Integrating feeding and reproductive management of dairy goats: a modelling approach to assess herd performance


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Increasing need to find **compromise** between production level and herd efficiency

A model integrating **management** x individual variability
Model presentation

Farmer’s Project

Strategy input parameters

- Feeding
- Reproduction
- Replacement

IF [condition true] THEN [action]

MY, lactation number, physio. state

Diet change, culling, mating

Group

Herd

Decisional system

Biological system

Farmer's Project

Replacement

Feeding

Strategy input parameters

Decisional system

Biological system

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Biological system
Simulation method

- 2 x 2 factorial design:
  - Reproductive management strategies
    condensed vs spread mating
  - Feeding management strategies
    2-step vs 5-step feeding sequences

- Herd (300 goats + 90 does) mated in season
Simulation method

Virtual herd

Genetic potential
Management parameters

Herd
Goats

20 years simulated
10 years analyzed
15 replications

Puillet et al., 2008. Simple representation of physiological regulations in a model of lactating female: application to the dairy goat. Animal 2, 235-246

Puillet et al., An individual based model to simulate individual variability and herd performance in the long term, in preparation
Results

• (1) Overview
• Focus on condensed mating
  • (2) Herd
  • (3) Productive life
  • (4) Individual variation in BW
(2) Herd

↑ number of steps → Slight production level ↑

But ↑ number of steps → Slight production cost ↑

Efficiency ↓
(3) Productive life

**Where are the goats?**

<table>
<thead>
<tr>
<th>Nb of goats</th>
<th>0</th>
<th>1-5</th>
<th>6-10</th>
<th>11-15</th>
<th>16-20</th>
<th>21-25</th>
<th>31-35</th>
<th>&gt;35</th>
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<tr>
<td>2 steps</td>
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</table>

**Average lifetime MY (kg/d)**

**Average lifetime feed cost (€/kg of milk)**
(4) Individual variation in BW

**Nb of goats**
- 0
- 1-2
- 3-5
- 6-8
- 9-11
- 12-15
- 16-20
- 21-30
- >30

**2 steps n=4084**

- + 20%

**5 steps n=4128**

**MY (kg) over 2d lactation**

**BW difference (kg) actual-potential at 90d of 2d lactation**
Conclusion

- Feeding sequences $\rightarrow \approx$ effect at herd and productive life levels

- Efficiency
  - $\rightarrow \neq$ biological processes
  - $\rightarrow$ 2 steps sequence =

  $\uparrow$ % individuals losing BW

*Indiv. variability $\rightarrow$ biological buffering abilities

$LFS$ adaptability
Perspective

- Model → investigation tool

- Management effect on individual variability
  - Feeding level and genetic potential
  - Management simplification linked to labor constraint in large herds
Acknowledgment

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