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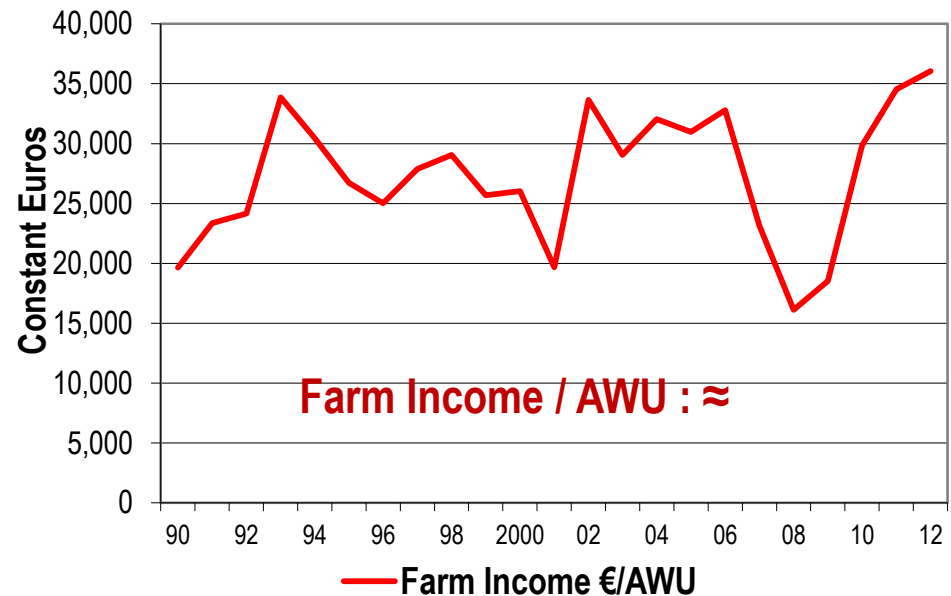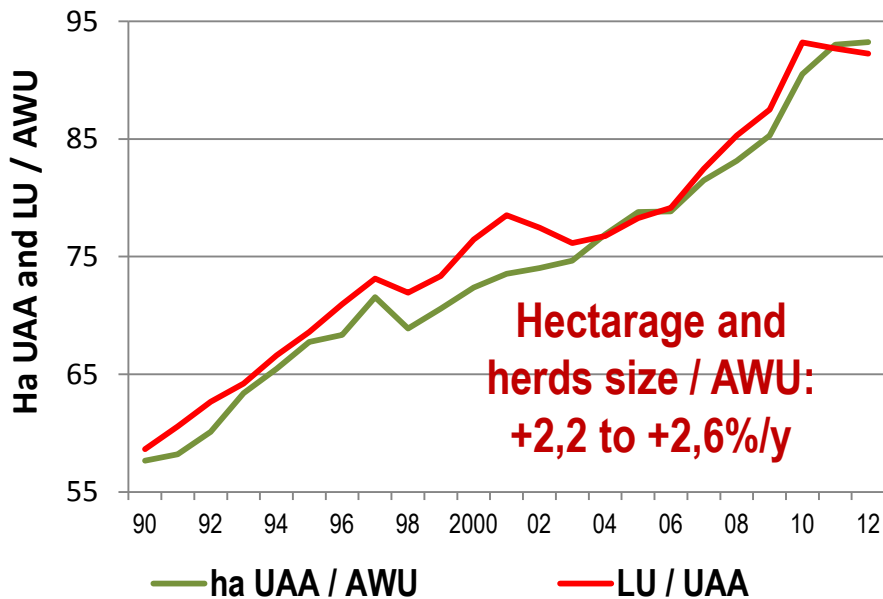
❖ **Suckler cattle farms**
- ✓ Work load problems
- ✓ Simplification of practices (feeding)
- ✓ **Stagnation of farm income per worker**

➲ Productivity of the production factors?

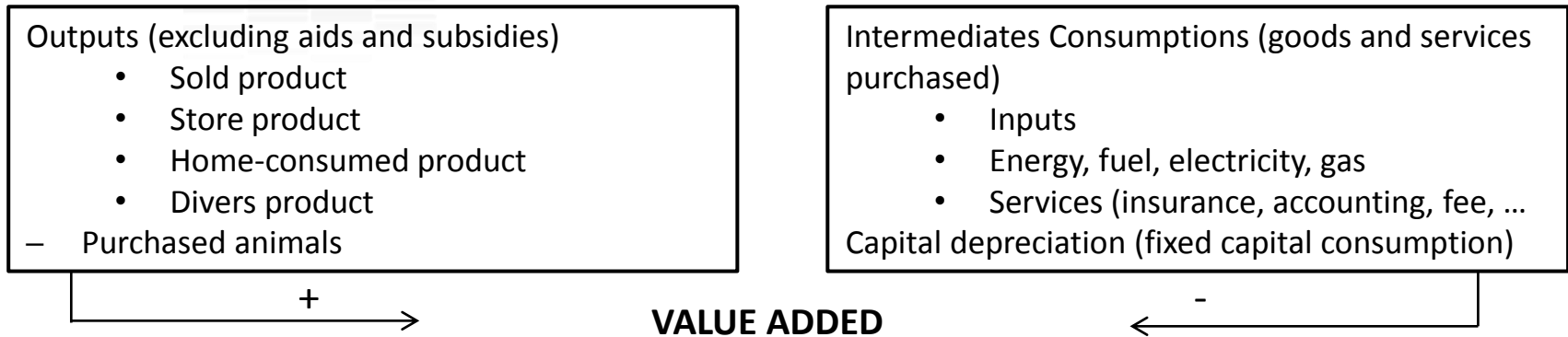➲ Technical efficiency of the production system?

