

## International Developments in Swine Genetics

Laurence MAIGNEL, CCSI



### Outline

- News from the last International Workshop on data management and evaluation in Pigs (Slovenia, April 2004)
- Recent developments for major pig producers around the world
- Genetics trends and relationship with performances for commercial producers
- Developments in molecular genetics (Yuefu Liu)

### International Workshop on data management and evaluation in Pigs (Slovenia, April 2004)

- 15-20 countries (mainly European) usually participating
- presentations on various issues such as :
  - data management,
  - information flow between herds and central databases,
  - genetic evaluation models and methods,
  - breeding objectives,
  - selection efficiency

Usual participants to the workshop :

- Most EU countries (25)
- + Australia
- + Canada
- + South Africa
- + Switzerland



### International Workshop on data management and evaluation in Pigs

- Survey sent to 21 participating countries or regions
- Questions on different aspects of breeding schemes :
  - Breeds used
  - Breeding programs and performance testing
  - Traits measured and evaluated
  - Models used
  - Frequency of genetic evaluations
  - Presentation of EBVs
  - Computation of accuracies

### International Workshop on data management and evaluation in Pigs

#### Breeds



- **Landrace, Large White** and **Yorkshire** breeds are the breeds most frequently used as maternal lines, but there is a tendency to use new combinations (Chinese breeds)
- **Piétrain, Hampshire, Duroc** are the most common sire lines.
- Some countries have distinct maternal and paternal lines for Large White (France, Switzerland).
- Population sizes are very variable : from 1,300 to 14,000 sows in maternal lines, and 12 to 2,000 in sire lines.
- Commercial hogs are usually the result of a **3-way cross** between a terminal purebred sire and an F1-dam. Four countries also use **4-way crosses** in addition to 3-way crosses.

## International Workshop on data management and evaluation in Pigs

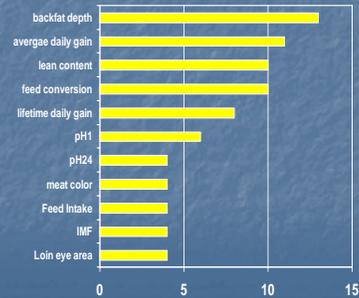
### Breeding programs

- Most participants use both field and station testing for recording production traits
- Only 2 programs rely only on field testing (Estonia and Australia)
- Growing number of countries using data from slaughterhouses

## International Workshop on data management and evaluation in Pigs

### Traits

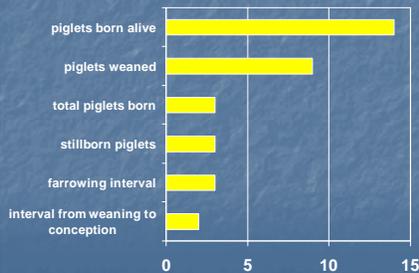
#### Production traits most frequently evaluated



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### Traits

#### Reproduction traits most frequently evaluated

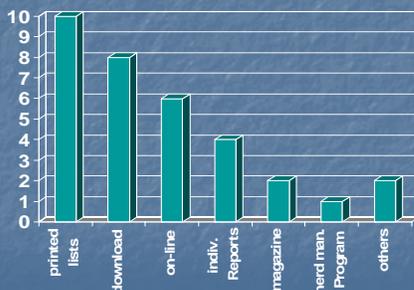


## International Workshop on data management and evaluation in Pigs

### Publication of EBVs

- About 50% of participants express indices using a base of 100 and a standard deviation of 20, and 50% express EBVs in monetary units
- Only 5 countries out of 13 are publishing accuracies
- 10 countries out of 13 have a weekly evaluation.
- In Switzerland genetic evaluation for production traits is performed every night
- In Australia a evaluation is run automatically whenever a breeder submit new data (but only possible because the number of participants is very low : 16 breeders)

