Institut National de la Recherche Agronomique

Nitrogen self-sufficiency at the suckler cattle farm scale

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Introduction

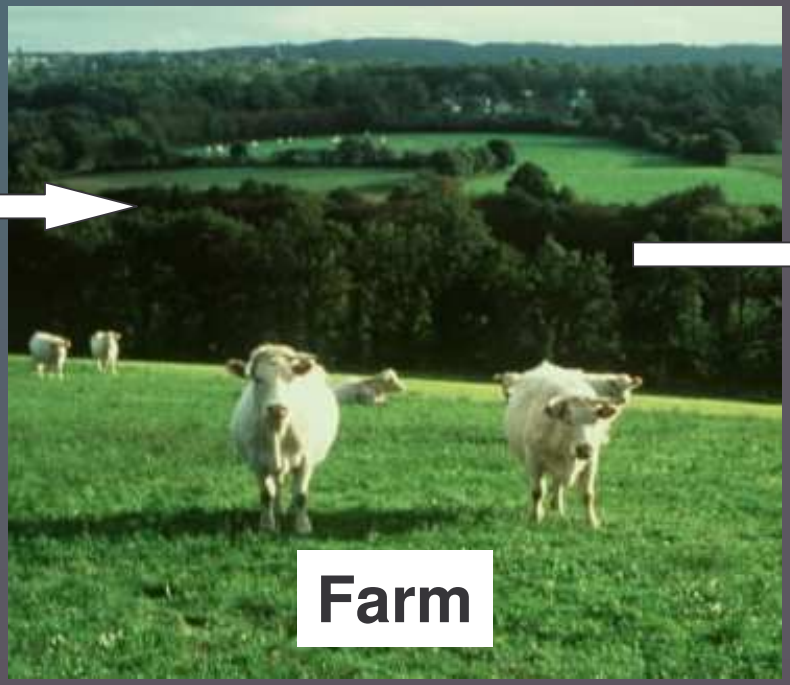
- French suckler cattle farms are dependent on N inputs (concentrates and chemical fertilisers) to provide for their requirements

- In 2001, the agricultural nitrogen balance in France showed a 19% surplus

Nitrogen balance

Inputs (purchases)

- Fertilisers
- Concentrates
- Forages
- Straw
- Animals



Outputs (sales)

- Animals
- Grain
- Forages
- Straw

N balance = Σ Inputs - Σ Outputs

N balance: results

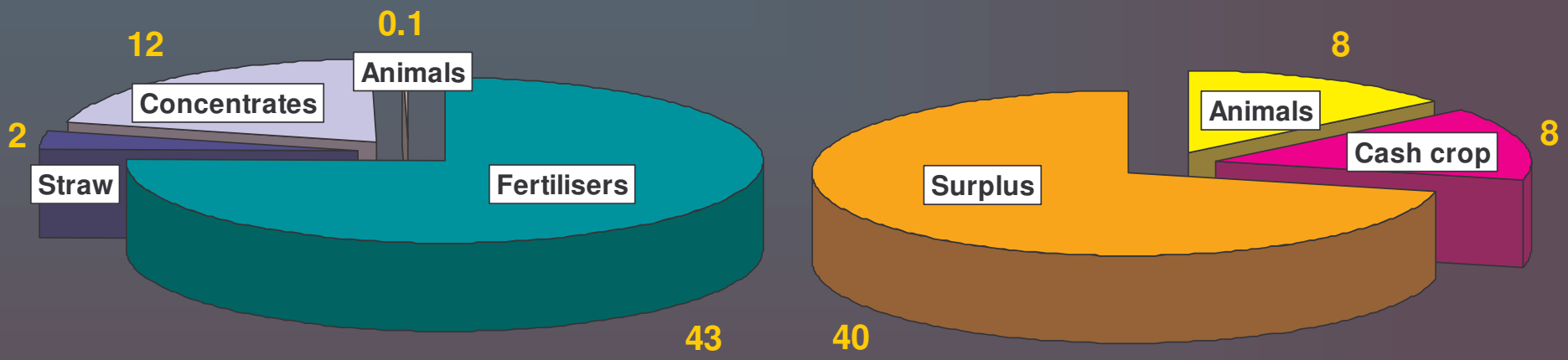
72 Charolais suckler cattle farms 2002

N inputs

total inputs = 57 kg N/ha

N outputs

total output = 16 kg N/ha



Surplus balance = +40 kg N/ha

Objectives

- Can the N self-sufficiency be an objective for the suckler cattle farms?
  - Proportion of cash crop and fodder area?
  - Which cropping plan?
  - Which types of animals produced?
  - Which economic results?

