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

Hugues CAILLAT¹, B. Ranger¹, E. Bruneteau¹, C. Paraud², R. Delagarde³

¹ INRA, UE1373 FERLus, F-86600 Lusignan, France
² ANSES, 60, rue de Pied de Fond, F-79000 Niort, France
³ INRA-Agrocampus Ouest, UMR PEGASE, F-35590 Saint-Gilles, France
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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange</td>
<td>Orange</td>
<td>Orange</td>
<td>Orange</td>
<td>Orange</td>
<td>Orange</td>
</tr>
<tr>
<td>Conventional system</td>
<td>Conventional system</td>
<td>Conventional system</td>
<td>Conventional system</td>
<td>Conventional system</td>
<td>Conventional system</td>
</tr>
</tbody>
</table>

Goat flock « Les Verrines »

- "Les Verrines" goat flock
- ≈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 »

- "Patuchev" goat flock
- ≈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

Dynamic rotational grazing

- **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 fertilzer)*

**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

Eggs per gram of faeces

- 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

<table>
<thead>
<tr>
<th>Techno-economic criteria</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>

**Diagram:**
- **Objectives**
- Conventional system
- Seasonal grazing system
- Milk yield (kg/goat/year)
- Fat content (g/kg)
- Feed self-sufficiency (%)
- Proportion of forage in ration (%)
- Conc. + Deshy. efficiency (g/liters of milk)
- Conc. + Deshy. quantity (kg/goat/year)
- Milksolids (kg/goat/year)
- Feed system cost (€/1000 L)
- Protein content (g/kg)
Lower milk performances but cheaper feed costs

<table>
<thead>
<tr>
<th>Techno-economic criteria</th>
<th>Objectives for a more sustainable goat system (references of case study)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk yield(^1) (kg/goat/year)</td>
<td>850 (\text{vs.}) 868 (975)</td>
</tr>
<tr>
<td>Fat content(^1) (g/kg)</td>
<td>38 (\text{vs.}) 34.9 (40.4)</td>
</tr>
<tr>
<td>Protein Content(^1) (g/kg)</td>
<td>33 (\text{vs.}) 31.5 (34.7)</td>
</tr>
<tr>
<td>Milksolids(^1) (kg/goat/year)</td>
<td>60 (\text{vs.}) 57 (73)</td>
</tr>
<tr>
<td>Conc. + Deshy. efficiency(^2) (g/liters of milk)</td>
<td>360 (\text{vs.}) 918 (921)</td>
</tr>
<tr>
<td>Conc. + Deshy. quantity(^2) (kg/goat/year)</td>
<td>300 (\text{vs.}) 790 (875)</td>
</tr>
<tr>
<td>Proportion of forage in ration (%)</td>
<td>65 (\text{vs.}) 30</td>
</tr>
<tr>
<td>Feed self-sufficiency (%)</td>
<td>80 (\text{vs.}) 0</td>
</tr>
<tr>
<td>Feeding system cost(^2) (€/1000 L)</td>
<td>290 (\text{vs.}) 428 (386)</td>
</tr>
</tbody>
</table>
### Techno-economic criteria

<table>
<thead>
<tr>
<th>Objectives for a more sustainable goat system</th>
<th>Conventional system (references of case study)</th>
<th>Seasonal grazing system &quot;Patucchev&quot;</th>
<th>Stat test³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk yield¹ (kg/goat/year)</td>
<td>850</td>
<td>868 (975)</td>
<td>755</td>
</tr>
<tr>
<td></td>
<td></td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Fat content¹ (g/kg)</td>
<td>38</td>
<td>34.9 (40.4)</td>
<td>35.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Protein Content¹ (g/kg)</td>
<td>33</td>
<td>31.5 (34.7)</td>
<td>33.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Milksolids¹ (kg/goat/year)</td>
<td>60</td>
<td>57 (73)</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>Conc. + Deshy. efficiency²</td>
<td>360</td>
<td>918 (921)</td>
<td>399</td>
</tr>
<tr>
<td>(g/liters of milk)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conc. + Deshy. quantity²</td>
<td>300</td>
<td>790 (875)</td>
<td>301</td>
</tr>
<tr>
<td>(kg/goat/year)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of forage in ration (%)</td>
<td>65</td>
<td>30</td>
<td>76</td>
</tr>
<tr>
<td>Feed self-sufficiency (%)</td>
<td>80</td>
<td>0</td>
<td>77</td>
</tr>
<tr>
<td>Feeding system cost² (€/1000 L)</td>
<td>290</td>
<td>428 (386)</td>
<td>315</td>
</tr>
</tbody>
</table>

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

¹ data from monthly individual milk recorder
² data from systemic approach
³Stat 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


Acknowledgments to experimental staff for measures and fundings