

# EEAP 2011 – Stavanger Norway

## Evaluation of the environmental sustainability of different European pig production systems using life cycle assessment

JY Dourmad, J Ryschawy, T Trousson, J Gonzalez, HWJ Houwers, M Hviid, TLT Nguyen, L Morgensen



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# Summary

## ✓ Introduction

- ✓ Q-PorkChains EU program

## ✓ Data collection and LCA calculations

- ✓ Collection of data
- ✓ LCA calculations

## ✓ Results

- ✓ Per dimension
- ✓ Multi-dimensional analysis

## ✓ Conclusions & perspectives

# Q-PorkChains EU Program

## ✓ General objective

⇒ *Improve the quality of pork and pork products and develop innovative and sustainable pork production chains with low environmental impact*

## ✓ Six research modules

1. Consumer, citizens & market
2. Pork production
3. Product development
4. Chain management
5. Molecular quality control
6. Knowledge synthesis

## ✓ Two application modules



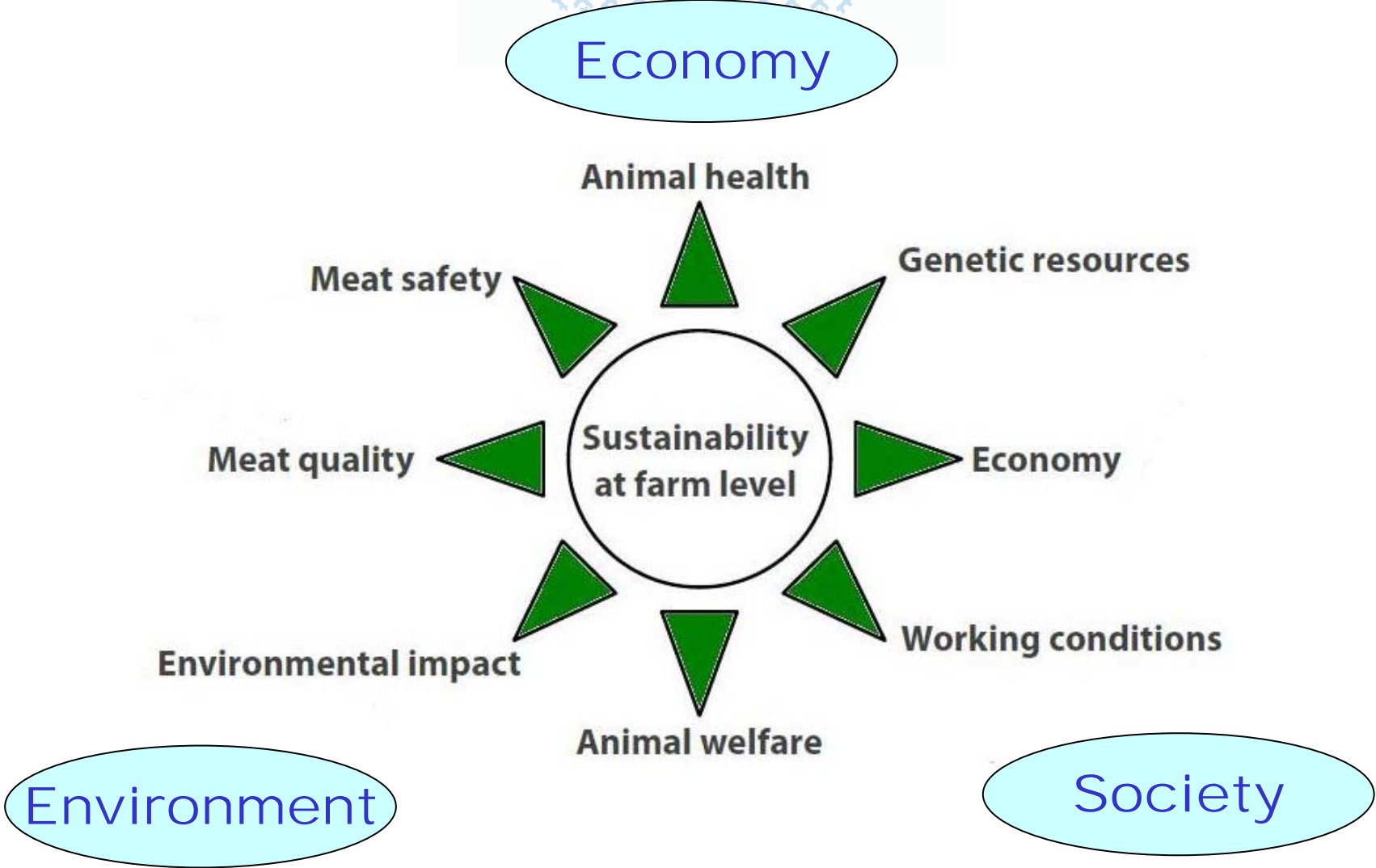
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# Q-PorkChains – module II

- ✓ **Diversity, Flexibility and Sustainability of Farm-level Production Systems**
  
- ✓ **Two-step approach**
  - ⇒ **Assessment and development of tools for sustainability evaluation**
  - ⇒ **Integrated sustainability evaluation of a selected number of European production systems**
    - **Conventional**
    - **Adapted conventional**
    - **Traditional**
    - **Organic**

