



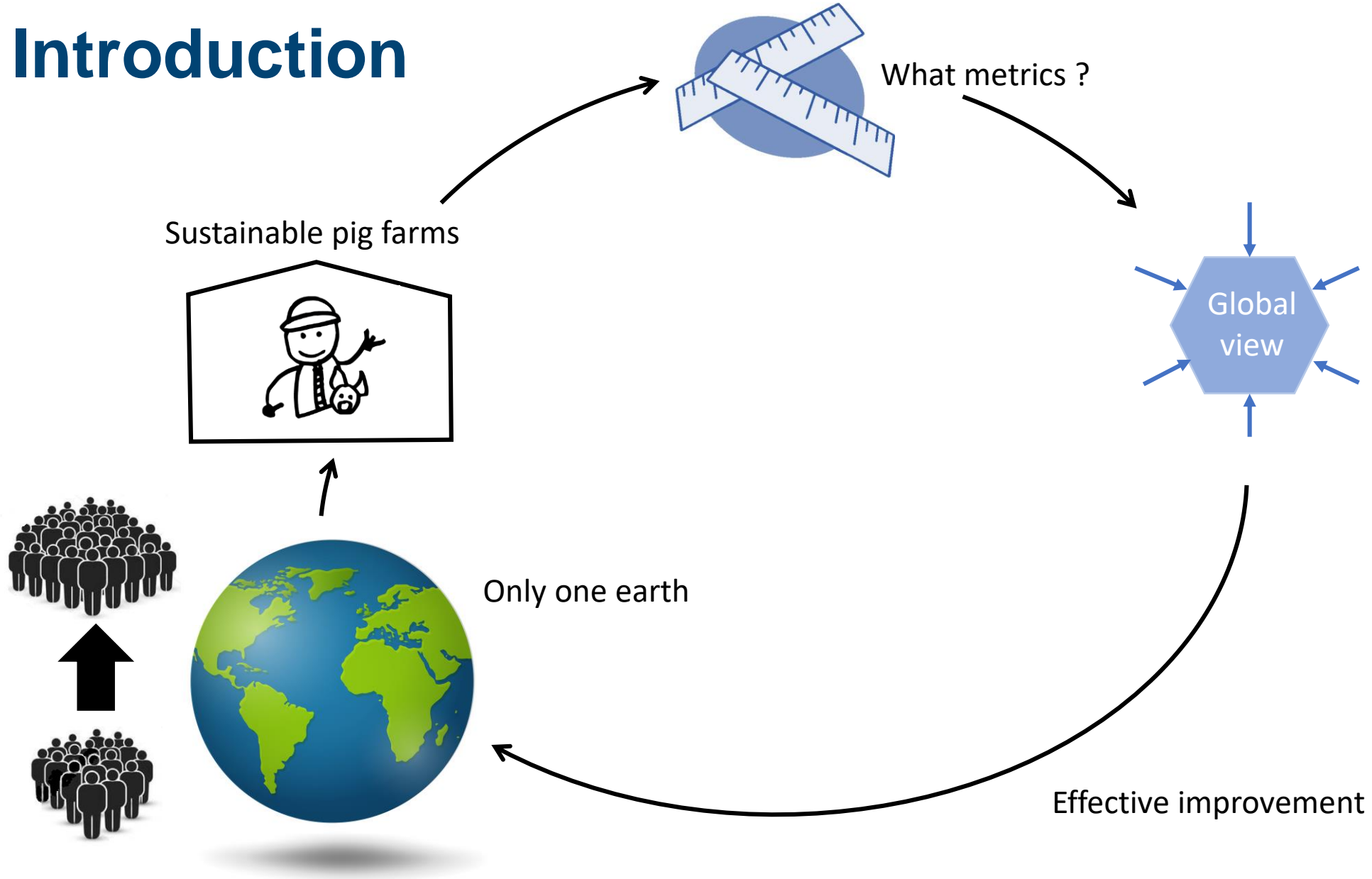
Use of inedible feed in the pork industry, feed efficiency: sustainability metrics, calculating tools, including C footprint