Definitions

- Feed N self-sufficiency %

100 - (N purchased feeds / N consumed feeds * 100)

- Global N self-sufficiency %

100 - (total N purchased / total N used * 100)

Materials and methods

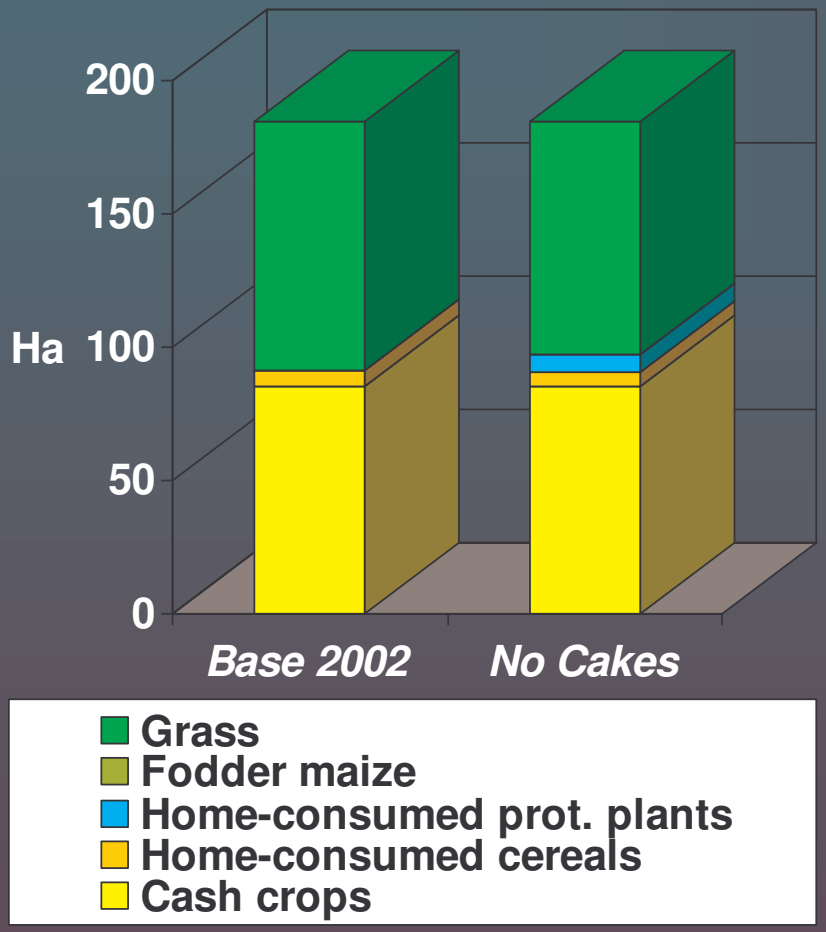
- Search for N self-sufficiency: use of a LP model (Opt 'INRA) for optimising farming systems, by maximising the overall gross margin, under constraints

- Farm studied:
  - Mixed crop-livestock Charolais, 185 ha, 50% cash crop, 70 calvings, store males, fat females
  - Economic situation 2002

Hypothesis

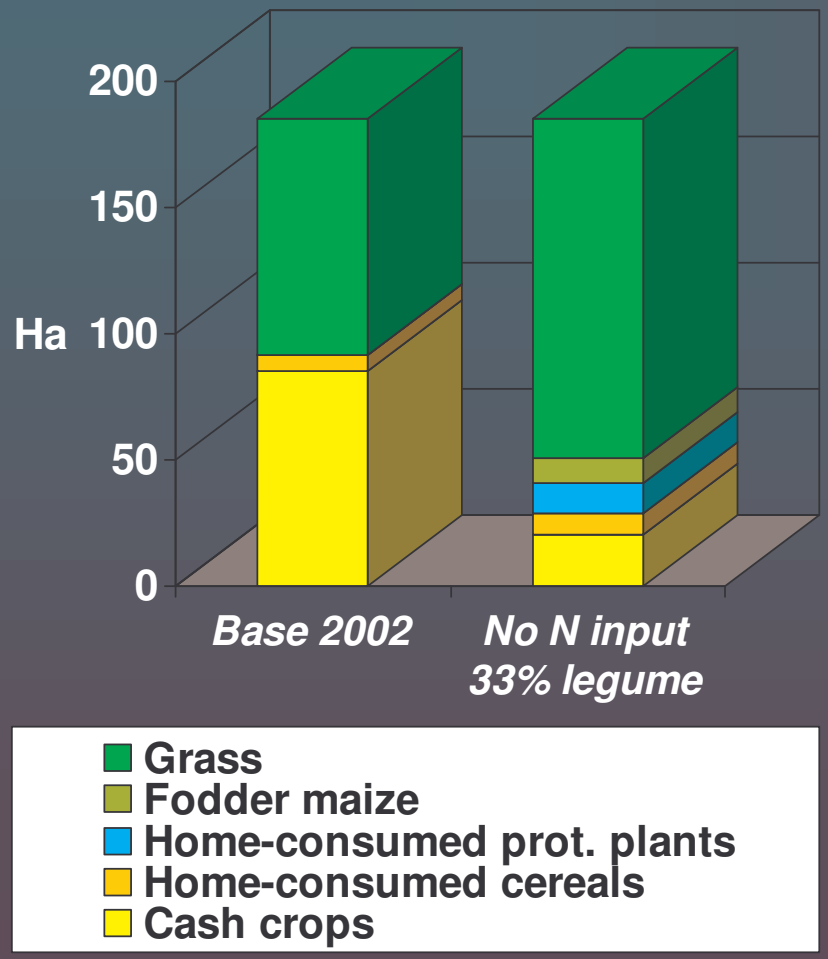
- Substitution purchased cakes / protein-rich plants crop (2.5 t/ha)
- Taking into account legume N
- N balance = +30 kg/ha/year
- With no N input:
  - Herd productivity criteria =
  - Cereal yield: -15 to -25%
  - Pasture yield: -5 to -15%

