Breeding for Meat Sheep in France

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Workshop: Identification, Meat & Reproduction Recording in Sheep & Goat in ICAR Member Countries
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Meat sheep in France

Size of population
(Source: FGE 2017)

Sheep

- Dairy production: 3,779,000 (73%)
- Meat production: 1,380,000 (24%)

Meat sheep

- Specialized meat breeds: 66%
- Hardy meat breeds: 10%
- Meat cross-breeds: 24%
Meat sheep breeds in France

47 breeds with at least 1 flock in performance recording

8 Specialized Meat Breeds

13 Hardy Breeds

26 Underutilized Breeds
Organization of selection in French meat sheep (typical selection scheme)

**Nucleus flocks**
Sires’ rams x sires’ ewes
~ 1,000 ♂ from assortative matings

On-farm recording/evaluation: prolificacy, mothering ability, growth
=> Connection and/or maternal progeny-testing

350 young rams

**Central Test Station:**
individual evaluation for growth & meat quality

15 young rams

**Progeny-testing for meat quality**

5 elite rams
On-farm performance recording: maternal abilities

The national farm recording system

- 330,312 ewes with on-farm recording (8.6% of meat sheep) in 1,267 flocks
  
  85% of the recorded flocks engaged in a breed society

- 149,599 ewes inseminated (3.9% of meat sheep) by meat rams
On-farm performance recording: maternal abilities

3 levels of performance recording

- **Prolificacy**
  - Weighing around 30 days of age
  - Viability of lambs

- **Reproduction**
  - ADG 30-70 days
  - Weighing around 70 days of age
  - Procedure (20%)

- **Maternal abilities**
  - Procedure (70%)

Complete procedure (10%)
On-farm performance recording: maternal abilities

Genetic evaluation & selection criteria
(Source: Loywyck & Tortereau, collection results Idele 2016)

Reproduction procedure (prolificacy PROL)

\[ \text{PROL} = a \text{PROL}_{\text{nat oestrus}} + b \text{PROL}_{\text{induced oestrus}} \]

Maternal ability procedure (PROL + ewe ability EWAB)

\[ \text{EWAB} = a \left( \frac{1}{2} \text{WEIGHT}_{\text{dir}} + \text{WEIGHT}_{\text{mat}} \right) + b \text{VIAB}_{\text{mat}} \]

Weight at 30d WEIGHT
Viability lambs VIAB

Complete procedure (PROL + EWAB + growth 30-70d GROW)

\[ \text{GROW} = \frac{1}{2} \text{ADG}_{30-70} + \frac{1}{2} \text{WEIGHT}_{70} \]

ADG\text{30-70}
WEIGHT\text{70}
Performance recording in Central Test Station: meat qualities

35 breeds with gathering station
- 13 with whole protocol in central test station
- 22 with only breeding center

- A major tool for collective management of the breed
- Scrapie-resistant rams born from dams of sires and sires of sires
- Individual selection on growth, feed efficiency, fat, muscle
- 3,500 young rams each year

20% eliminated
Recommended for natural mating
++

Commercial flocks
Selection flocks
Selected for AI
Performance recording in Central Test Station: meat qualities

Traits collected and evaluated (Source: Tiphine et al., EAAP 2011)

Best matings

70 d
85 d
141 d

Adaptation
Test period
Transition

Measurements

Weighing
Growth rate
Weight at typical age

Ultrasound
Fat at typical age
(fat depth & rib-eye area)

Scoring
Muscle at typical age
(shoulders, back-loins, legs)

TMI = a Growth + b Weight + c Fat + d Muscle
Progeny testing for meat qualities

**Dual objective**: lambs’ meat quality + decrease of production costs (reduce selling age)

Carcass quality:
- More muscle
- Less fat

Increase of feed efficiency through growth & fat

**Aim**: produce the sires of sires of the breed
Progeny testing for meat qualities

**Traits collected and evaluated** *(Source: Tiphine et al., EAAP 2011)*

- Best 10-15 rams from Central Test Station
- 35-50 AI per sire
- 30 progeny per sire
- Lambs gathered at weaning for fattening
- [Around 110 days]
  - Slaughtering at fixed weight (females 33kg males 39kg)

