

Improvement of sow productivity in French maternal lines

Laurence MAIGNEL
Geneticist, CCSI



Canadian Centre for Swine Improvement Inc

Improvement of Sow Productivity in French maternal lines

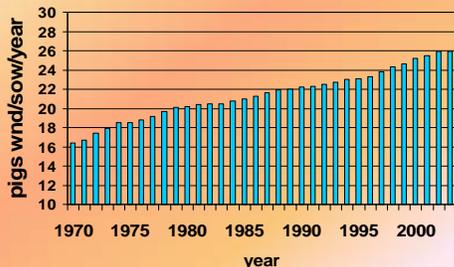
Outline

- Sow productivity in France : trends and current status
- The keys to success in France
 - Hyperprolific programs
 - BLUP genetic evaluation
 - Use of chinese genes
 - Elimination of hypoprolific boars
- What to expect in the future
 - Evolution of the proportion of French genes in the Canadian Swine Improvement Program
 - New opportunities of selection



Canadian Centre for Swine Improvement Inc

Sow productivity in French commercial herds

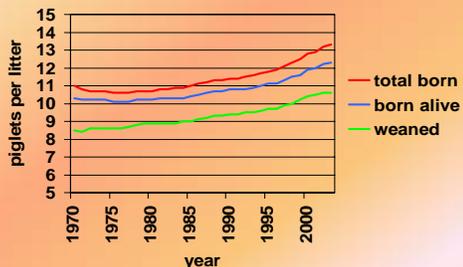


Source : ITP - GTTT (Gestion Technique des Troupeaux de Truies)



Canadian Centre for Swine Improvement Inc

Sow productivity in French commercial herds



Source : ITP - GTTT (Gestion Technique des Troupeaux de Truies)



Canadian Centre for Swine Improvement Inc

Two distinct periods in sow productivity improvement :

- 1970 - 1990 : reduction of reproduction intervals (weaning to oestrus, age at first insemination..)

- since 1990 : improvement of litter size

Main consequences :

- more piglets weaned
- but also a higher piglet mortality
 - more stillborn due to longer farrowings
 - lower birth weight
 - more heterogeneous birth weights



Canadian Centre for Swine Improvement Inc

Sow Productivity in France

Current status (year 2003)

Piglets weaned/sow/year	25.9
Piglets born alive per litter	12.3
Stillborn per litter	1.0
Weaned / litter	10.6
Between litters interval	149.3 days
Piglets age at weaning	25.4 days
Conception rate (first insemination)	90%
Sow age at first farrowing	373 days
Litters weaned per culled sow	4.9

(source : ITP - GTTT)

Data collected on 1,115,988 litters in 3,301 herds



Canadian Centre for Swine Improvement Inc

The keys to success in France

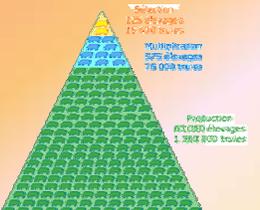
1. **Hyperprolific programs**
2. BLUP genetic evaluation
3. Use of Chinese lines
4. Elimination of hypoprolific boars



Canadian Centre for Swine Improvement Inc

Hyperprolific programs

- Research program started in 1973
- Initiative of the French National Institute for Agricultural Research (INRA)
- Detection of the best 5% purebred Large White sows in the French selection and multiplication stages




Canadian Centre for Swine Improvement Inc

Hyperprolific programs

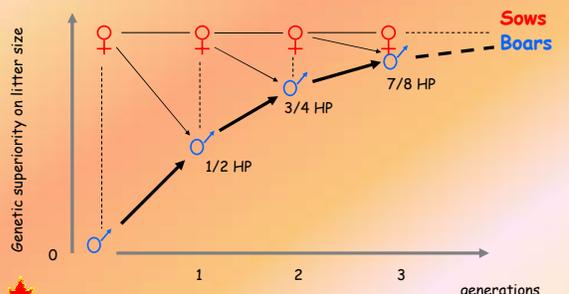
- Successive matings to produce hyperprolific lines
- Extension to the French Landrace breed
- Use of hyperprolific boars
- Wider use due to simultaneous development of AI



Canadian Centre for Swine Improvement Inc

Hyperprolific programs

Principle of the creation of hyperprolific lines (HP)