Results:
Feed N self-sufficiency



- Calvings: - 5 (64 *vs* 69)
- Fodder area: - 6 ha
- Prot. plants: 11 are/calv.
- Area devoted to the herd =
- Fattening 50% =
- Product : - 2 400 €
- Costs : - 2 400 €
- Gross Margin =

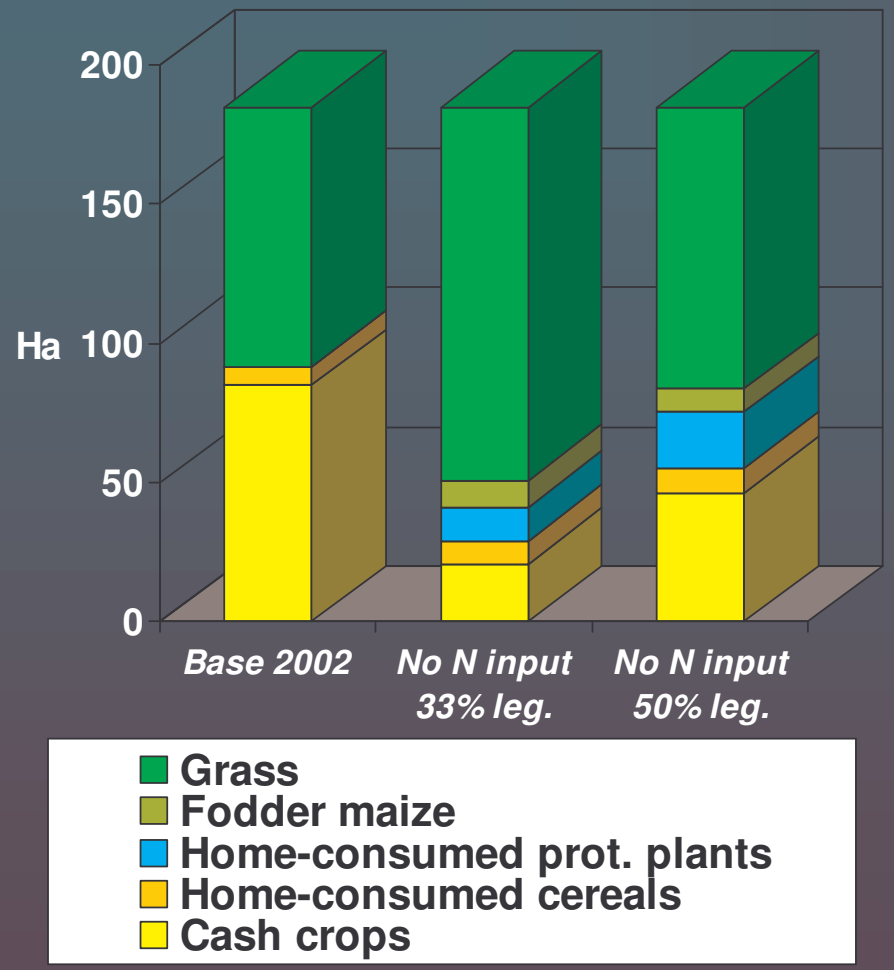
Results:
Global N self-sufficiency



33% legume

- Calvings: +24 (93 *vs* 69)
- Cash crops: - 64 ha
- Area devoted to the herd: 89% total area
- Fattening: 52%
- Product : - 25 K€
- Costs : - 13 K€
- Gross Margin: - 10%