**Fattening station**

- Measurements and scores
  - ~ 30 days (lambs born from dairy ewes)
  - ~ 70 days (lambs born from meat ewes)

**Slaughterhouse**

- Carcass weight
- Conformation score
- Fat score (external)
- Fat score (internal)
- Amount of loins fat
- Back fat depth
- Shoulder width
- Rump width
- Carcass length
- Rib eye area or muscle depth

**Weekly weighing**
Progeny testing for meat qualities

Spider chart representation of EBVs
(Source: Cheype et al., collection results Idele 2016)

\[
\text{TMI} = a \ \text{ADG}_{\text{0-slaughter}} + b \ \text{FAT} + c
\]

\[
\text{CONFORMATION} = f(\text{fat score[external]}, \text{fat score[internal]}, \text{amount of loins fat}, \text{back fat depth})
\]

\[
\text{CONFORMATION} = f(\text{shoulder width}, \text{rump width}, \text{carcass length}, \text{conformation score}, \text{rib eye area}, \text{muscle depth})
\]
Progeny testing for meat qualities

Fattening stations and breeds (Source: Cheype, 2017)

130 rams progeny-tested

11 Vendéens
16 Charollais

20 Ile-de-France
10 Berrichon du Cher
10 Suffolk
11 Rouge de l’Ouest
18 Blanche du Massif Central

22 Meat Lacaune “Ovitest”

12 Meat Lacaune “GID”
Novel traits investigated

✓ Semen production
  - EBVs released once a yr (volume, concentration, motility, number spz)

✓ Resistance to internal parasites
  - Experimental infestation on central station

✓ Maternal behavior
  - In progress in experimental farm

✓ Lamb survival / lamb vigor
  - R&D project => common way of registration

✓ Functional longevity
  - R&D project in-progress
## Major genes genotyped, collected and managed

<table>
<thead>
<tr>
<th>Major gene</th>
<th>Trait</th>
<th># genotyped animals</th>
<th># genotyped animals in 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>PrP</td>
<td>Resistance to scrapie</td>
<td>&gt; 1,004,000 since 1999</td>
<td>30,990</td>
</tr>
<tr>
<td>FecX&lt;sup&gt;L&lt;/sup&gt;</td>
<td>Prolificacy</td>
<td>1,235</td>
<td>17</td>
</tr>
<tr>
<td>FecL&lt;sup&gt;L&lt;/sup&gt;</td>
<td></td>
<td>21,230</td>
<td>3,900</td>
</tr>
<tr>
<td>FecB&lt;sup&gt;B&lt;/sup&gt;</td>
<td></td>
<td>1,161</td>
<td>286</td>
</tr>
<tr>
<td>GDF-8 (double-muscled Lacaune)</td>
<td>Muscularity</td>
<td>3,086</td>
<td>389</td>
</tr>
</tbody>
</table>
Organizational issues

✓ French selection of meat sheep based on a large number of organizations:
  - 18 breed societies (some of them ruling several breeds)
  - 63 performance recording organizations
  - 9 AI centers
  - Genetic evaluation run by INRA so far
  - Diffusion of EBVs run by IDELE
  - Collective breeding programs => actual efficiency of selection

✓ The EU Animal Breeding Regulations (2016/1012) deeply changes the organization: breed societies will manage all aspects of selection, including performance recording and genetic evaluation (NEW in France)

✓ This new rule is the main challenge of the upcoming years, regarding the sustainability of collective breeding programs, their efficiency and their economic model.
Conclusion

✓ Importance of performance recording (330,000 ewes)

✓ Difficulty to maintain AI

✓ Collective breeding programs with management of rams in central test stations and AI centers

✓ Efficient tools to respond to urgent matters such as resistance to scrapie issue

✓ A lot of breeds => biodiversity +

✓ ICAR Certificate of Quality obtained for meat sheep in France in 2017
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