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)

Hectarage and herds size / AWU: +2,2 to +2,6%/y

Farm Income / AWU : ≈

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**   **-**

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, …
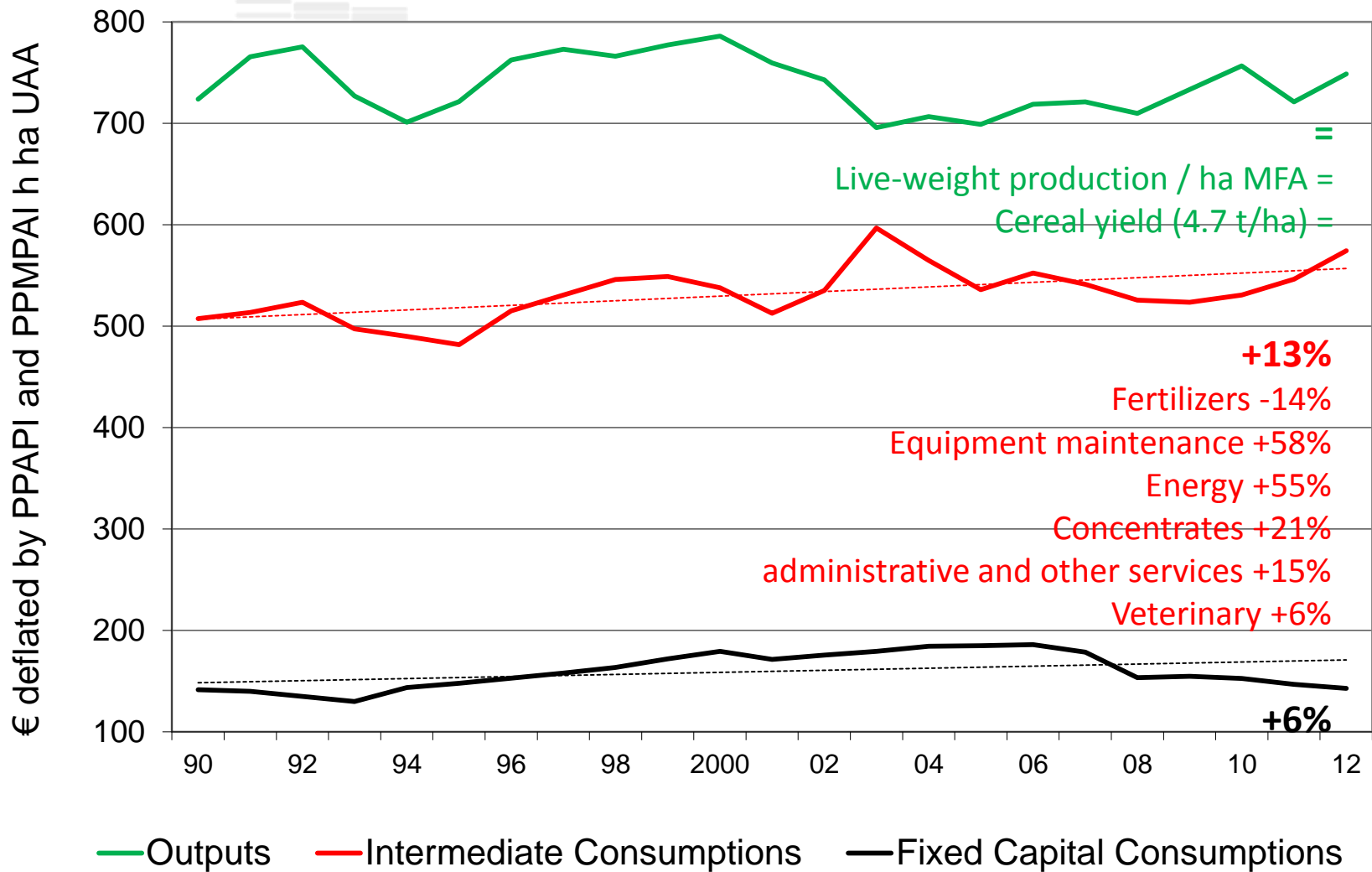 - ✓ Kg, litres, doses, hours, …