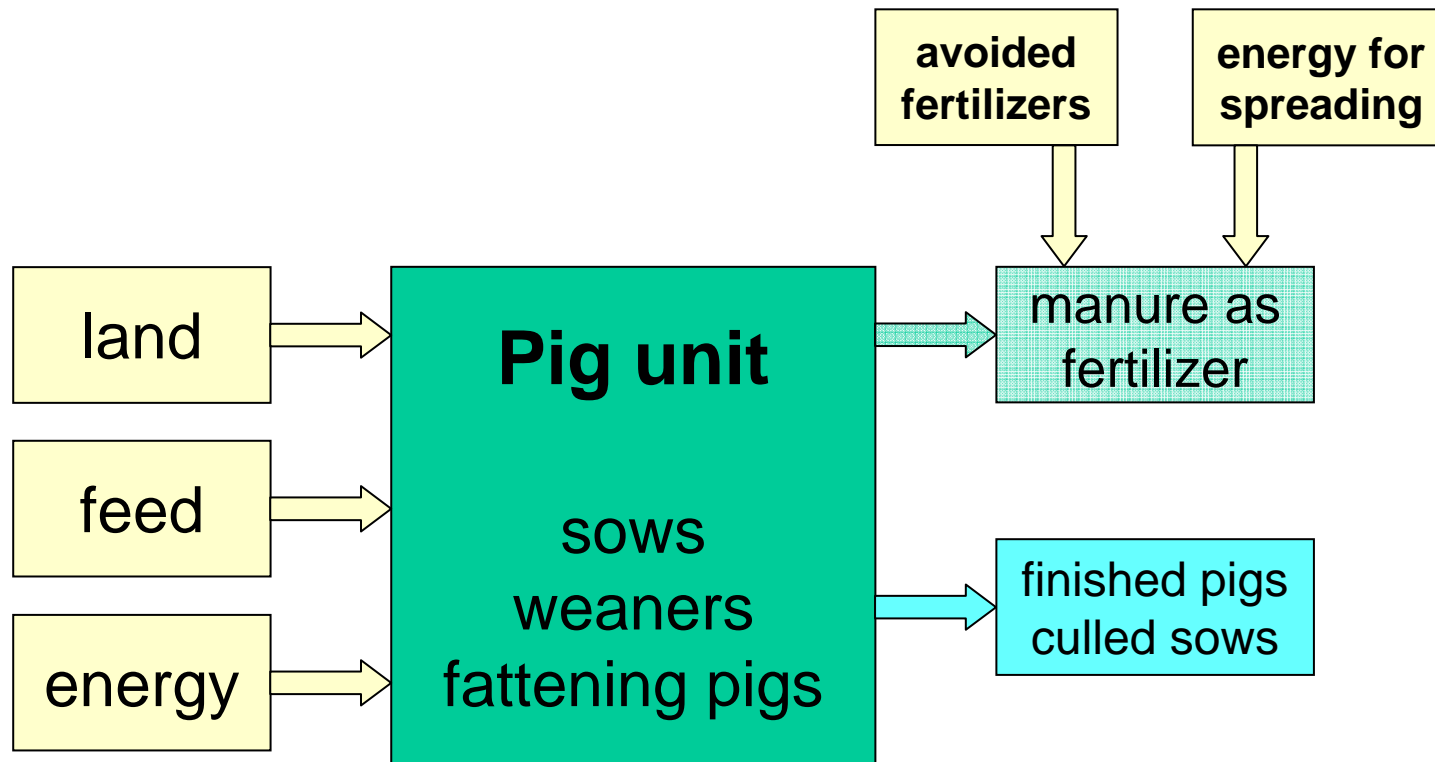
# Multi-dimension evaluation



# Collection of data for environmental evaluation

- 12 systems in 4 countries (3 / country)
- Enquiries in 10 farms from each system
- Data collected
  - Animal performance (sows, piglets, fatteners)
  - Feed amount and nutritional composition (ME, crude protein, total phosphorus)
  - Housing (type of floor, ventilation)
  - Use of land when outdoor raising
  - Manure collection and management (liquid/solid, evacuation & storage, treatment, spreading...)

# Simplified description of the system



# LCA methodology

- **System description**

- Feed composition => feed ingredients combination of energy (cereals), protein (meals & peas), and phosphorus sources to achieve target ME, CP and P
- Calculation of N, OM and P excretion (Rigolot et al., 2010)
- Emissions calculated from excretion and specific EF (IPCC, 2006, Rigolot et al., 2010)

- **LC inventory of feed ingredients**

- Conventiounal : ecoinvent database adapted to France (Mosnier et al. 2011)
- Organic (Denmark)