Animal Task Force, Brussels – 18 November 2021

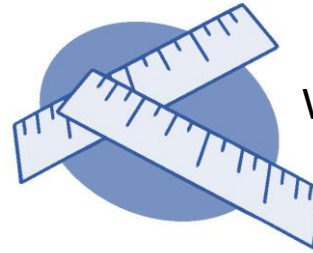
Sandrine ESPAGNOL

Expert in environmental assessment of pig farms

Introduction

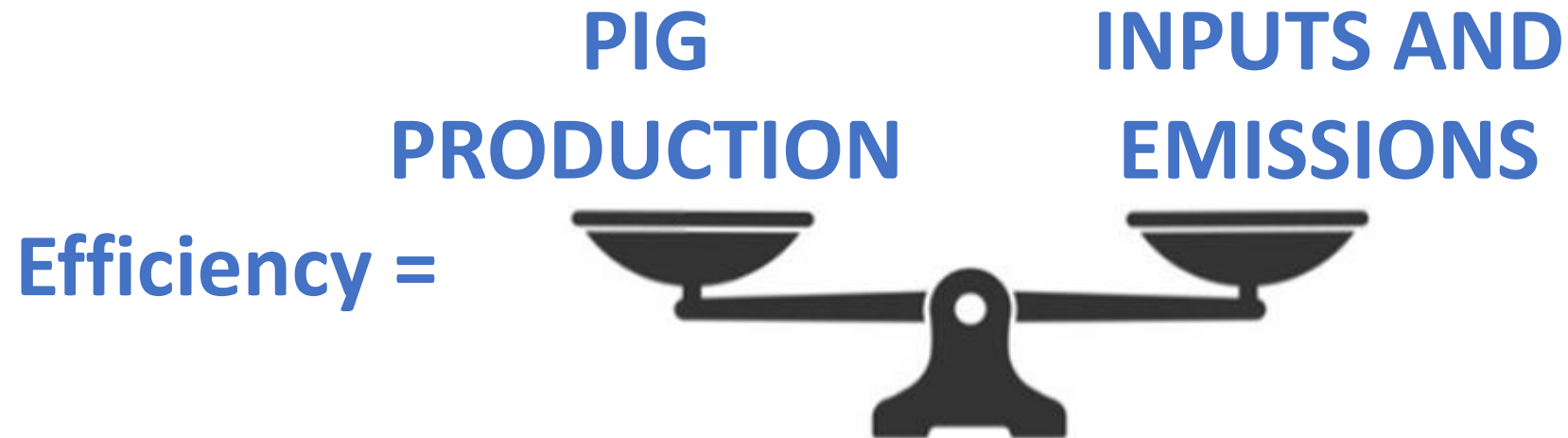


Introduction



What metrics ?

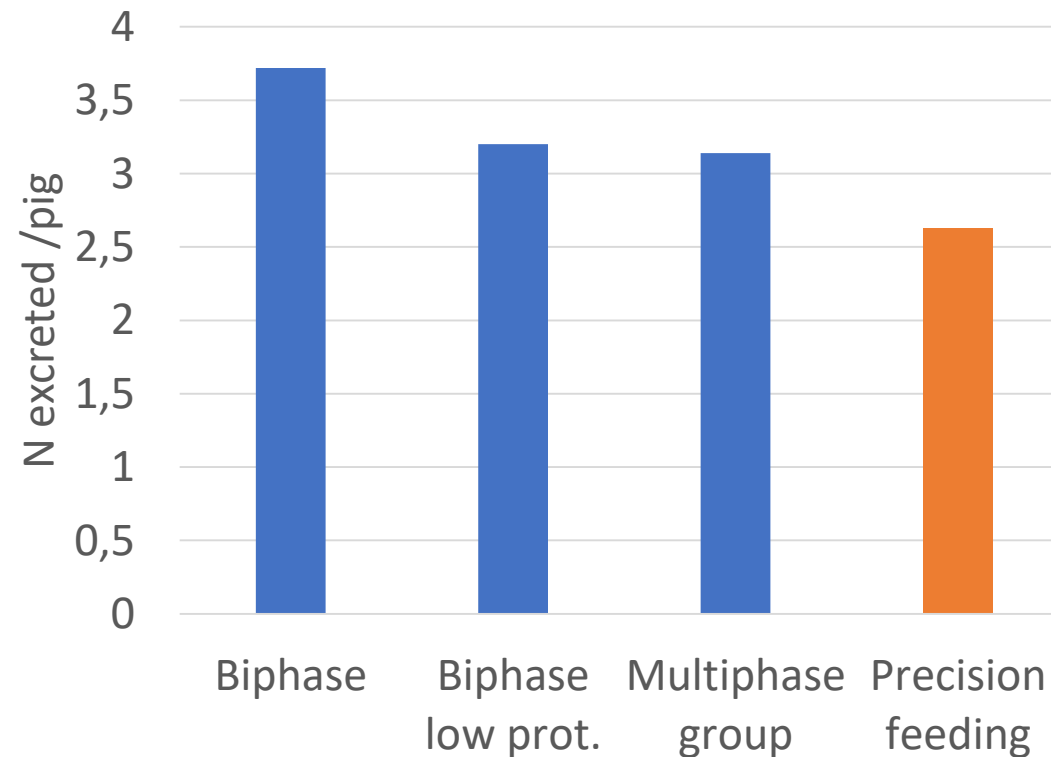
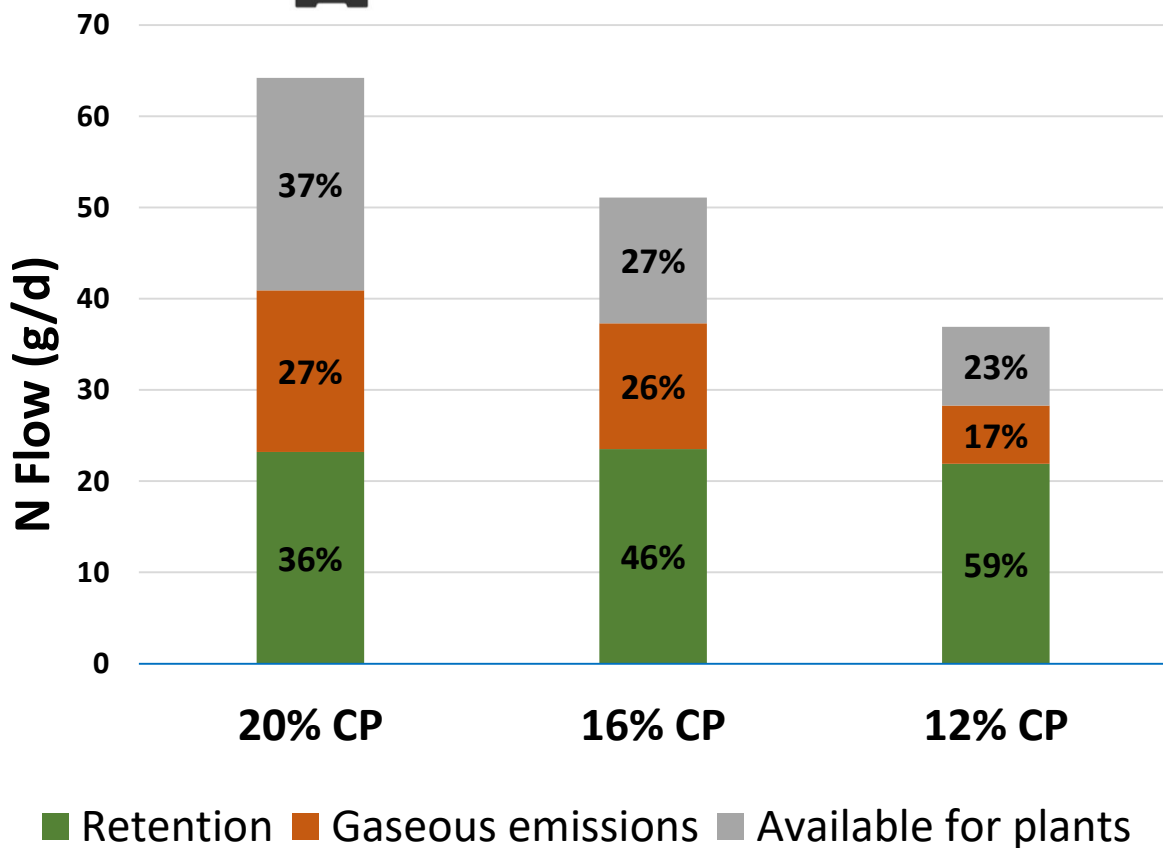
The issues: produce food with less environmental impacts

