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

Animal Task Force, Brussels – 18 November 2021

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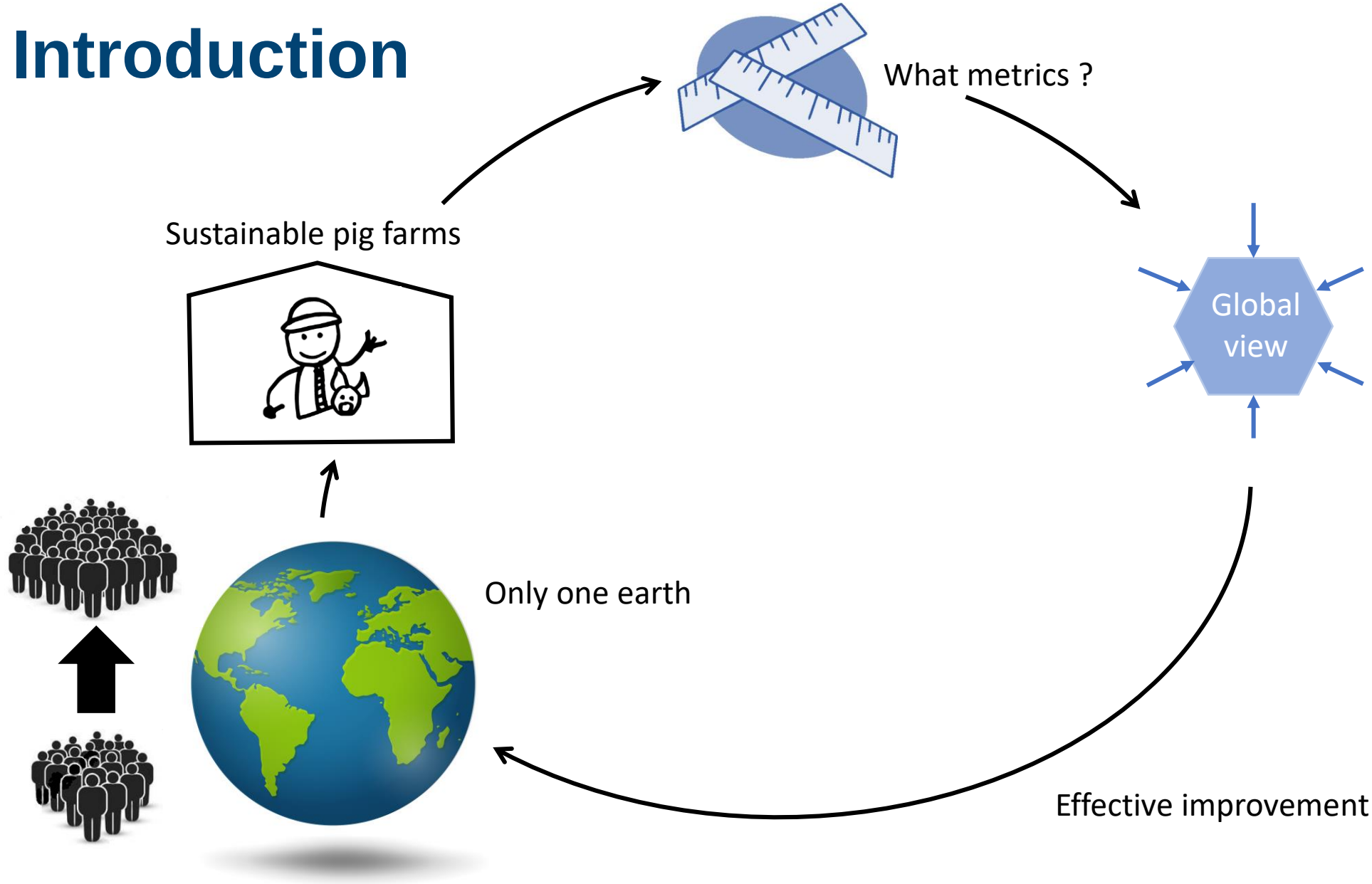
**Expert in environmental assessment of pig farms**

# Introduction



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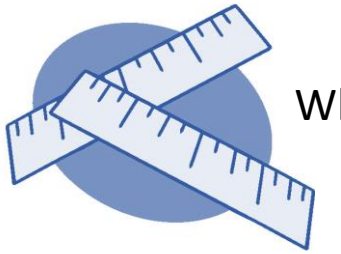
# Introduction



What metrics ?