- **Five impact categories**

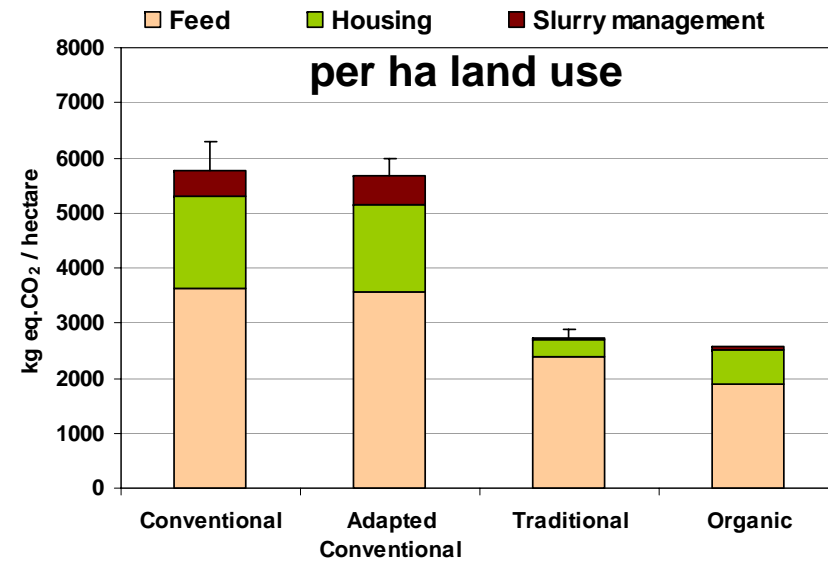
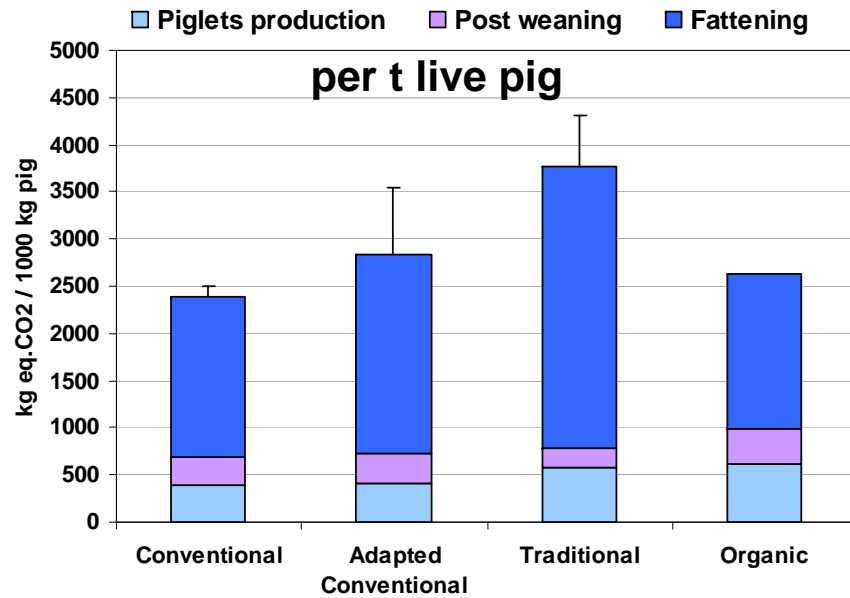
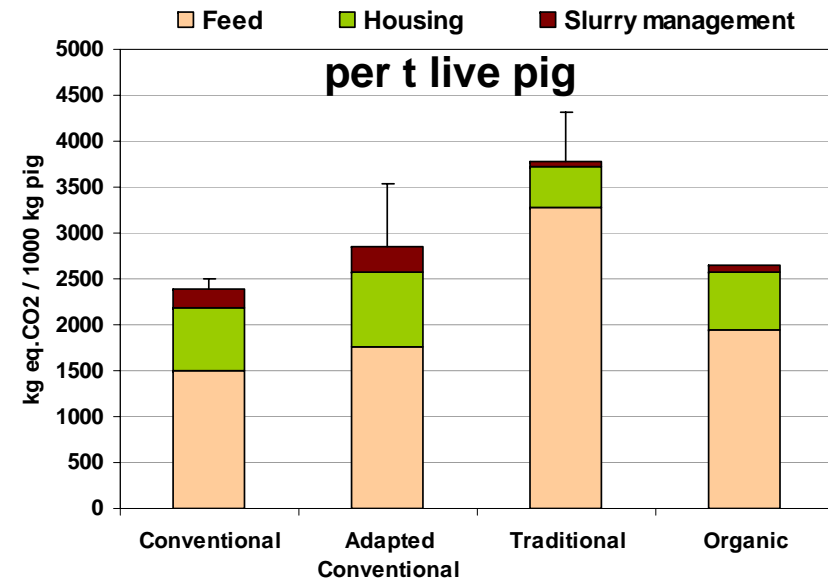
- **Two functional units : kg live pig & ha land use**