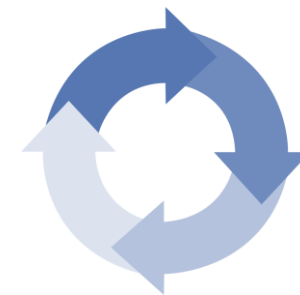




Efficiency at animal scale

$N \text{ retained} / N \text{ intake} = \text{Animal N efficiency}$





Efficiency at life cycle assessment level

Ex : kg
eq CO₂ / kg pig



=C footprint

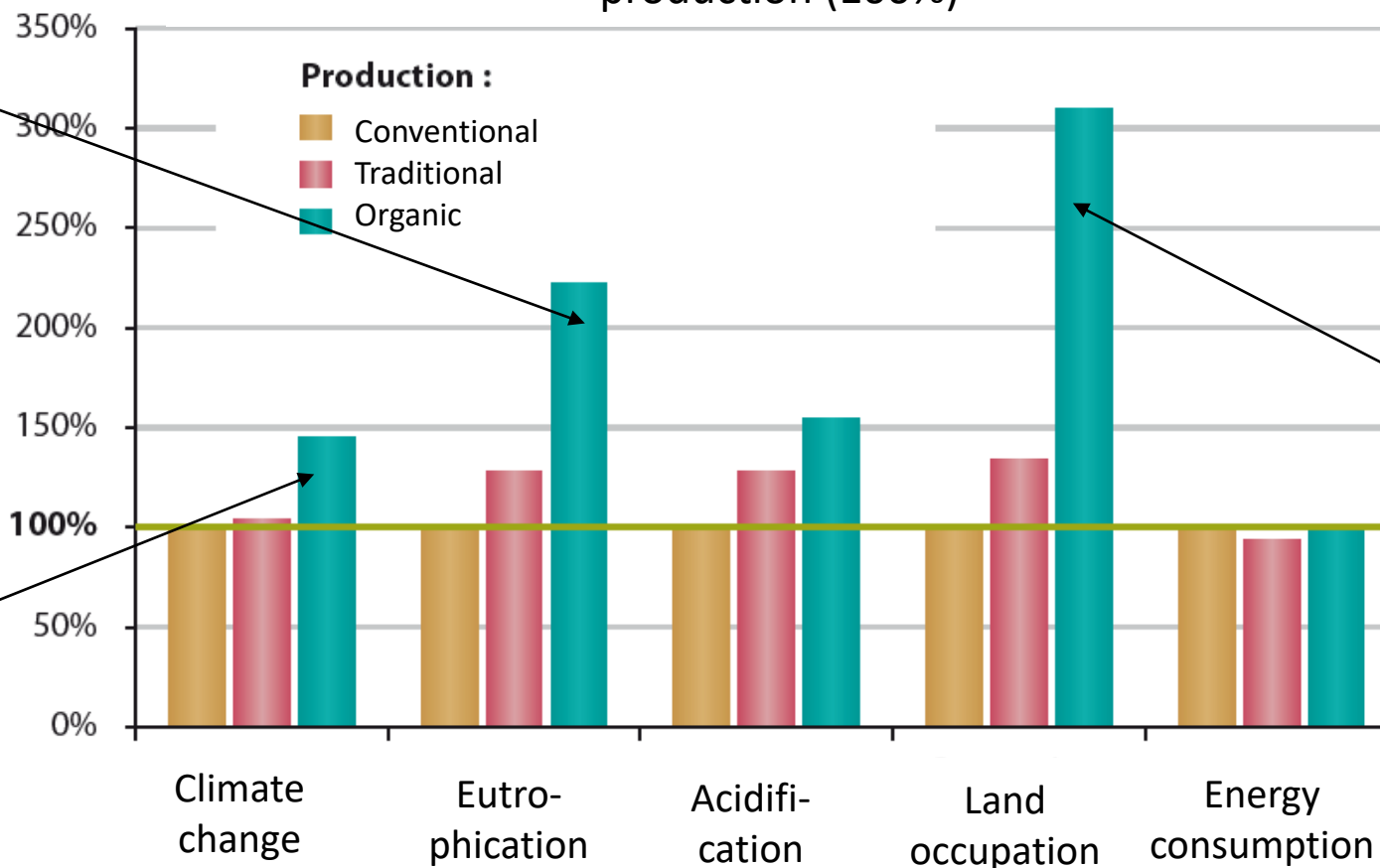
Results of LCA per kg of pig compared to conventional production (100%)

Access to outdoor :
nitrates leaching

Technical performances
(productivity, feed conversion ratio)

Extensive system
which needs more space

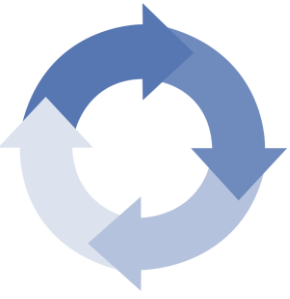
Use of straw in buildings
(greenhouse gas emissions)



Agribalyse : Espagnol, 2015

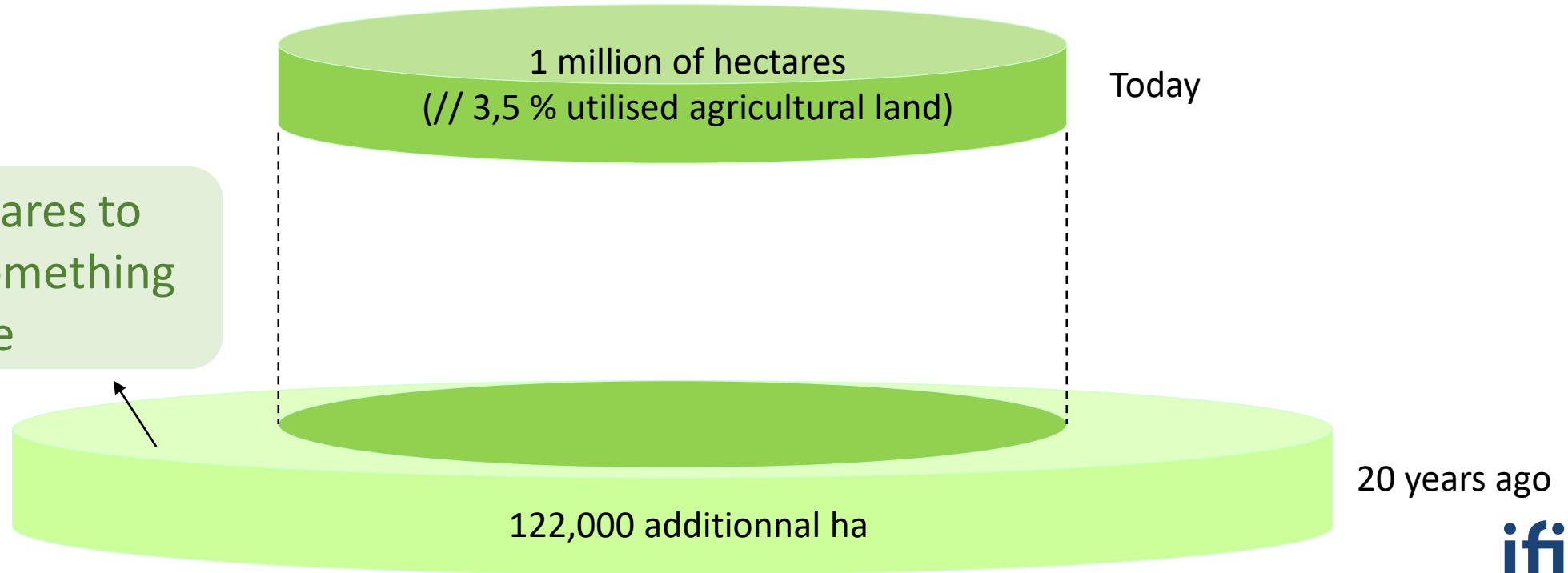
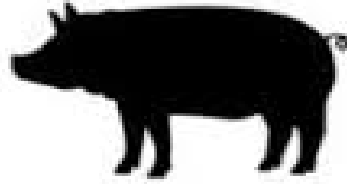
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5 Institut du porc