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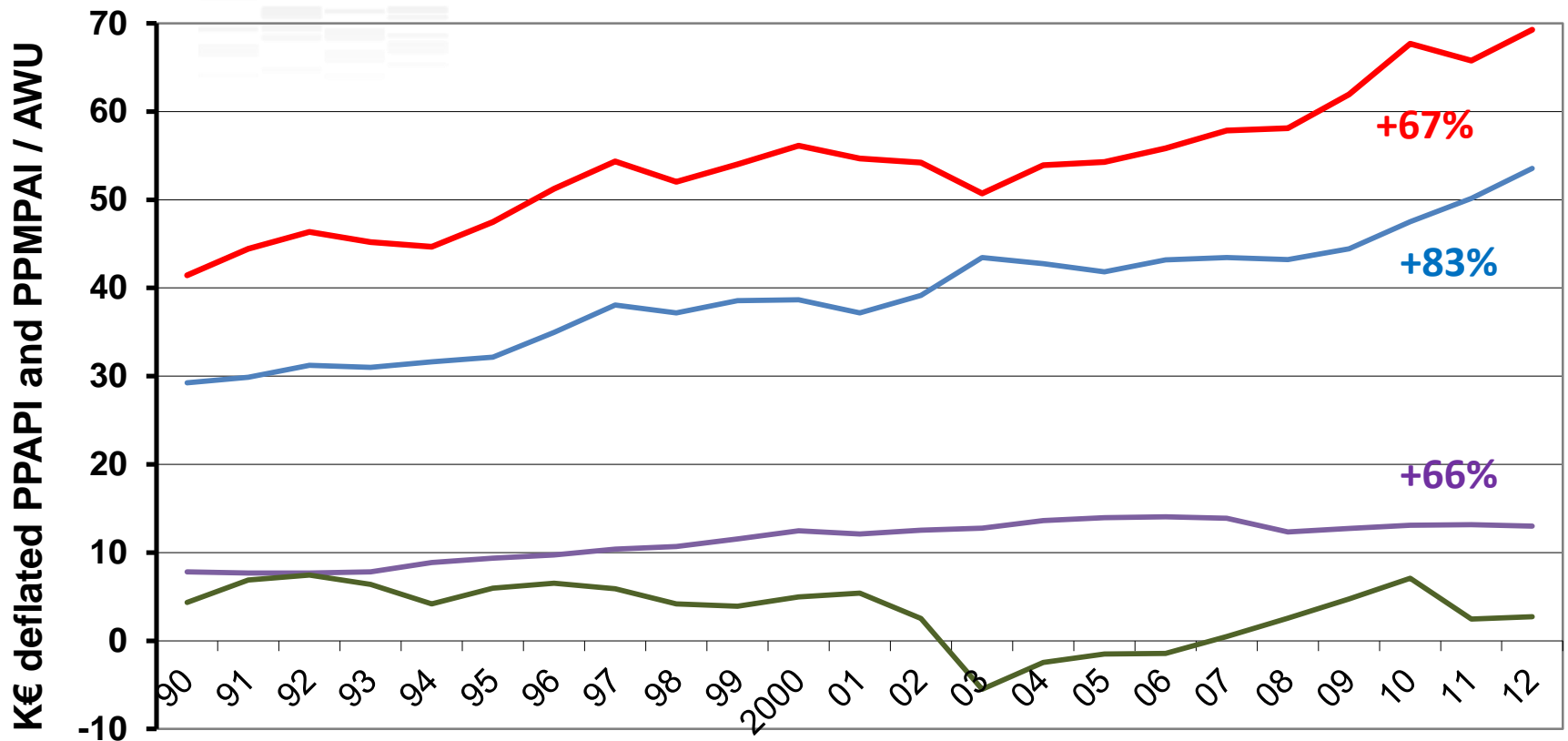 - ✓ Eurostat publishes the updated index, base 100 = 2010

❖ **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 PPMAPI

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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%

—— Outputs   —— Intermediate Consumptions   —— Fixed Capital Consumptions

y-axis: € deflated by PPAPI and PPMPAI h ha UAA

x-axis: 90, 92, 94, 96, 98, 2000, 02, 04, 06, 08, 10, 12

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Results: Value added per worker

Legend:
- **Outputs / AWU** (red line, +67%)
- **Intermediate Consumption / AWU** (blue line, +83%)
- **Fixed Capital Consumption / AWU** (purple line, +66%)
- **Value added / AWU** (green line)