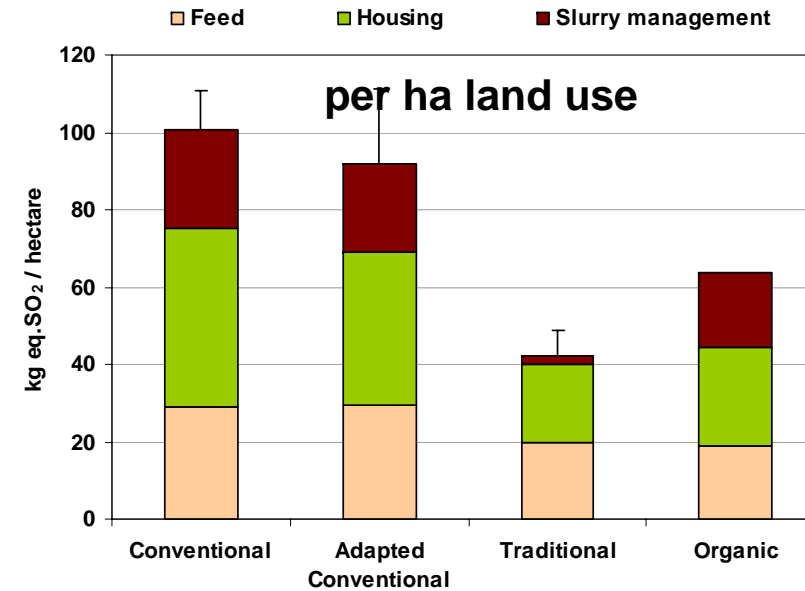
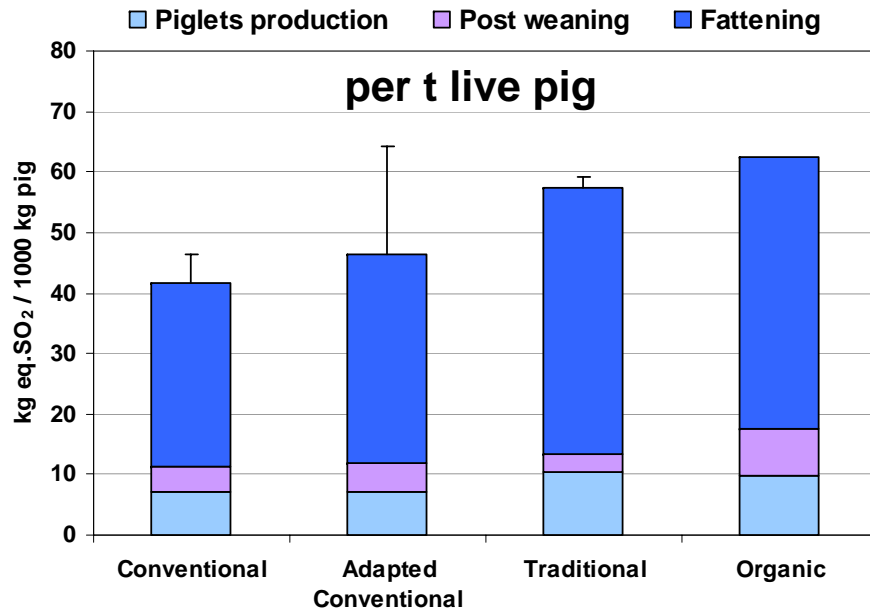
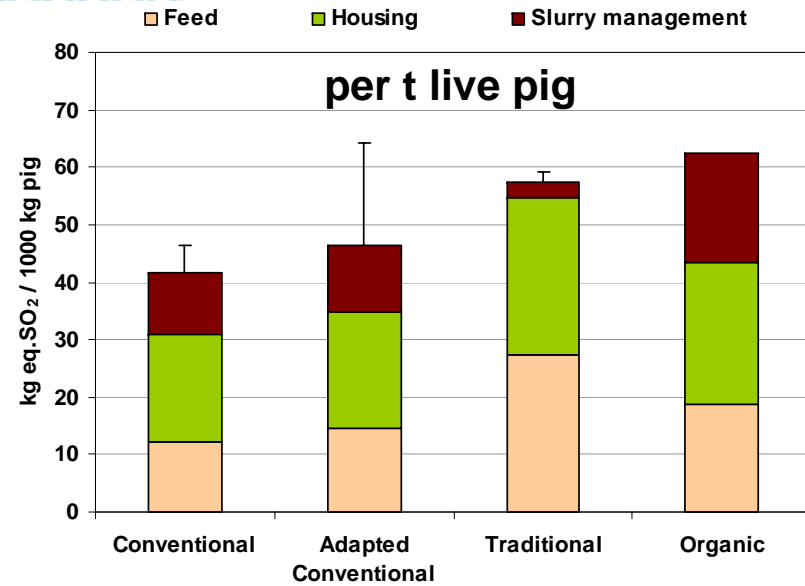
# Description of pig units

	<b>conven- tional</b>	<b>adapted conven.</b>	<b>tradi- tional</b>	<b>organic</b>
n° farms (sys)	40 (4)	40 (4)	20 (2)	10 (1)
n° fat. pigs/year/farm	5390	3440	165	2840
Piglets/sow/year	27.5	26.3	12.0	19.8
Feed conversion ratio				
weaners	1.67	1.75	2.74	2.40
fatteners	2.73	2.81	6.52	3.00
Feed CP				
sows	13.3	13.0	12.9	16.5
weaners	17.3	16.8	14.8	20.4
fatteners	15.6	15.5	13.5	18.0