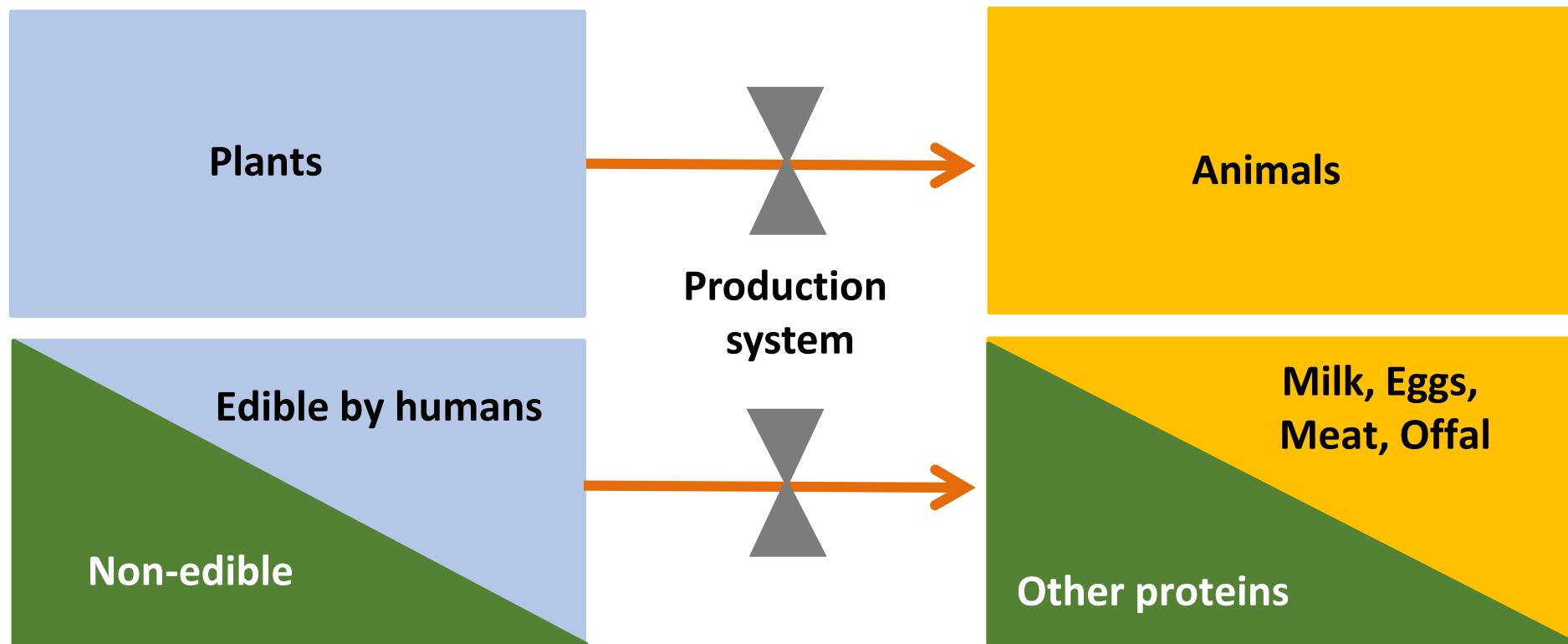
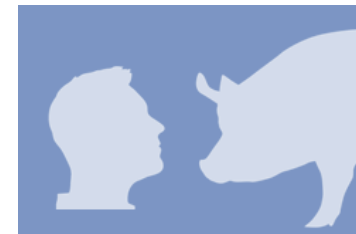