### Media used for publication of breeding values



## International Workshop on data management and evaluation in Pigs

### Summary

- Great variety of current genetic evaluation systems in pigs, because of differences in **breeding programs**, **performance testing** and general **structure** of pig breeding and pig industry in different countries
- Most countries use Relational Database Management System (RDBMS), and some are using APIIS (Adaptable Platform Independent Information System), developed by Groenvelde since 1999.
- There is a proposal for a large European project based on a centralized data management (EURO-PIIS)
- East/Central European countries have been developing new systems very quickly

## International Workshop on data management and evaluation in Pigs

### Summary

- The majority of systems sticks with very classical traits of production and reproduction
- There are few examples where new traits have been included in genetic evaluations :
  - conformation in Switzerland, Denmark and Sweden
  - osteochondrosis in Sweden,
  - piglet survival in The Netherlands,
  - number of teats in France.

World Congress on Genetics Applied to Livestock Production  
(France, 2002)

European Association for Animal Production  
(Italy, 2003)

International Workshop on data management and evaluation in Pigs  
(Slovenia, 2004)

A lot of on-going applied research, on opportunities to select on :

- Meat quality : in-vivo measurements, eating quality
- Piglet survival : studied as a sow trait (Scandinavia, France, Germany) or as a piglet trait (The Netherlands)
- Sow longevity, usually through conformation
- Disease Resistance
- Very few examples of practical use so far...

### Other area of interest : what is the efficiency of selection ??

- "Retrospective" experiments using frozen semen to estimate genetic gains in the last years or decades, using a method independent from the evaluation system
- Analysis of the consequences of genetic improvement at the commercial level
- Most of these studies are confidential !!

### Selection efficiency - examples

Denmark	France	Canada	USA
<i>Breeding populations (national programme)</i>			
3,350 Landrace 2,550 Yorkshire 2,050 Duroc 350 Hampshire (8,300 sows)	5,400 Yorkshire 3,200 Landrace 900 Pietrain (9,500 sows)	4,600 Yorkshire 3,000 Landrace 1,800 Duroc (9,400 sows)	5,700 Yorkshire 2,000 Landrace 4,600 Duroc 2,400 Hampshire (14,700 sows)
<i>Hogs produced / year</i>			
23,000,000	26,000,000	28,000,000	98,000,000

### Genetic trends for days to 100kg



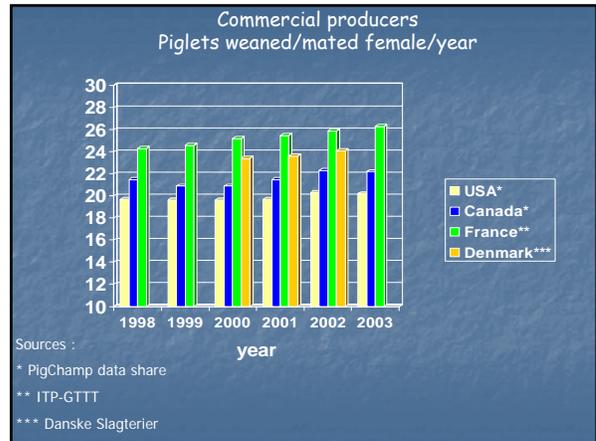
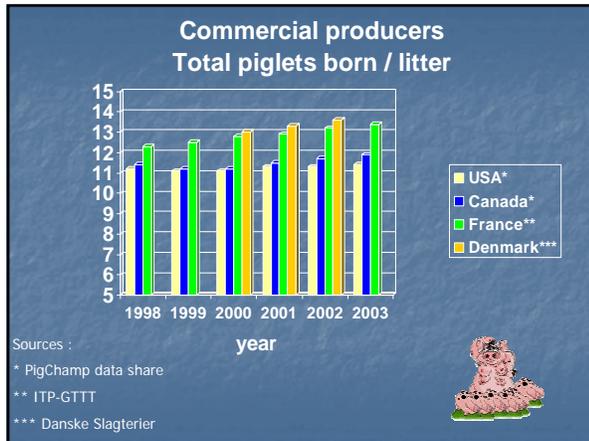
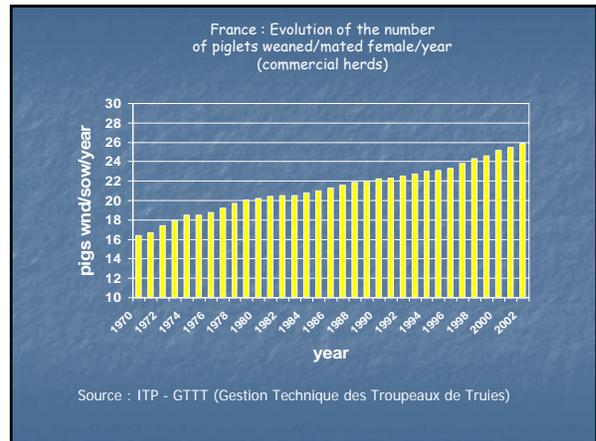
	Denmark	France	Canada	USA
	Duroc	Pietrain	Duroc	Duroc
1999-2000		-0.7	-1.5	
2000-2001		-0.5	-1.7	
2001-2002		-0.7	-1.1	
2002-2003		-0.8	-2.0	
<i>Aver./year</i>	<b>-1.6</b>	<b>-0.7</b>	<b>-1.6</b>	<b>-1.4</b>
	Yorkshire	Yorkshire	Yorkshire	Yorkshire
1999-2000		-0.6	-1.5	
2000-2001		-0.8	-1.5	
2001-2002		-0.8	-1.5	
2002-2003		-0.9	-1.5	
<i>Aver./year</i>	<b>-0.9</b>	<b>-0.8</b>	<b>-1.5</b>	<b>-0.5</b>