Y-axis: K€ deflated PPAPI and PPMPAI / AWU

Technical efficiency of the production system

-0,8% / y
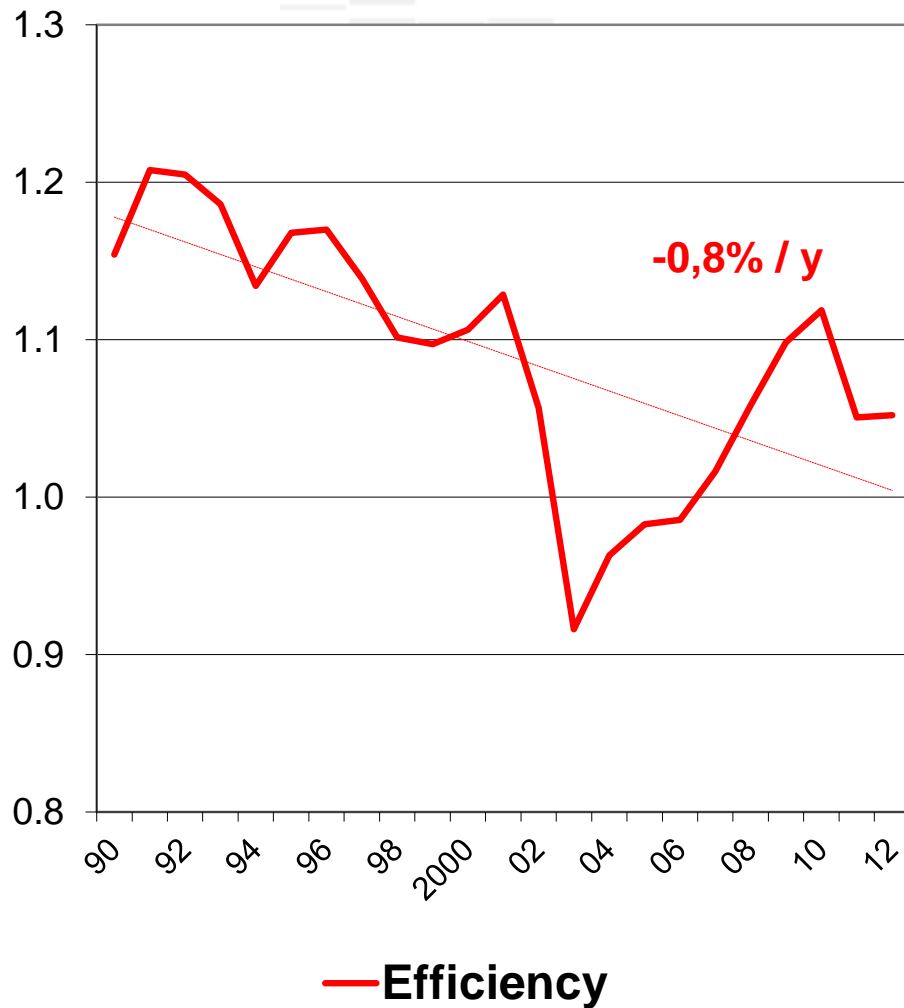
—— **Efficiency**

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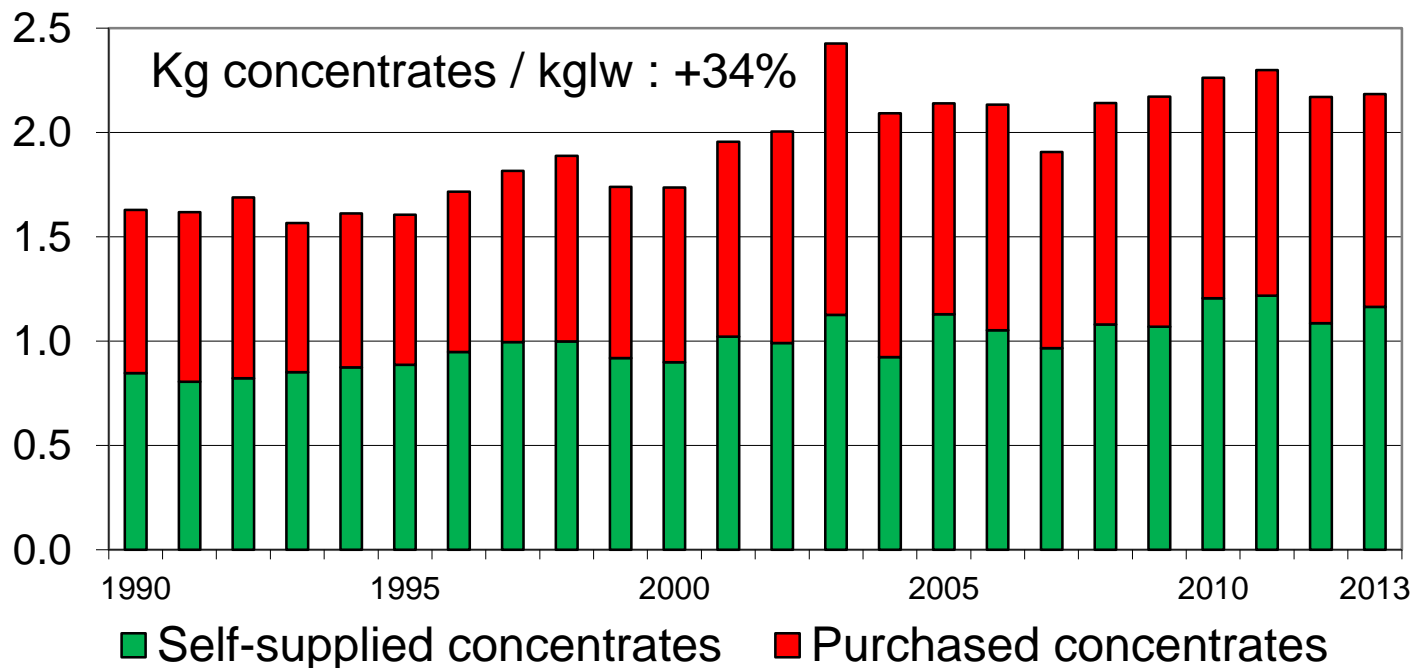- **Feed self-sufficiency** (forage and total)