Efficiency at life cycle assessment level

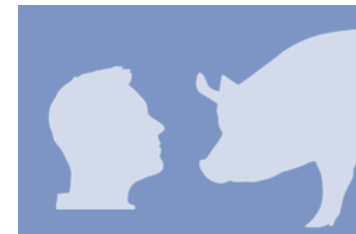
Land use by the French pig production



Protein efficiency



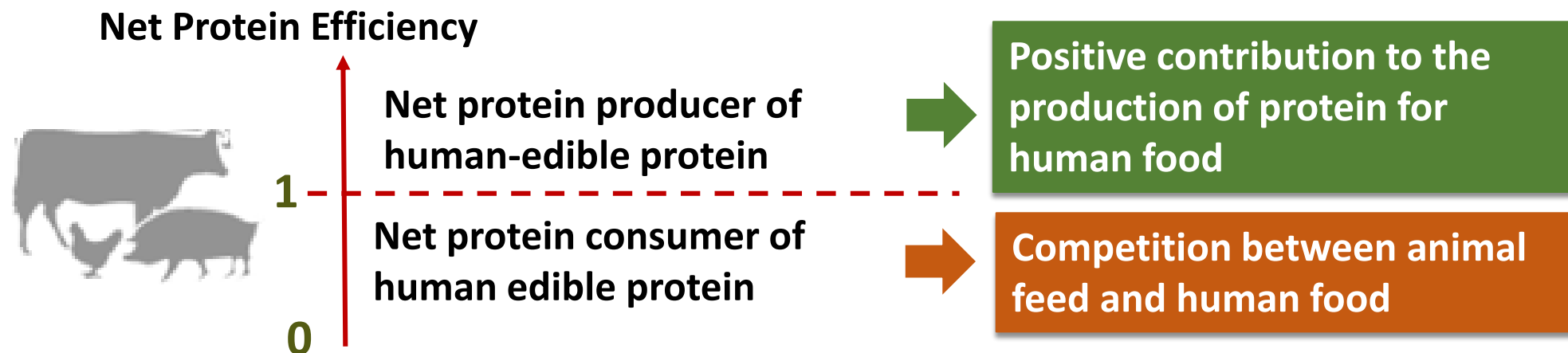
The competition only concerns the human-edible fraction that is consumed by animals !



Net protein efficiency

$$\text{NET protein efficiency} = \frac{\text{Kg produced of animal « human edible » protein}}{\text{Kg intake by animals of « human edible » plant protein}}$$

Interpretation :