Canadian Centre for Swine Improvement Inc

The keys to success in France

1. Hyperprolific programs
2. **BLUP genetic evaluation**
3. Use of Chinese lines
4. Elimination of hypoprolific boars



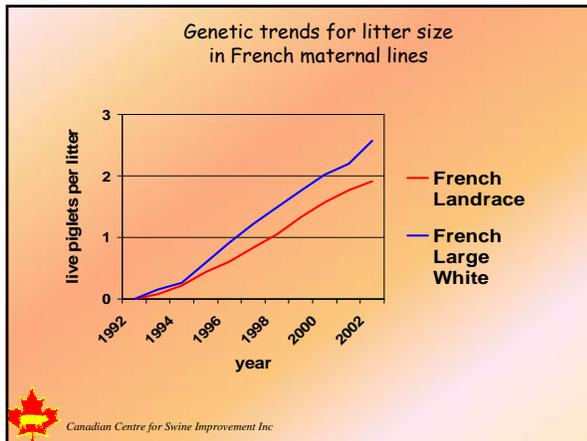
Canadian Centre for Swine Improvement Inc

BLUP genetic evaluation

- BLUP = Best Linear Unbiased Prediction
- Used in France since 1995 for litter size evaluation
- Provides EBVs for all animals, including boars, which don't have any record
- Despite the quite low heritability of litter size (10%), effective selection due to BLUP evaluation



Canadian Centre for Swine Improvement Inc



- ### The keys to success in France
1. Hyperprolific programs
 2. BLUP genetic evaluation
 3. Use of Chinese lines
 4. Detection of hypoprolific boars
- Canadian Centre for Swine Improvement Inc

Use of Chinese lines

- Research project of the National Institute for Agricultural Research in the 1980s.
- Breeds involved : Meishan, Jiaxing

- Creation of composite maternal lines : from 12 to 50% of Chinese genes (Naima, Youna, Adeshan...) in different breeding companies

Taizumu line
(50% Meishan/50% Yorkshire)

Canadian Centre for Swine Improvement Inc

Use of Chinese lines

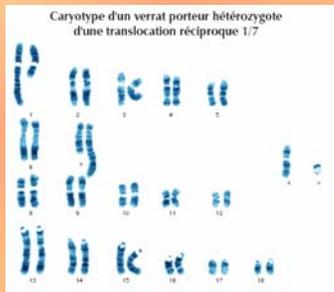
- Main advantages :
 - ↗ litter size
 - ↗ number of teats (18 is common)
 - ↗ maternal abilities
 - ↗ behaviour towards piglets and breeder
 - ↗ hardiness
 - ↗ meat quality
- Some drawbacks :
 - ↗ poor carcass composition
 - ↗ quite low growth rate and feed conversion
 - ↗ heterogeneity in crossbred products

Canadian Centre for Swine Improvement Inc

- ### The keys to success in France
1. Hyperprolific programs
 2. BLUP genetic evaluation
 3. Use of Chinese lines
 4. Elimination of HYPOprolific boars
- Canadian Centre for Swine Improvement Inc

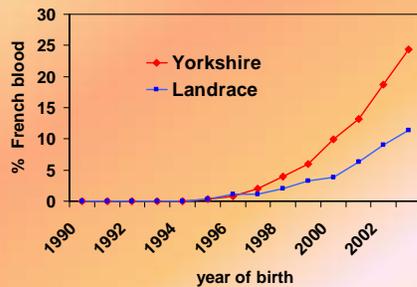
- ### Elimination of hypoprolific boars
- Some boars carry **chromosomal abnormalities** causing non-viable embryos in the litters of the sows they are mated to.
 - Several abnormalities were identified and proven to be related to lower litter size.
 - **Karyotypes** of all AI boars are now routinely performed by the lab of INRA/veterinary faculty of Toulouse in France.
- Canadian Centre for Swine Improvement Inc

Elimination of hypoprolific boars
Example of a pig karyotype



What to expect in the future ??

Evolution of the average % of French blood in pigs tested in the Canadian Swine Improvement Program



Perspectives

- French lines have been widely used in Canada, and imports remain high.
- Some links exist between the French and Canadian swine improvement program, in order to make the best use of French genes.
- The use of French lines in the Canadian Swine Improvement Program brings large advantages on several sow productivity traits
- However, **breeding objectives are different** in both countries

Perspectives

- New selection goals were recently added in the French swine improvement program :
 - ☛ number of functional teats
 - ☛ sow appetite
 - ☛ maternal abilities
- Several research programs are on-going, about the consequences of hyperprolificacy on :
 - ☛ sow longevity
 - ☛ production traits
 - ☛ cost effectiveness
 - ☛ welfare

New opportunities of selection

- Selection programs on sow productivity :
 - very successful in France and in Canada
 - required adaptations at the selection, multiplication and commercial levels, in order to manage extra piglets
- More work to be achieved, especially on **maternal abilities** of sows, in order to reduce piglet mortality



New opportunities of selection

• In the Canadian Swine Improvement Program, new traits will be selected soon :

- ↪ perinatal piglet survival
- ↪ number of functional teats



Canadian Centre for Swine Improvement Inc