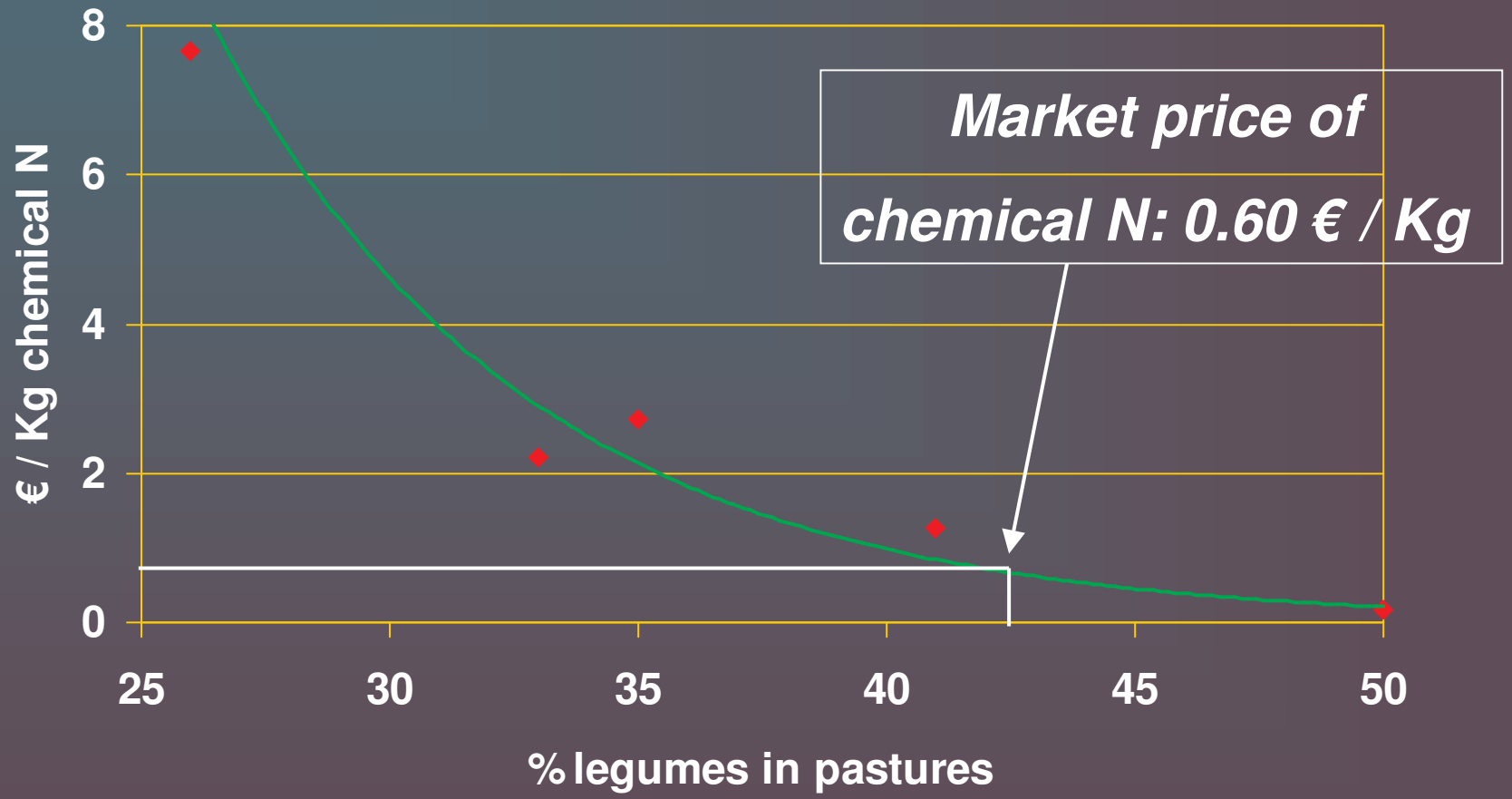
Results:
Global N self-sufficiency



50% legume

- Calvings =
- Cash crops: - 39 ha
- Area devoted to the herd: 75% total area
- Fattening: 100%
- Product : - 19 K€
- Costs : - 10 K€
- Gross Margin: - 7%

Substitution price of chemical N fertilisers



Conclusion (1)

- French suckler cattle farming:
  - High French feed unit self-sufficiency > 90%
  - N self-sufficiency from 50% (mixed crop-livestock farms) to 90% (grassland farms)

But

  - N balance (out of legume) = +40 kg/ha/year
  - low «polluting potential»

Conclusion (2)

- Global N self-sufficiency = technical mastery
  - complementarity crop / livestock farming
  - legume and rich-protein plants cropping
  - long crop rotations
  - renunciation of the maize-soya model
- Promoting the marketing value of this technical mastery?
  - Decrease of the product, low decrease of the costs
  - Gross margin on the best the same (with more labour)

Conclusion (3)

- «Repressive» incentives to the N self-sufficiency:
  - water law, the polluter pays principle
  - nitrate guideline
  - taxation and/or price increase of the inputs
- «Positive» incentives to the N self-sufficiency:
  - Non GMO production and processing network
  - Better sale price of environment-friendly produced agricultural commodities