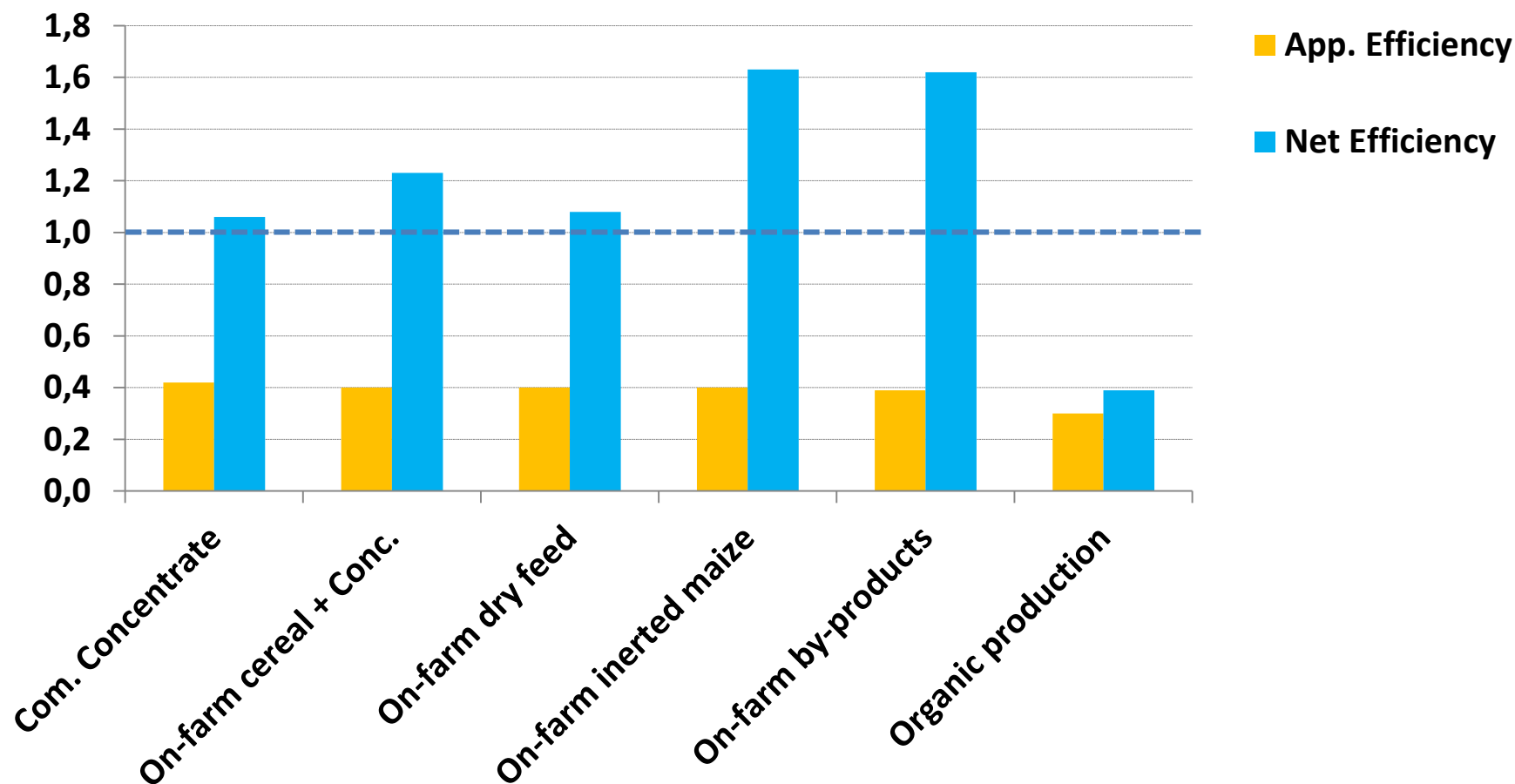


Laisse et al. (2018)



Net protein efficiency

Effect of pig feeding on protein apparent and net protein efficiency



Laisse et al. (2018)