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

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 en 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)
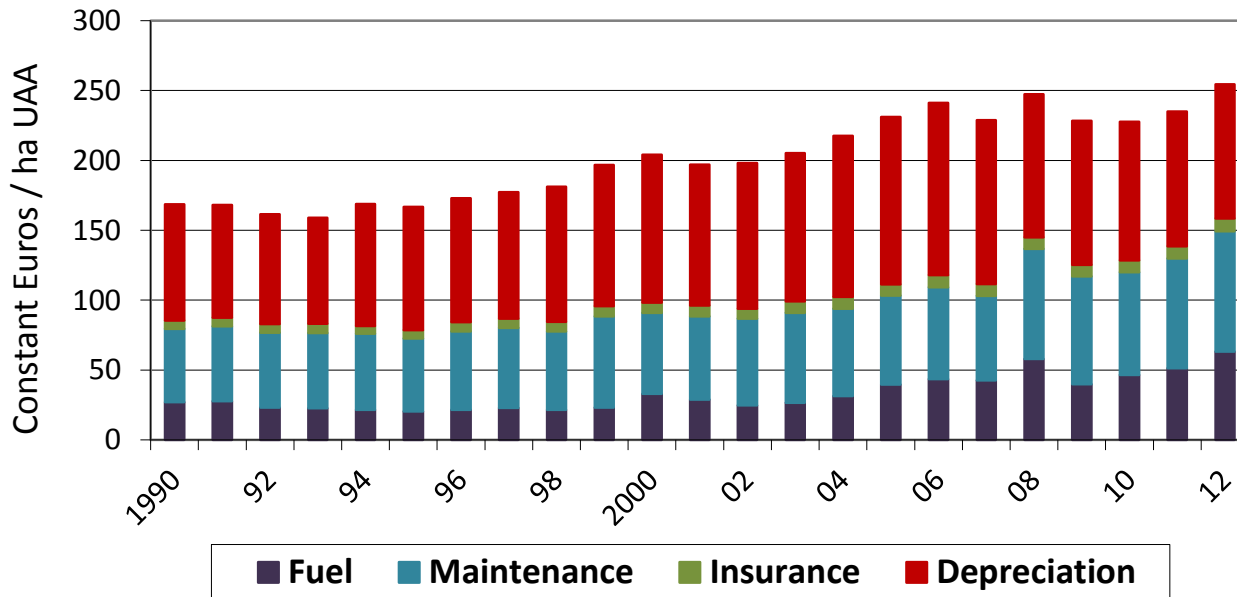

—Forage FU Feed self-sufficiency
—Total FU Feed self-sufficiency
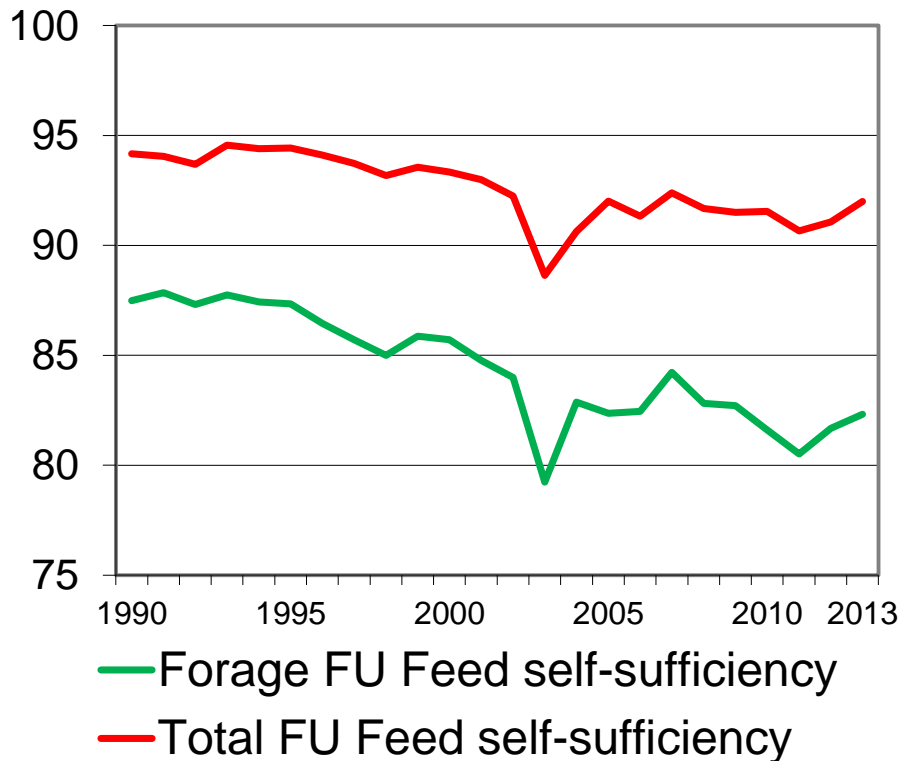
❖ Forage feed self-suff.: -6 pc units
  – **Negative correlation with:**
    • **Crop area (ha)**
    • Live-weight production per ha
    • **Size of the herd (LU)**