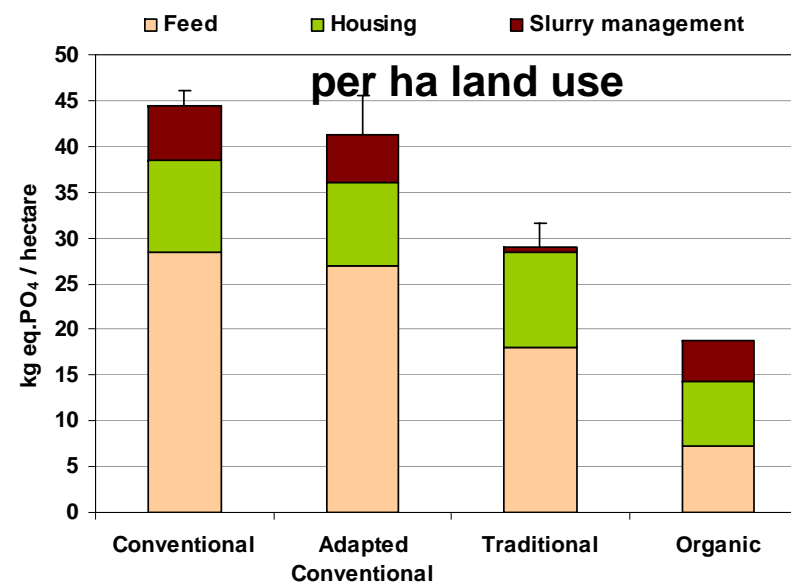
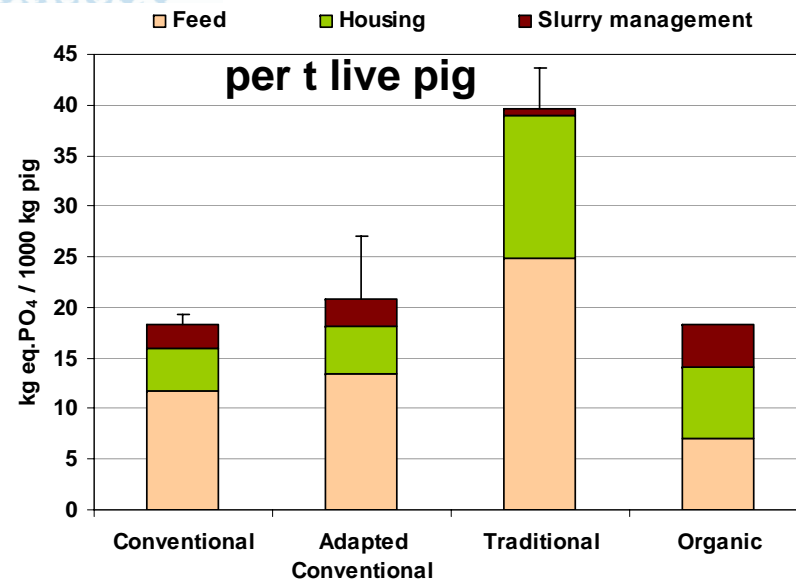
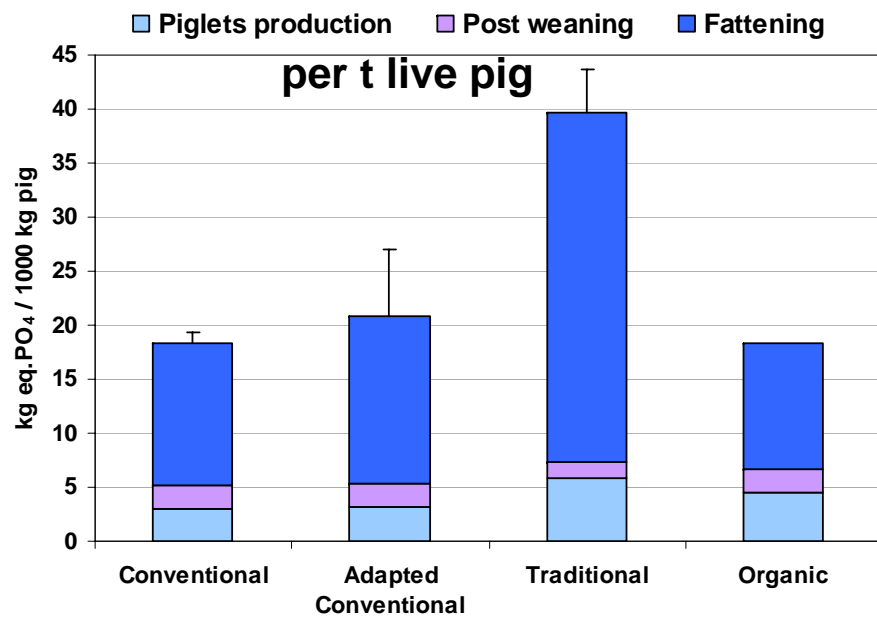
# Global warming eq CO<sub>2</sub>



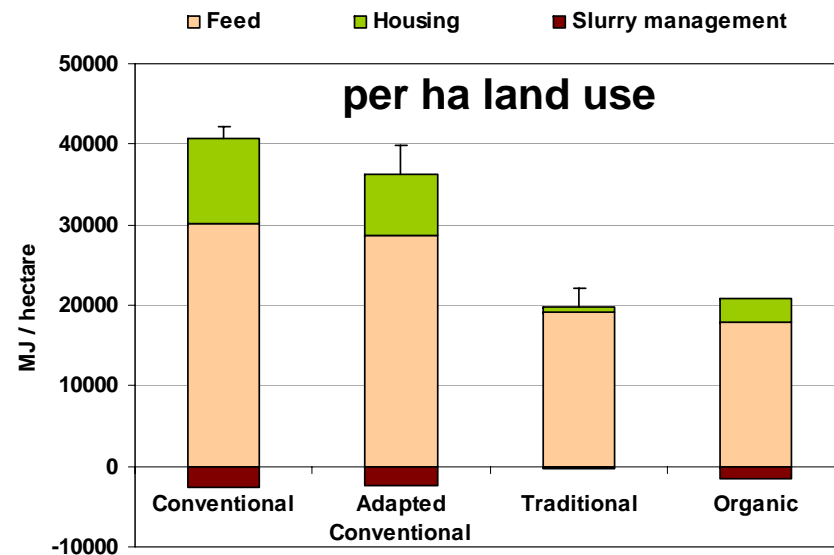
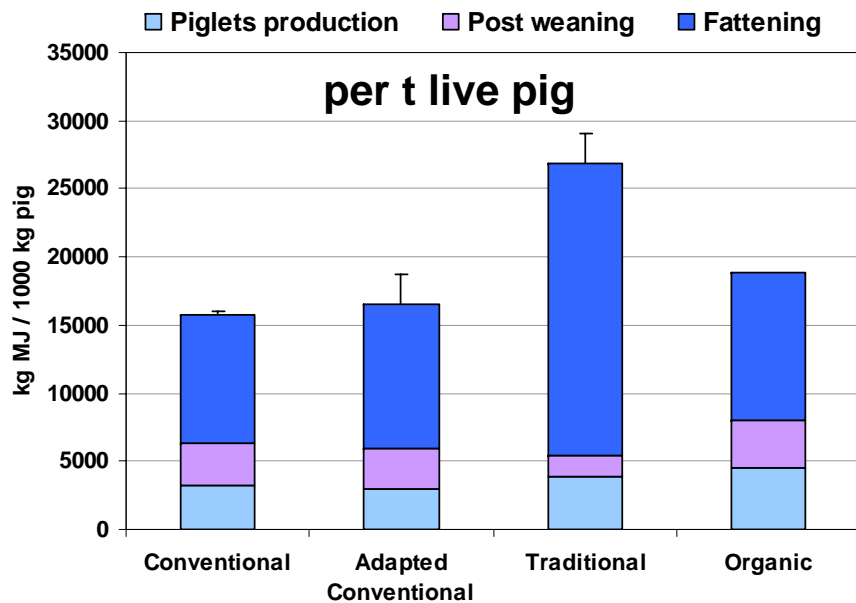
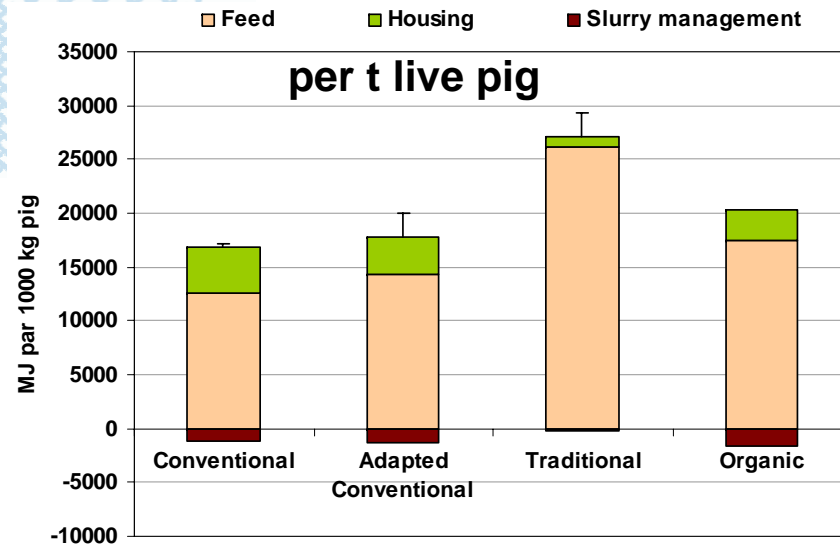
# Acidification eq SO<sub>2</sub>



