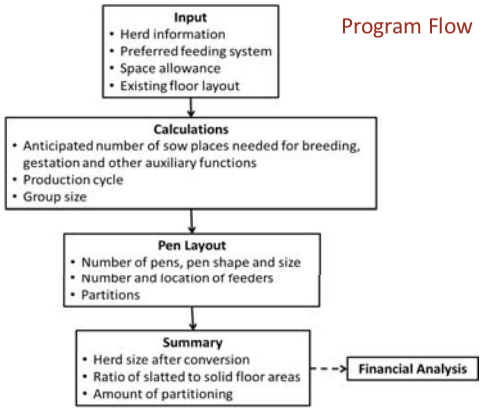
2) viable methods of converting existing sow barns to group housing

Information /Decision-making Tools

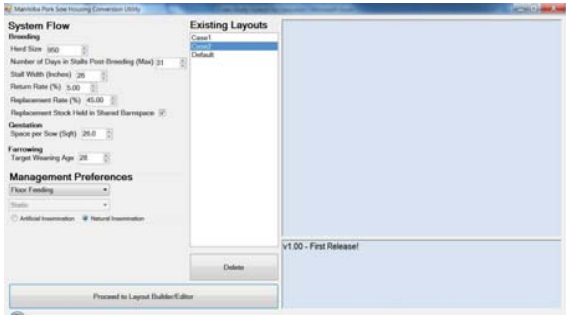
P-1 review of important considerations, key concepts, various options, with pros and cons
- *Focus/advisory groups help ID 4 most feasible conversion options*

P-2 interactive computer program/workbook for producers & advisors:
- A step-by-step guide to plan the conversion
- Guiding principles
  - barn flow
  - space
  - flooring
  - grouping
  - feeding
  - critical dimensions
- Cost & Financial analyses

Program Flow



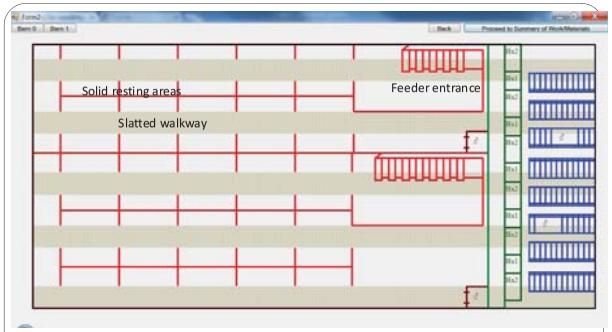
Screenshot of input of barn information and management preferences



Deliverables

- Phases 1 and 2 are developing information/decision-making tools.

THANK YOU !
Questions/Comments??



Screenshot of floor layout generated by the program for dynamic ESF groups

Future phases developing from 1 & 2

3. **Phase 3** → actual on-farm conversion of existing conventional G - barn(s) -> ***NSHCP/NSHWG***

4. **Phase 4** → addressing scientific and technological knowledge gaps identified in earlier phases.
   - Flooring → slat/gap width; rubber mat
   - Sow-group management → time of mixing; enrichment