Grazing in a dairy goat farm to design sustainable production systems in France

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FRANCE: the country of goat’s milk in EU

1st EU producer: 550 millions liters collected
4th flock: 1.2 million of goats

INRA Lusignan research center is based in the main region of goat milk industry

50% of national delivered milk collection
26% of French goat flock
Mixed farming systems region
Oceanic climate with dry summers

Source: GEB Institut de l’élevage d’après SSA 2013
...but a low feed self-sufficiency!

Feed self-sufficiency = 53 % ± 26% (88% in French dairy cows systems)

Due to:
- Intensification of dairy goat systems
- Stopping of grazing because of parasitism

Today, only 5% of goats graze in the main region of production!!!

Main challenges of goat sector: develop sustainable dairy goat systems

- Develop grazing and/or herbage utilization in ration
- Optimize self-sufficiency of goat systems
- Integrate grasslands in cropping systems

To find a compromise between economy and environment
PATUCHEV : THE NEW EXPERIMENTAL GOAT PLATFORM OF INRA

A system-experiment to **assess goat breeding systems using cultivated grasslands**

- **30 hectares** of cultivated area
- **180 French Alpine goats** divided into **3 balanced independent groups**:
  - Forage use: grazing + hay or exclusive hay
  - Reproduction: in or out sexual season
- **Solar-heated air dried hay**

**Systemic and multidisciplinary approach**
The system’s transition & studied period

70’s


Conventional system

New platform

Goat flock « Les Verrines »
≈160 dairy goats
Kidding in January
Farming system relying on external feeds

Typical ration:
1.8-2 kg complete concentrate
(overpressing lucerne + Ctrates mix)
0.2 kg maize grains
0.5 kg lucerne hay
Straw ad libitum

Goat flock « Patuchev »

≈60 dairy goats kidding in February
Grazing + hay in winter period

≈60 dairy goats kidding in September
Grazing + hay in winter period

≈60 dairy goats kidding in September
Indoor + hay all year
A multi-challenges grazing

- maximize herbage intake
- manage parasitism
- high yield and high qualities herbage

- **Offer**: 3 kg DM/goat/day ↔ 21 m²/goat/day
- **Paddocks** of 0.5 ha ➔ daily alternate use during 7 days with another
  (changes in paddocks stimulates goat intake)
- **Sward height objectives** ➔ initial: 13-14 cm / final: more 7-8 cm
  (« high » to limitate parasites intake)
- After grazing ➔ make hay alternate grazing /cutting to provide a rest period of
  more 45 days between 2 grazings. (break parasite’s cycle)
- When goats **graze more 9 h/day**, the ration is only about 700 g of self-produce
  grains complements

- **Herbage average yield (2014-2015)**: 10 Tons DM/ha
  (only organic fertilizer)

**Cutting**: 6.5 T DM/ha + **Grazing***: 3.5 T DM /ha

*(estimated by feed intake method from Inra 2007 tables)*
A rapid but controlled GIN infestation

- Main GINs: *Oesophagostomum* and *Teladorsagia/Trichonstrongylus*
- TST + alternating AH molecules: only 2 to 15% of goats (*FEC individual level*)
  - reduces costs, AH resistance and negative impacts on the environment
## Lower milk performances but cheaper feed costs

### Techno-economic criteria

<table>
<thead>
<tr>
<th></th>
<th>Objectives for a more sustainable goat system</th>
<th>Conventional system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk yield(^1) (kg/goat/year)</td>
<td>850</td>
<td>868</td>
</tr>
<tr>
<td>Fat content(^1) (g/kg)</td>
<td>38</td>
<td>34.9</td>
</tr>
<tr>
<td>Protein Content(^1) (g/kg)</td>
<td>33</td>
<td>31.5</td>
</tr>
<tr>
<td>Milksolids(^1) (kg/goat/year)</td>
<td>60</td>
<td>57</td>
</tr>
<tr>
<td>Conc. + Deshy. efficiency(^2) (g/liters of milk)</td>
<td>360</td>
<td>918</td>
</tr>
<tr>
<td>Conc. + Deshy. quantity(^2) (kg/goat/year)</td>
<td>300</td>
<td>790</td>
</tr>
<tr>
<td>Proportion of forage in ration (%)</td>
<td>65</td>
<td>30</td>
</tr>
<tr>
<td>Feed self-sufficiency (%)</td>
<td>80</td>
<td>0</td>
</tr>
<tr>
<td>Feeding system cost(^2) (€/1000 L)</td>
<td>290</td>
<td>428</td>
</tr>
</tbody>
</table>

### Conventional system

- Lower milk performances but cheaper feed costs

### Seasonal grazing system

- 

![Graph showing comparison of objectives and system performances](image-url)
Lower milk performances but cheaper feed costs

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Despite a lower milk yield, feeding system cost is decreased and the objectives of self-sufficiency are reached.

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<th>Seasonal grazing system &quot;Patuchev&quot;</th>
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<tr>
<td>Milk yield(^1) (kg/goat/year)</td>
<td>850 868 (975)</td>
<td>755</td>
<td>***</td>
</tr>
<tr>
<td>Fat content(^1) (g/kg)</td>
<td>38 34.9 (40.4)</td>
<td>35.8</td>
<td>NS</td>
</tr>
<tr>
<td>Protein Content(^1) (g/kg)</td>
<td>33 31.5 (34.7)</td>
<td>33.2</td>
<td>***</td>
</tr>
<tr>
<td>Milkosolids(^1) (kg/goat/year)</td>
<td>60 57 (73)</td>
<td>52</td>
<td>**</td>
</tr>
<tr>
<td>Conc. + Deshy. efficiency(^2) (g/liters of milk)</td>
<td>360 918 (921)</td>
<td>399</td>
<td></td>
</tr>
<tr>
<td>Conc. + Deshy. quantity(^2) (kg/goat/year)</td>
<td>300 790 (875)</td>
<td>301</td>
<td></td>
</tr>
<tr>
<td>Proportion of forage in ration (%)</td>
<td>65 30</td>
<td>76</td>
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<td>80 0</td>
<td>77</td>
<td></td>
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<td>290 428 (386)</td>
<td>315</td>
<td></td>
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\(^1\)data from monthly individual milk recorder  
\(^2\) data from systemic approach  
\(^3\)Stat test: PROC GLM SAS - *** <0.001, ** <0.01, NS: No significant
Conclusion

• For goat systems, grazing is a real opportunity to improve their feeding self-sufficiency and their sustainability
  ➔ Milk production is lower but lower feed prod. costs
  ➔ No major problem on metabolic or health aspects

BUT...

• It is essential:
  - to choose swards and grazing management adapted to goats
  - to respect rules for integrated gastro-intestinal parasitism management

and evidently, to have access to land areas...

We need still to improve knowledge on
  - impacts on environment, qualities of milk and cheeses, ...
  - simulations according to economic situations
  - herbage intake under grazing (grazing time and offered area)
  - interactions between herbs and complements
THANK YOU FOR YOUR ATTENTION


Aknowledgments to experimental staff for measures and fundings
Productive and high feeding value grasslands integrated in rotations

- A forage area of 10 ha with multi-species swards and mixed crops (10 years rotation)

- Balanced and varied multispecies swards to stimulate intake

Fresh herbage quality parameters (%DM)*
- OMD: 65.8 ± 6.4
- Crude Protein: 16.0 ± 4.4
- NDF: 49.5 ± 5.3
- ADF: 34.5 ± 5.3
- Ash: 9.9 ± 1.6
8.6 g of Ca/kg DM

*106 samples in 2014-2015
Impacts on Somatic Cells Score

** + 300,000 cells/mL