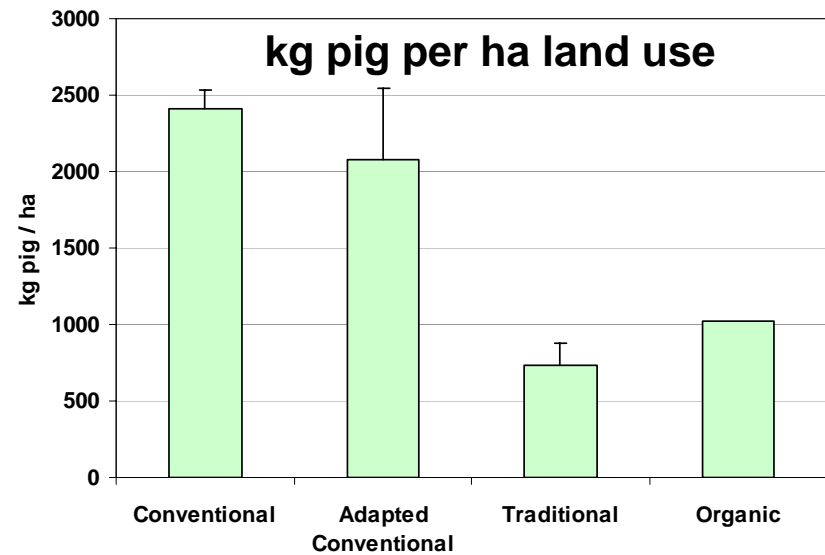
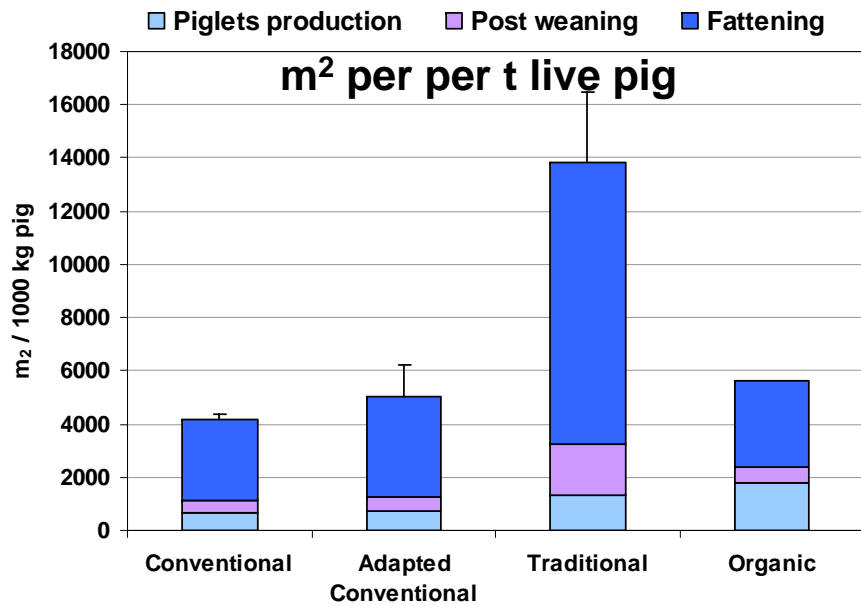
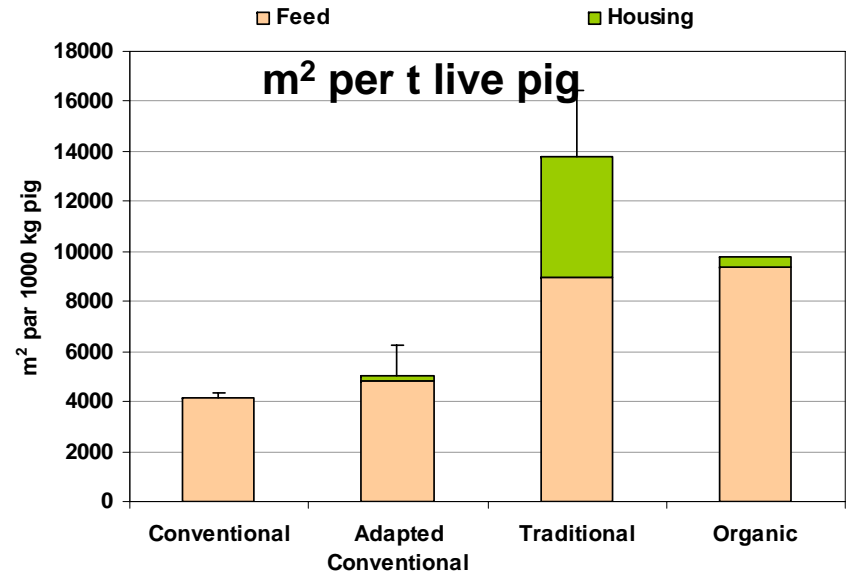
# Eutrophication eq PO<sub>4</sub>