❖ Total feed self-suff.: -2 pc units
  – **Negative correlation with:**
    • **Size of the herd (LU)**
    • **Farm area (ha UAA)**

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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%
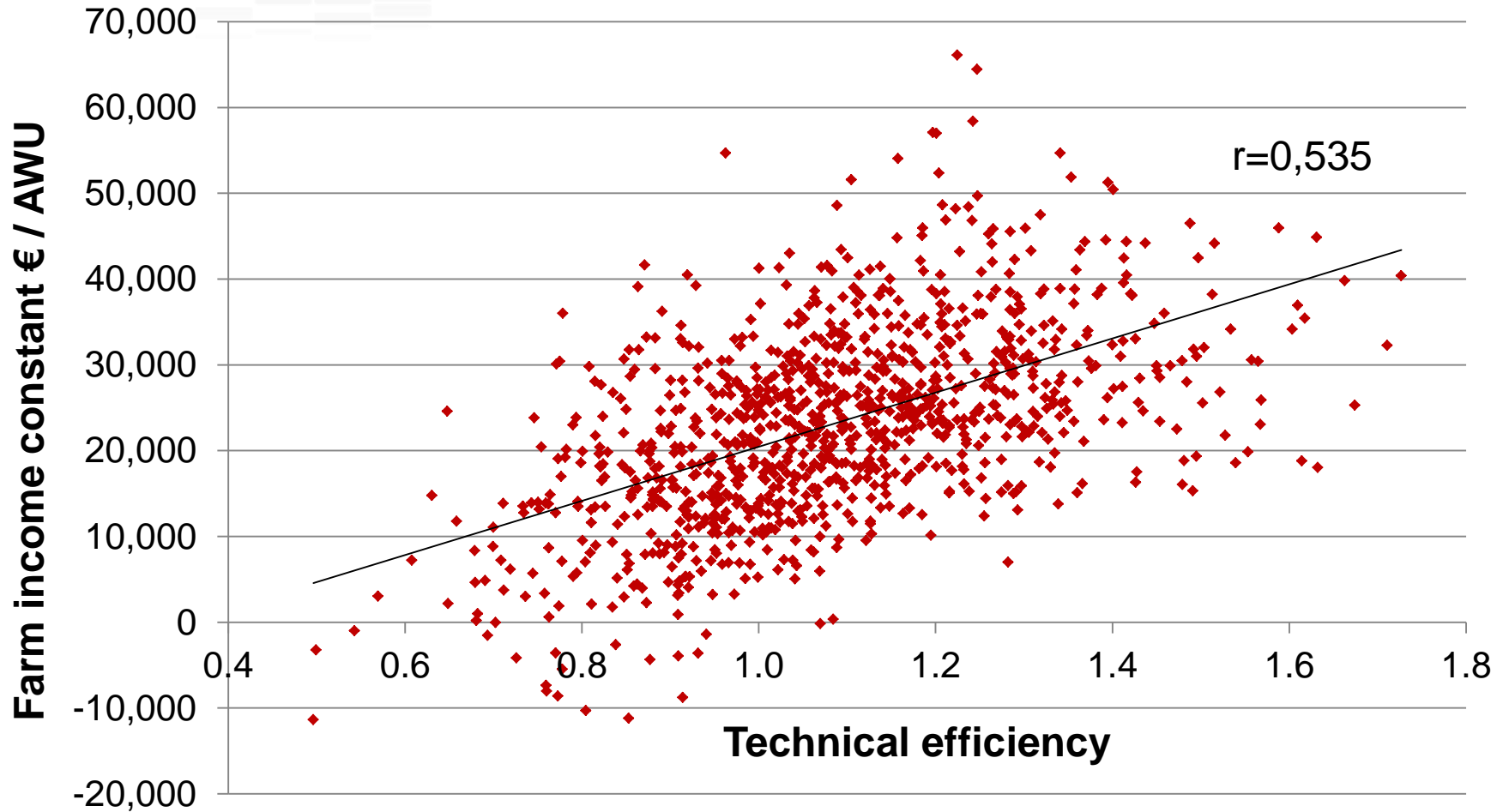- **Mechanization   +48% → economies of scale?**

Depreciation €/ha = +16%

Fuel €/ha = +134%
- Price €/l = +71%
- Consumption l/ha : +37% (56→77 l/ha)