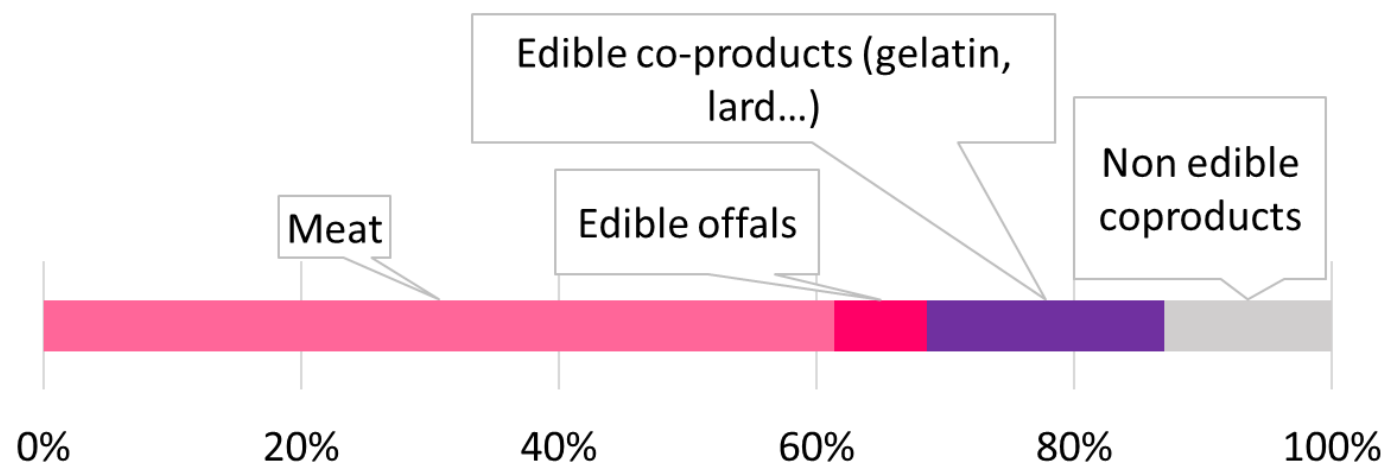


Net protein efficiency

1. Human-edible fraction of protein in animal feed ingredients

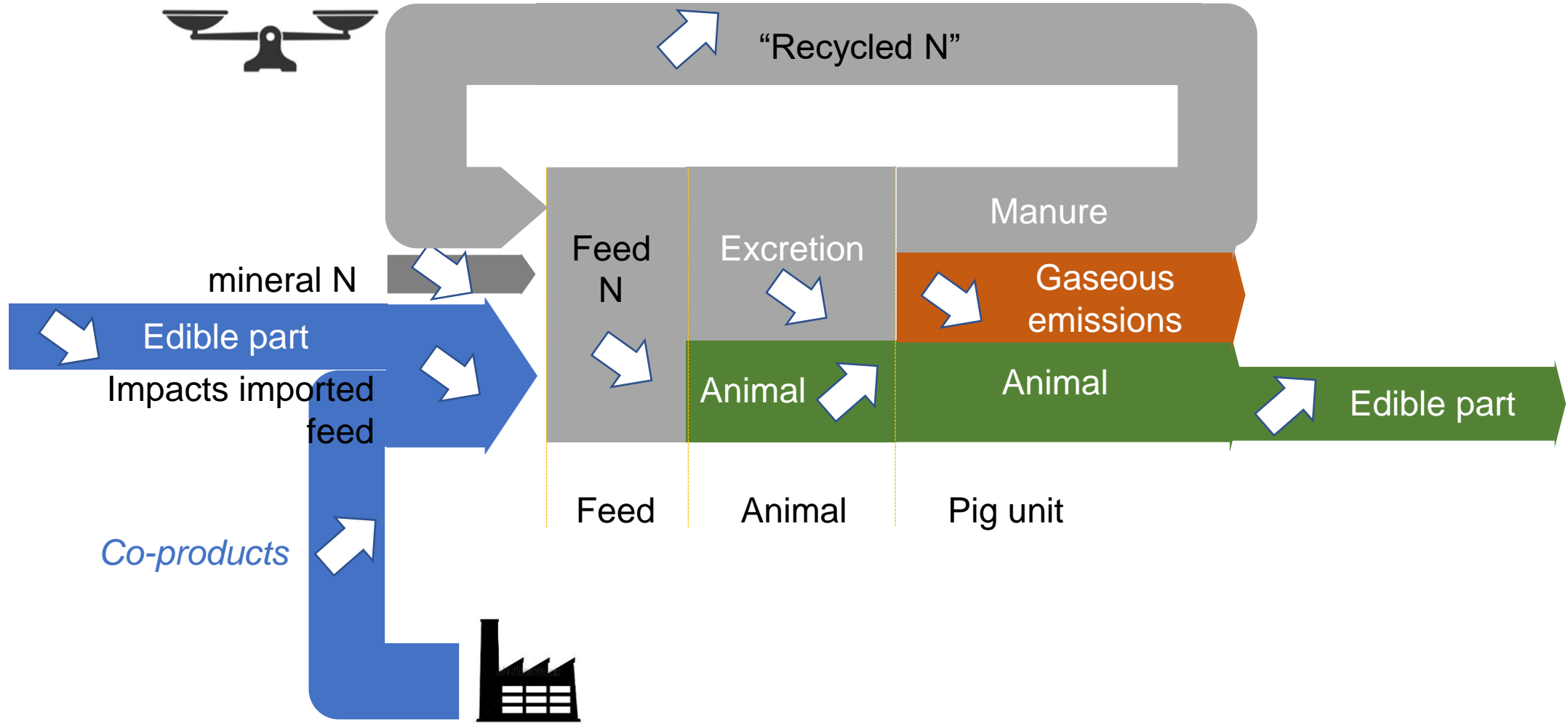
	Protein
Pasture	0
Maize Silage	10
Maize grain	15
Wheat grain	66
Peas grais	74
Rapeseed grain	0
Wheat co-products	90
Soybean meal	60
Rapeseed, sunflower meal	0
Other co-products	0

2. Proteins from a pig



Complementarity of efficiencies at different levels

$\frac{\text{Kg animal edible protein}}{\text{kg feed edible protein}}$
 = Protein efficiency



A tool



Gestion Environnementale des Élevages Porcins

- Assessment of environmental performances of pig units
 - Since 2014
 - References
 - Benchmarking
- Deployment
 - 611 farmers
 - 749 environmental assessments
 - 115 advisors trained to support farmers
- Tool in the case of Label Bas Carbone in France

Indicators		
Natural resources consumption	Water	Consumed water (l/kg of growth)
	Energy	Nonrenewable energy consumption (kWh/kg of growth)
Manure	Nitrogen	N excreted (g N/kg of growth)
	Phosphorous	N at pig unit gate (g N/kg of growth)
Gaseous emissions	NH ₃	Phosphorous excreted (g P ₂ O ₅ /kg of growth)
	GES	Direct emissions of ammonia (g NH ₃ /kg of growth)
Waste production	Waste	Emissions of greenhouse gazes (kg eq CO ₂ /kg live weight pig at farm gate)
		Waste produced (g waste/kg of growth)

Optimization of the pig system

- Efficiency and that's all?