# Energy use MJ



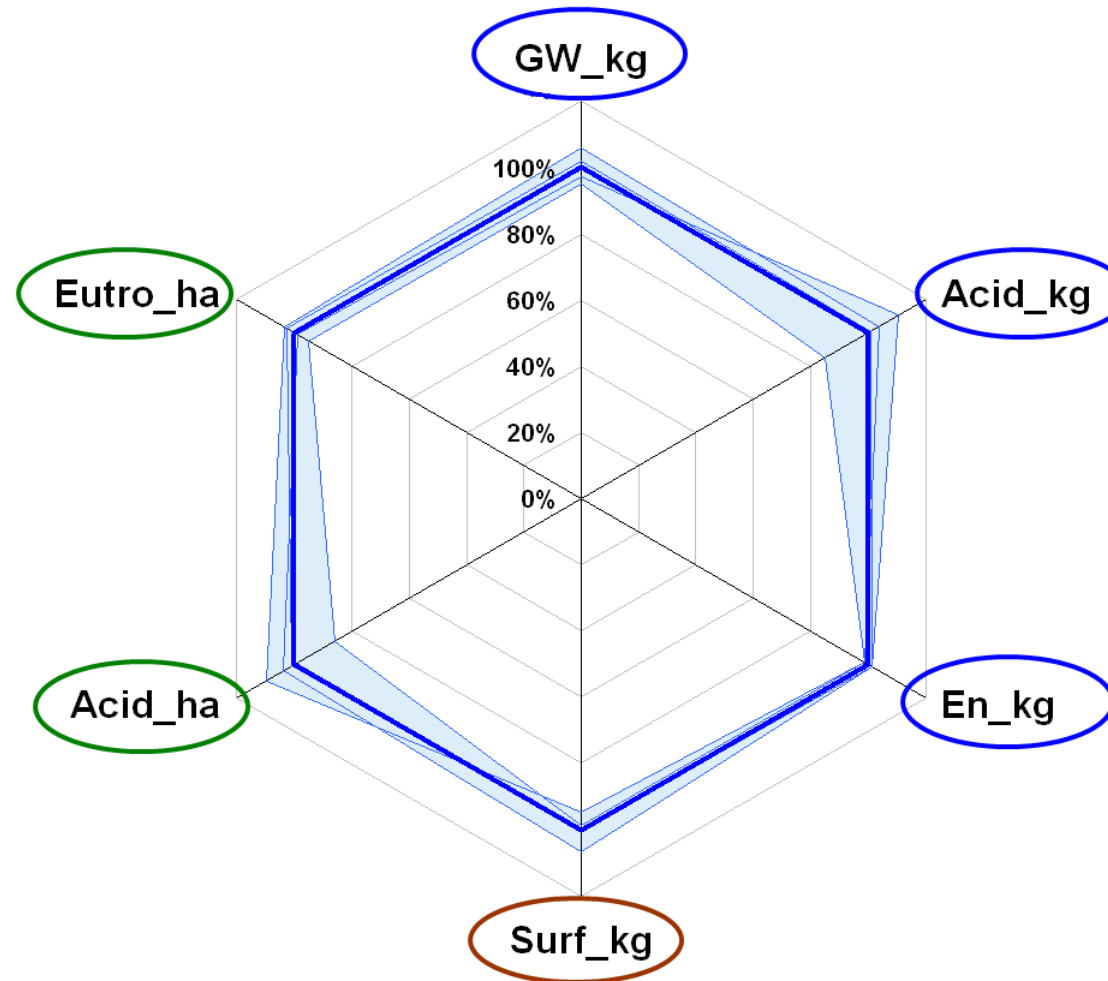
# Land use



# Integrated evaluation

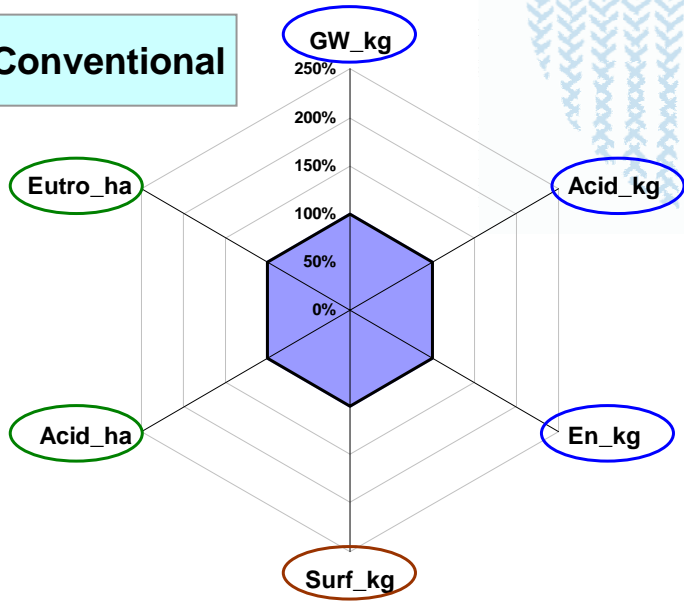
- Selection of criteria
  - Local impact (per ha of land use)
    - Eutrophication
    - Acidification
  - Global impact (per kg product)
    - Global warming
    - Energy use
    - Acidification
  - Land use
    - Feed
    - Outdoor raising

# Results for conventional systems

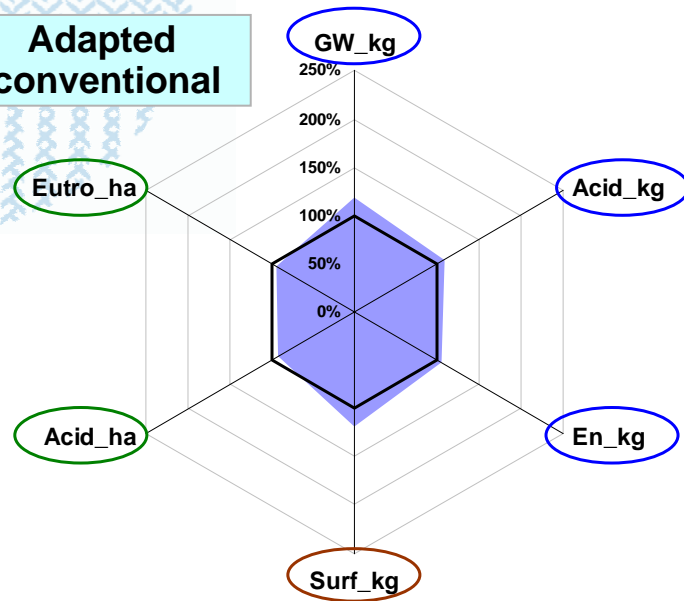




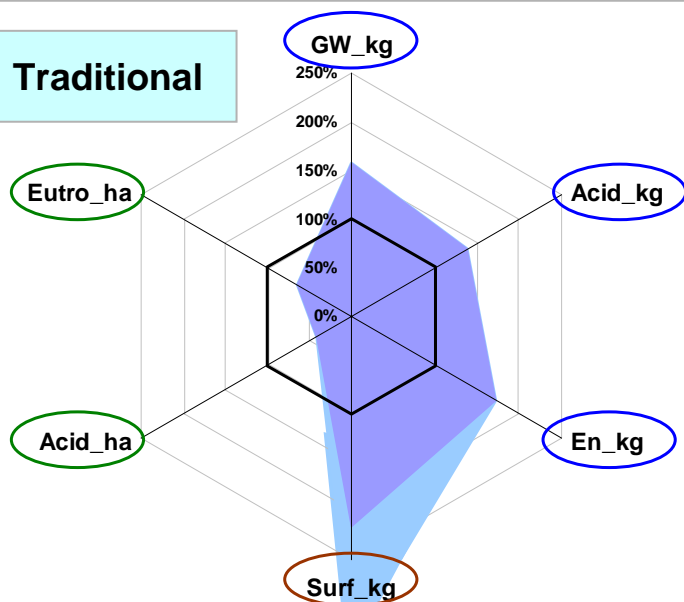
