Enteric methane emission in extensive cattle in Salamanca (Spain)

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60th Meeting EAAP. Barcelona, 2009
Livestock: source of greenhouse gases
Extensive cattle in Salamanca

Based on dehesa
**Dehesa**: central and south western Spain.

Also in Portugal (called *montado*)
Extensive cattle in Salamanca

Autochthonous breeds: **Morucha**. Crossed with Carolais, Limuosin…

Grazing all year around, no stables for cows.

Weaning: 6 month after calving, 200-250 kgLW
Extensive cattle in Salamanca

- Autochthonous breeds: Morucha
- Use of natural resources
Enteric methane: estimate is needed

- National national greenhouse gas inventories
- Searching for sustainable production systems
Enteric methane: estimate

• Tier 2 method (IPCC, 2006); estimate is based on:
  – average feed intake in gross energy and
  – CH\(_4\) conversion rates (Ym)

\[
EF = \frac{EB \cdot \frac{Y_m}{100}}{55.65}
\]
Enteric methane: estimate

• Tier 2 method (IPCC, 2006); estimate is based on:
  – average feed intake in gross energy and
  – CH$_4$ conversion rates (Ym)

• **Our aim: improving estimate**
  17 MJ/kgMS gross energy pastures
    (Almoguera, 2007)
  Ym = $-0,0038 \cdot DE^2 + 0,3501 \cdot DE - 0,8111$
    (Cambra-López et al, 2008)
  Monthly pastures production in *dehesa*, DE of the area
  pastures
    (Daza, 1999; Martín Bellido et al, 1986; Martín Polo et al, 2003)
Practical feeding calculated
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1. Practical feeding
   - **Pastures**: 1460 kg DM/year·ha, monthly production adapted from Daza (1999).
   - **Stocking rate**: 0.4 heads/ha
   - **Requirements** for grazing cows of 550 kg, considering physiological status, following Daza (1999),
   - **Quality** of pastures and supplementary feeding
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1. Practical feeding
   - **Summer**: 7 kgDM/d pastures, 1,5 kg/d pellet feeding in July and August; in September, 7,6 kgDM/d straw and 1,5 kg/d pellet feeding
   - **Autumn** (October): 10 kgDM/d pastures.
   - **Winter** (November-March): 1,25 kgDM/d pastures and 6 kgDM/d *Vicia*-oats hay.
   - **Spring**: 9,4 kgDM/d pastures
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2. Calculating Ym:
   - **Summer:**
     \[ Ym = -0,0038 \cdot 42^2 + 0,3501 \cdot 42 - 0,8111 = 7,19 \% \]
   - **Autumn** (October):
     \[ Ym = -0,0038 \cdot 39,7^2 + 0,3501 \cdot 39,7 - 0,8111 = 7,1 \% \]
   - **Winter** (November-March):
     \[ Ym = -0,0038 \cdot 60,35^2 + 0,3501 \cdot 60,35 - 0,8111 = 6,48 \% \]
   - **Spring**:
     \[ Ym = -0,0038 \cdot 58,98^2 + 0,3501 \cdot 58,98 - 0,8111 = 6,62 \% \]
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3. Calculating FE:
   - **Spring**:
     \[
     FE = \frac{GE \cdot \frac{Y_m}{100} \cdot 91}{55,65} = \frac{17,9,4 \cdot \frac{6,62}{100} \cdot 91}{55,65} = 17,2959
     \]
     
     (kg CH\textsubscript{4}/head)
3. Calculating FE:

- **Summer:**
  \[ FE = 15,7169 \text{ kg CH}_4/\text{head} \]

- **Autumn** (October): 
  \[ FE = 6,7224 \text{ kg CH}_4/\text{head} \]

- **Winter** (November-March):
  \[ FE = 22,5206 \text{ kg CH}_4/\text{head} \]

- **Spring**:
  \[ FE = 17,2959 \text{ kg CH}_4/\text{head} \]
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3. Calculating FE:

62,2858 kg CH₄ /head·year

Tier 1 estimate: 57 kg CH₄ /head·year
(IPCC, 2006)
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Further steps:

• ¿C sequestration of dehesa?

• ¿Is this production system a sink or a source of greenhouse gases?