### Genetic trends for lean %

	Denmark	France	Canada	USA
	Duroc	Pietrain	Duroc	
1999-2000	+0.26	+0.33	+0.11	
2000-2001	+0.09	+0.22	+0.18	
2001-2002	+0.09	+0.30	+0.22	
2002-2003	+0.12	+0.24	+0.29	
<i>Aver./year</i>	<b>+0.14</b>	<b>+0.27</b>	<b>+0.20</b>	
	Yorkshire	Yorkshire	Yorkshire	
1999-2000	+0.01	+0.33	+0.04	
2000-2001	+0.10	+0.42	+0.09	
2001-2002	+0.07	+0.28	+0.06	
2002-2003	+0.02	+0.09	+0.07	
<i>Aver./year</i>	<b>+0.05</b>	<b>+0.28</b>	<b>+0.07</b>	

### Genetic trends for litter size

	Denmark (TB)	France(BA)	Canada(TB)	USA(BA)
<u>Landrace</u>				
1999-2000	+0.44	+0.25	+0.22	
2000-2001	+0.29	+0.24	+0.24	
2001-2002	+0.41	+0.26	+0.17	
2002-2003	+0.40		+0.32	
<i>Aver./year</i>	<i>+0.39</i>	<i>+0.25</i>	<i>+0.24</i>	<i>+0.17</i>
<u>Yorkshire</u>				
1999-2000	+0.32	+0.28	+0.15	
2000-2001	+0.33	+0.14	+0.25	
2001-2002	+0.27	+0.32	+0.26	
2002-2003	+0.13		+0.38	
<i>Aver./year</i>	<i>+0.26</i>	<i>+0.25</i>	<i>+0.26</i>	<i>+0.12</i>



*"The Canadians continue to out perform their US counterparts on breeding herd productivity. During the last 4 quarters, the pig crop per litter has averaged 9.44 in Canada (8.85 in US), farrowings per breeding animal have averaged 2.13 (1.92 I US) and the Canadian pig crop per breeding animal has averaged 20.11 (17.04 in US)"*

Source : Ron Plain's Swine Economics Report (University of Missouri) read in ASRP e-newsletter on May 5<sup>th</sup>, 2004

- Canada is among leaders in swine genetics, but not number 1 for everything !
  - It is important to be aware about what's going on in other countries, however less and less information is public
  - Most of the new developments regard data management, new traits and selection efficiency, but also molecular genetics
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