Productivity and technical efficiency of suckler cattle systems

Trends for the period 1990 to 2012

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Context

- Since 50’s: continuous gains in labour productivity
  - Increase in farm size
  - Decrease in working population in agricultural
  - Specialisation
  - Increase in inputs and capital use

- Suckler cattle farms
  - Work load problems
  - Simplification of practices (feeding)
  - Stagnation of farm income per worker

- Productivity of the production factors?
- Technical efficiency of the production system?
Objectives

- To define and to assess the concept of technical efficiency of the production system at the farm scale
  ✓ Via the components of the value added (or wealth created)

- Evolution over 23 years (1990-2012) of the beef cattle farms efficiency
  ✓ INRA network of Charolais suckler beef farms, 43 farms (constant)
**Method**

- **Value added: definition**

  Outputs (excluding aids and subsidies)
  - Sold product
  - Store product
  - Home-consumed product
  - Divers product
  - Purchased animals

  Intermediates Consumptions (goods and services purchased)
  - Inputs
  - Energy, fuel, electricity, gas
  - Services (insurance, accounting, fee, ...)

  Capital depreciation (fixed capital consumption)

  **Value added** = Wealth created by the production system.

- **Technical efficiency of the production system**
  - Efficiency: capacity to obtain good performances with a given quantity of production factors
  - Productivity of the business’s factors of production
  - **Efficiency = Farm Prod. excl. aids / (Inter. Cons. + Cap. Depr.)**
  - Products, intermediates consumptions and fixed capital consumption are expressed in volume
  - Economic results are expressed in euros
Method

- Aggregate various inputs and outputs expressed in different units
  - Live-weight, grain, fertilizers, fuel, services, …
  - Kg, litres, doses, hours, …

- Shared unit: Euros
  - PPAPI: Index of Producer Prices of Agricultural Products
  - PPMPAI: Index of Purchase Prices of the Means of Agricultural Production
  - Eurostat publishes the updated index, base 100 = 2010

- Adjusted for the price effect, year-on-year variations correspond to the volumes variations
  - Annual values of each product of each farm have been reweighted with their own PPAPI
  - Annual values of each expenditure of each farm were reweighted with their own respective PPMPAI
Results: value added components / ha UAA

Live-weight production / ha MFA =
Cereal yield (4.7 t/ha) =

+13%
Fertilizers -14%
Equipment maintenance +58%
Energy +55%
Concentrates +21%
administrative and other services +15%
Veterinary +6%

+6%
Results: Value added per worker

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Technical efficiency of the production system

- **Positive correlation:**
  - Live-weight productivity
  - **Feed self-sufficiency** (forage and total)

- **Negative correlation:**
  - Concentrates kg/kglw
  - **Size of the herd per worker** (LU/AWU)
  - **Agricultural area per worker** (ha UAA/AWU)

Efficiency

-0.8% / y
Technical results
Charolais INRA network

- Numerical productivity: -1.6 percentage units in 23 years
- Proportion of male fattened on-farm: 42% in 1990 vs 24% in 2013
- Weight productivity: 295 kglw/LU in 1990 vs 313 in 2013 (+6%)
- Stocking rate: 1.29 LU/ha MFA in 1990 vs 1.22 in 2013 (-5%)
- Live-weight production / ha MFA = stable
- Proportion of mowed grasslands bale-wrapped: +17 percentage units

Kg concentrates / kglw: +34%

- Self-supplied concentrates
- Purchased concentrates
Feed self-sufficiency
Charolais INRA network

- **Forage ‘Feed Unit’ feed self-sufficiency**: share of the herd’s annual FU needs covered by FU from forages produced on the farm (pasture, haylage and other annual forages)
- **Total FU feed self-sufficiency**: share of the herd’s annual FU needs covered by FU from all feed produced on the farm (self-supplied forages and concentrate)

- Forage feed self-suff.: -6 pc units
  - Negative correlation with:
    - Crop area (ha)
    - Live-weight production per ha
    - Size of the herd (LU)

- Total feed self-suff.: -2 pc units
  - Negative correlation with:
    - Size of the herd (LU)
    - Farm area (ha UAA)
Structural costs per ha UAA
Charolais INRA network

- Structural costs, constant € / ha UAA +6%
  - Labour -38% → increase in labour productivity
  - Land -21% → decrease in land rent
  - Divers +25% → administrative and accounting costs
  - Buildings +17%
  - Mechanization +48% → economies of scale?

- Depreciation €/ha = +16%
  - Fuel €/ha = +134%
    - Price €/l = +71%
    - Consumption l/ha : +37%
      (56 → 77 l/ha)
Technical efficiency and farm income per worker

Charolais INRA network: 43 farms * 23 years = 989 observations

**Technical efficiency**

Farm income constant € / AWU

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Discussion
French FADN. Type of farming: beef cattle farms (TF46)

- Ha UAA and LU / AWU
  - Ha UAA / AWU
  - LU / AWU
  - +70%
  - +87%

- Constant Euros
  - 0
  - 5,000
  - 10,000
  - 15,000
  - 20,000

- Farm Income €/AWU
- Technical Efficiency

- Outputs deflated by PPAPI and PPMPAI
  - +0.64%/an
  - Fertilizers -54%
  - Equipment maintenance +33%
  - Energy +29%
  - Concentrates +21%

- Intermediate Consumptions
- Fixed Capital Consumptions

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Discussion

Size and labour productivity: determinant of the income per worker?

Evolution of the correlation: farm income / AWU with size and labour productivity

Charolais INRA network

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Discussion, conclusion

- Feed self-sufficiency: key factor of the system efficiency
- No economies of scale for these beef cattle systems
- Expansion of farm size with simplification of feeding practices led to heavier use of off-farm resources
  - Lower use of on-farm resources (genetic potential of livestock and plant) → decrease in self-sufficiency and technical efficiency
  - Heavier capital needs → substitution labour / capital
  - No gain on land productivity → wealth creation?

- Genetic, technical, technological and knowledge progress
  - To offset losses in system efficiency?
  - To increase labour productivity?

- Agro-ecology concept
  - An empty promise face the myth of “labour productivity” and face the development model of the beef production systems?