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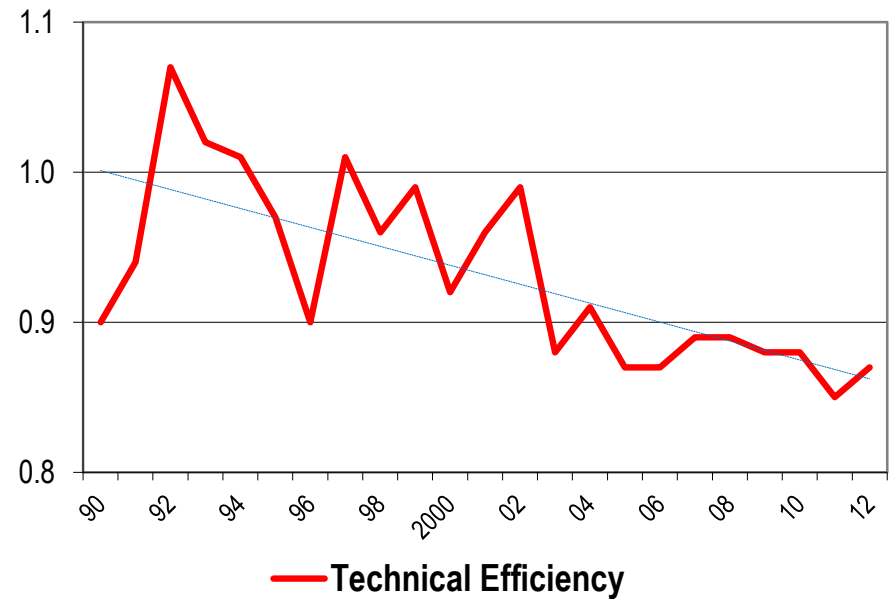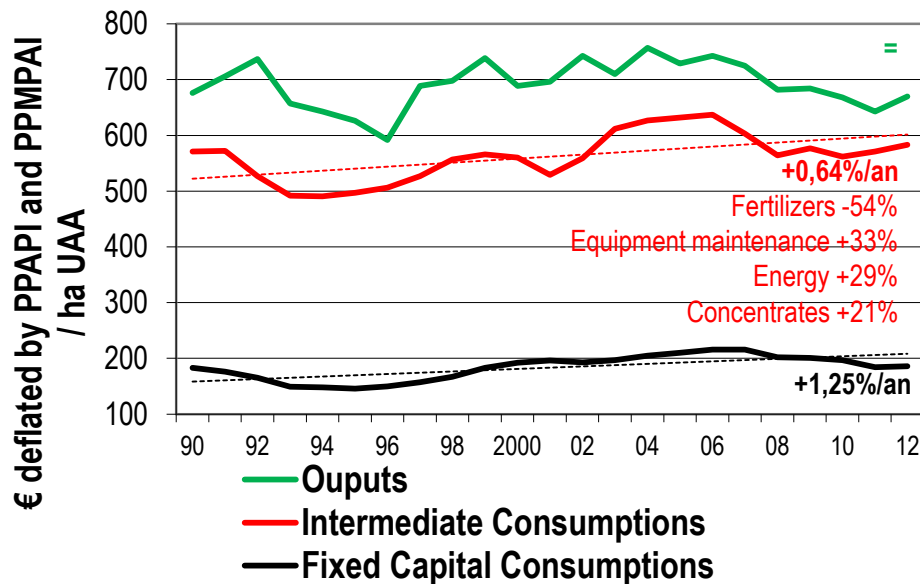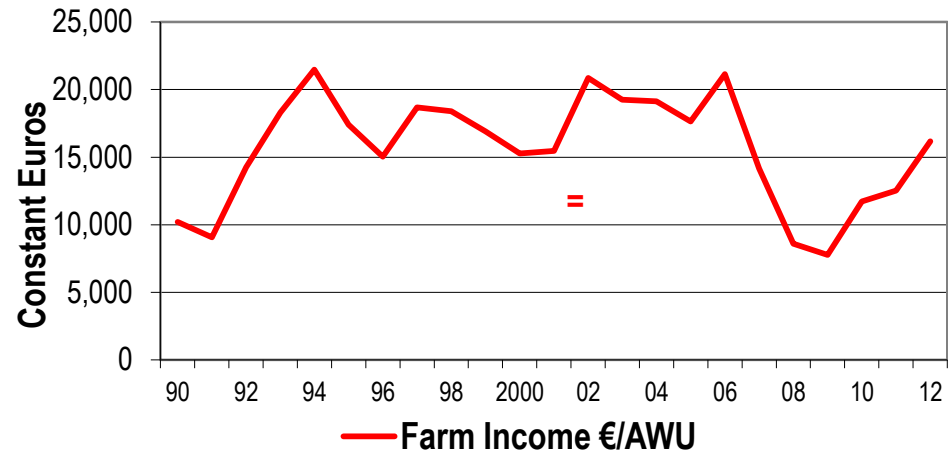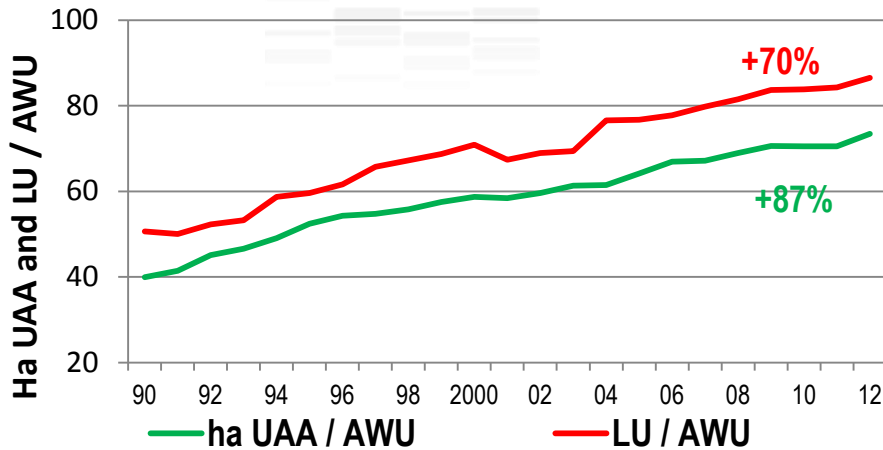
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Technical efficiency and farm income per worker
Charolais INRA network: 43 farms * 23 years = 989 observations

