Mitigation of enteric methane for French cattle: potential extent and cost of selected actions

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Livestock sector accounts for 14.5% of anthropogenic greenhouse gases (GHG) emissions (FAO, 2013)

Public policies aim to decrease GHG emissions

Scientific community works at finding ways for GHG mitigation

How to bridge the gap between scientists and policy makers?

- Determine the best available and applicable mitigation techniques
- Determine the extent of abatement and the cost
The French government order

Propose 10 mitigation actions for French agriculture, evaluate effectiveness, calculate abatement extent and cost from now on until 2030

This presentation: action for decreasing enteric methane (> 50% GHG)

Constraints

- No change in production
- No adverse effects on other sustainability issues

- No significant changes in farming systems but changes in practices i.e. not business-as-usual

- Proof of effectiveness, availability at present

- Acceptability by farmers and citizens
Selected actions and methodology

Dietary fats (unsaturated)
Nitrates as dietary additives

**Fats**
- Extruded linseed and rapeseed
- 3.5% additional fat
  - for a 14% methane abatement
- All cattle receiving concentrates
- Replacement of cereals and meals
- Rapid adoption

**Nitrates**
- 1% in the diet for a 10% methane abatement
  - Only for cattle fed diets low in fermentable N (maize silage-based)
- Replacement of other fermentable N sources (urea)
- Slow and incomplete adoption

Abatement extent (t CO₂-eq/yr) calculated from:
- Number of animals / yr
- kg of nitrate / animal
- abatement / kg nitrate
## Abatement and cost

<table>
<thead>
<tr>
<th></th>
<th>FAT</th>
<th>NIT</th>
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<tbody>
<tr>
<td>Abatement potential (Mt CO₂-eq)</td>
<td>27.0</td>
<td>4.5</td>
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<tr>
<td>Total cost for farmers (M€)</td>
<td>7209</td>
<td>170</td>
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<tr>
<td>Cost per t CO₂-eq avoided</td>
<td>267</td>
<td>38</td>
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High sensitivity to hypotheses for unitary emissions (per cow) for prices
Marginal abatement cost curve:
FAT & NIT among all actions for agricultural GHG

- Pasture management
- Protein feeding
- Protein feeding pigs
- Protein feeding cattle
- Legumes
- Fertilisation
- No tillage
- Methanisation and flares
- Nitrates
- Agroforestry
- Cover crops

Annual cost (€/t CO2e avoided)
Annual abatement (Mt CO2e avoided)
Abatement Mt CO2-eq/yr

width = extent

Save money
win-win
Concluding remarks

Selection of options depends on initial constraints

A significant methane abatement is possible now but may need incentives for application by farmers

Other options may be possible in a near future

Decisive role of policy makers