 - Central in the environmental assessment of pig production
 - Different from cattle production where an extensification could be associated to more carbon storage
- In pig production the intensification is often associated to more efficiency
 - No correlation with more impacts per ha because in regulation the surface of spreading is adapted to the size of the pig unit
- The limit in pig production comes more from the animal welfare

Take-home messages

- Efficiency is good for the environment
- New challenges for the future
 - Diversified stakes to consider (welfare, environment, quality of life, profitability)
 - Changing context: Adaptation to climate change, new farmers, new consumers
 - Searching for compromise: multicriteria optimization
- Place and relevance of having a diversity of livestock systems (some based on industrial ecology, others based on agroecology)
- Choice should be made at macroscopic level of territorial agricultural systems linked to food systems
 - Global environmental results
 - Ability to feed people

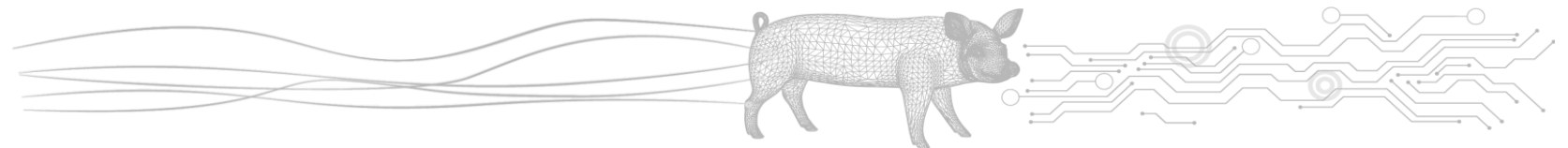


Thanks for your attention

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The case of Label Bas Carbone



GOALS

Helping to invest in projects reducing the carbon impact

Offset companies' polluting emissions by financing low-carbon projects

Creation of a virtuous circular economy on French territory