r=0,535

Farm income constant € / AWU (y-axis: -20,000 to 70,000)

Technical efficiency (x-axis: 0.4 to 1.8)

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Discussion

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

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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

— **Ha Agricultural Area**   — **Kg live-weight / AWU**

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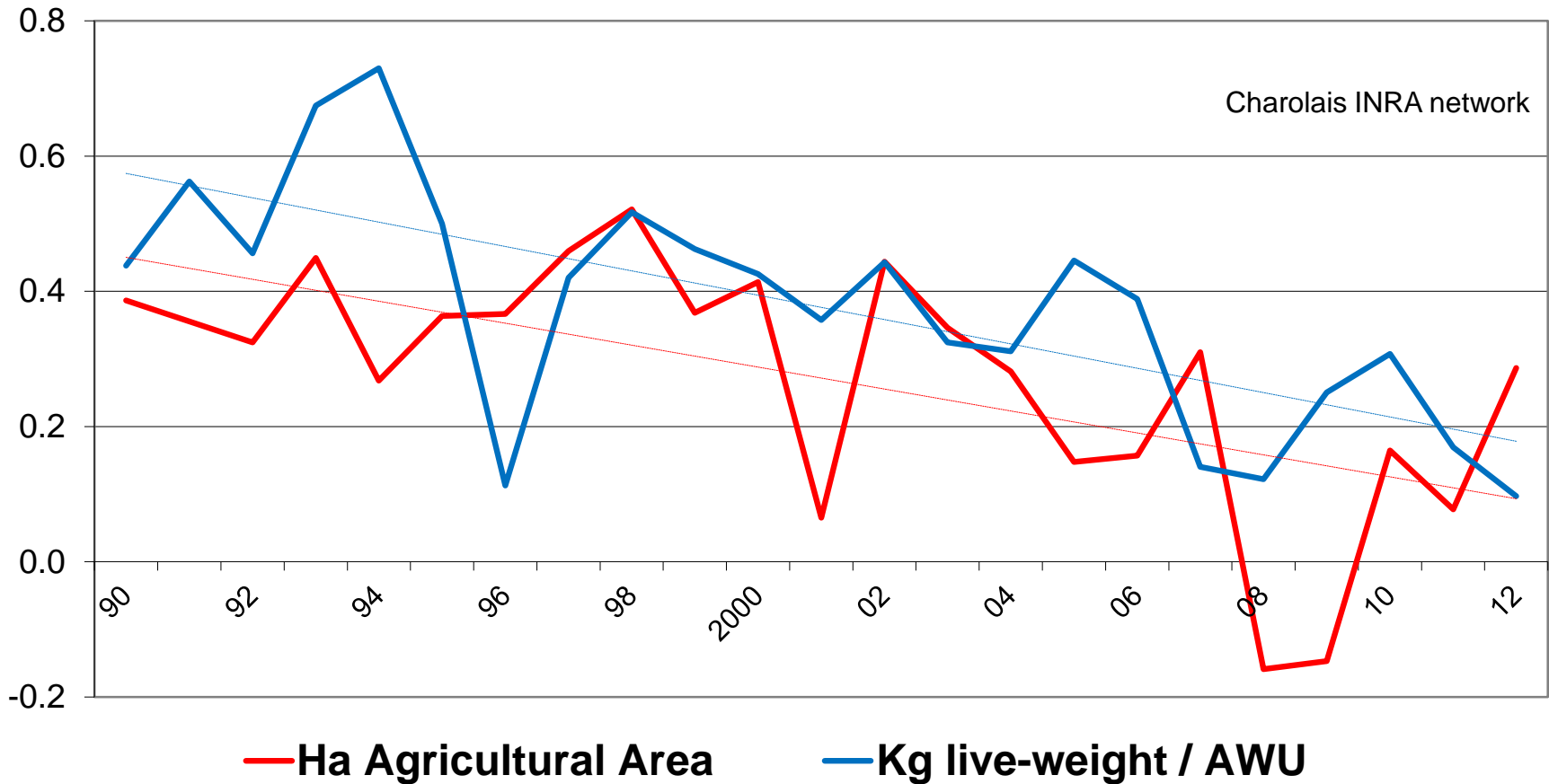
Discussion, conclusion

- ❖ 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?