Modelling fattening pig production systems: use of a dynamic, stochastic, mechanistic model

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Introduction:

- European pig production faces economic and environmental challenges
- Fattening unit \(\rightarrow\) major part of the total emissions and pig production costs

Evolution of French pork price
Introduction:

- Objective: To develop a pig fattening unit model
- To simulate individual performance of pigs (variability) in interaction with the farmer’s practices
- To evaluate their effects on the technico-economic and environmental performance
Model characteristics:

- **Mechanistic**

- **Stochastic:** animal characteristics → individual-based model (Brossard et al., 2014)

- **Dynamic:** daily time-step
Model description:

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Model application:

- Typical pig fattening unit:
  - Batch interval (21 days)
  - Feeding strategy (ad libitum up to 2.5kg/day + Two-phase)
  - ~6400 pigs produced per year
Variability among pigs intra-batch

- Example of mean growth curve of pigs from a same batch and 95% population interval

DEP: pigs delivery to slaughterhouse
### Variability among pigs performance

<table>
<thead>
<tr>
<th>Parameter (unit)</th>
<th>mean (±sd) between pigs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slaughter weight (kg)</td>
<td>119.8 (± 3.7)</td>
</tr>
<tr>
<td>Pigs in range of slaughter weight (%)</td>
<td>99%</td>
</tr>
<tr>
<td>Slaughter age (day)</td>
<td>176 (±11)</td>
</tr>
</tbody>
</table>

#### Live weight of pig at slaughter

**Lighter pigs (<105kg)**
Variability among pigs climate change impact

- Impact per kg of weight gain
Variability between- and within-batch

<table>
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<tr>
<th>Parameter (unit)</th>
<th>Average and variability mean (±sd)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Between pigs (within batch)</td>
</tr>
<tr>
<td>Average daily gain (kg)</td>
<td>0.86 (±0.1)</td>
</tr>
<tr>
<td>Feed conversion ratio (kg/kg)</td>
<td>2.72 (±0.30)</td>
</tr>
<tr>
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<td>176 (±11)</td>
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Variability ➔ pigs potential, mortality
Conclusion and perspectives:

- A fattening unit model → evaluation of effects of practices on technico-economic and environmental performance
- In progress: a virtual experiment study and a sensitivity analysis
- Coupling with a farrowing unit model
Thank you for your attention!

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