### Conventional



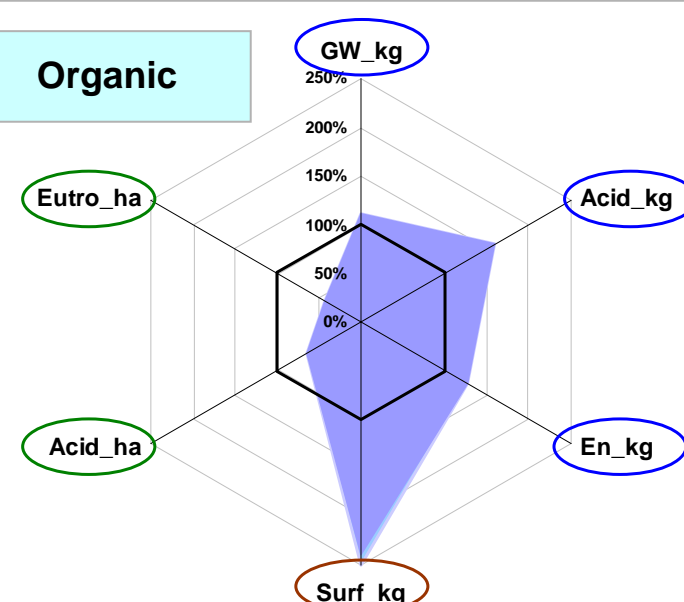
### Adapted conventional



### Traditional



### Organic



# Conclusion

## ✓ LCA approach

- ✓ Allows the discrimination of production systems

## ✓ Results

- ✓ Highly dependent on functional units
- ✓ Conventional systems => better for global impact (/kg)
- ✓ Alternative systems = better for local impact (/ha)

## ✓ Perspectives

- ✓ Use of others functional units : € of pork  
=> the value of products are very different
- ✓ Integrate with the others dimensions of sustainability