The issues: produce food with less environmental impacts

**Efficiency =** **PIG PRODUCTION** / **INPUTS AND EMISSIONS**



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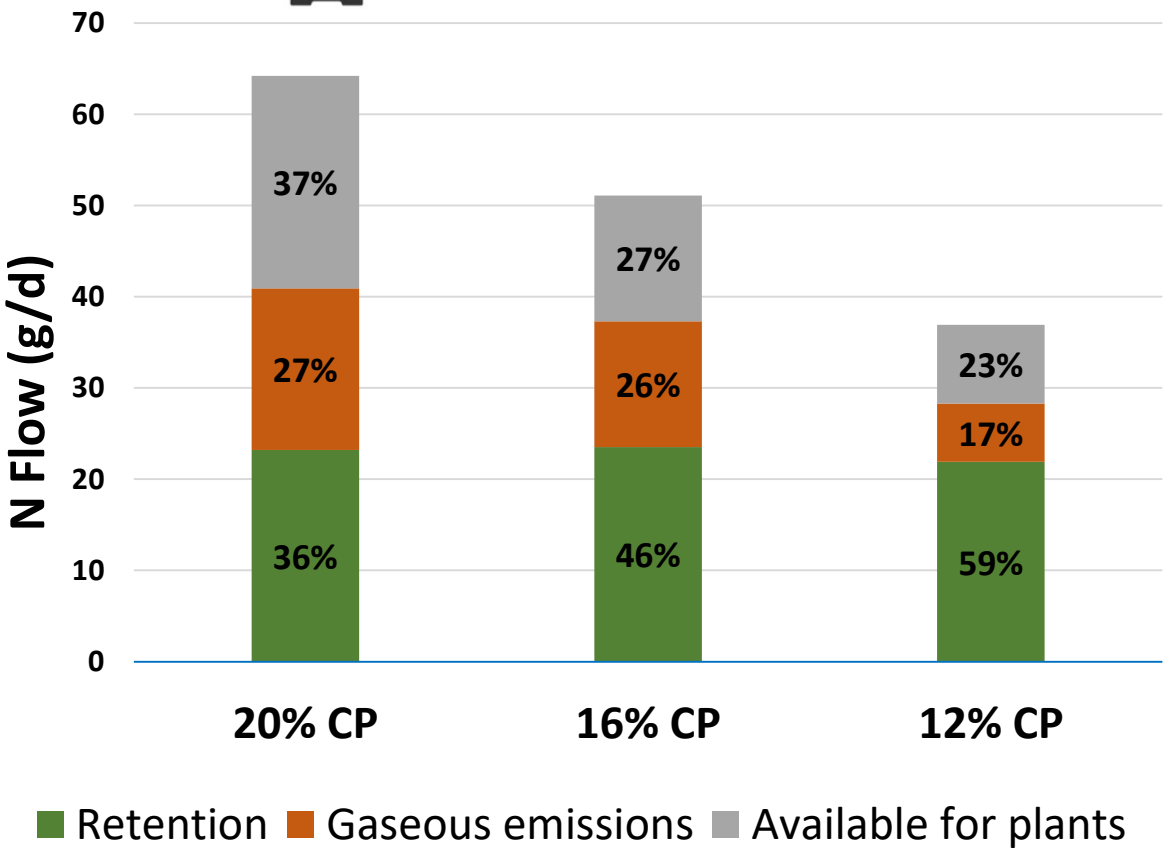
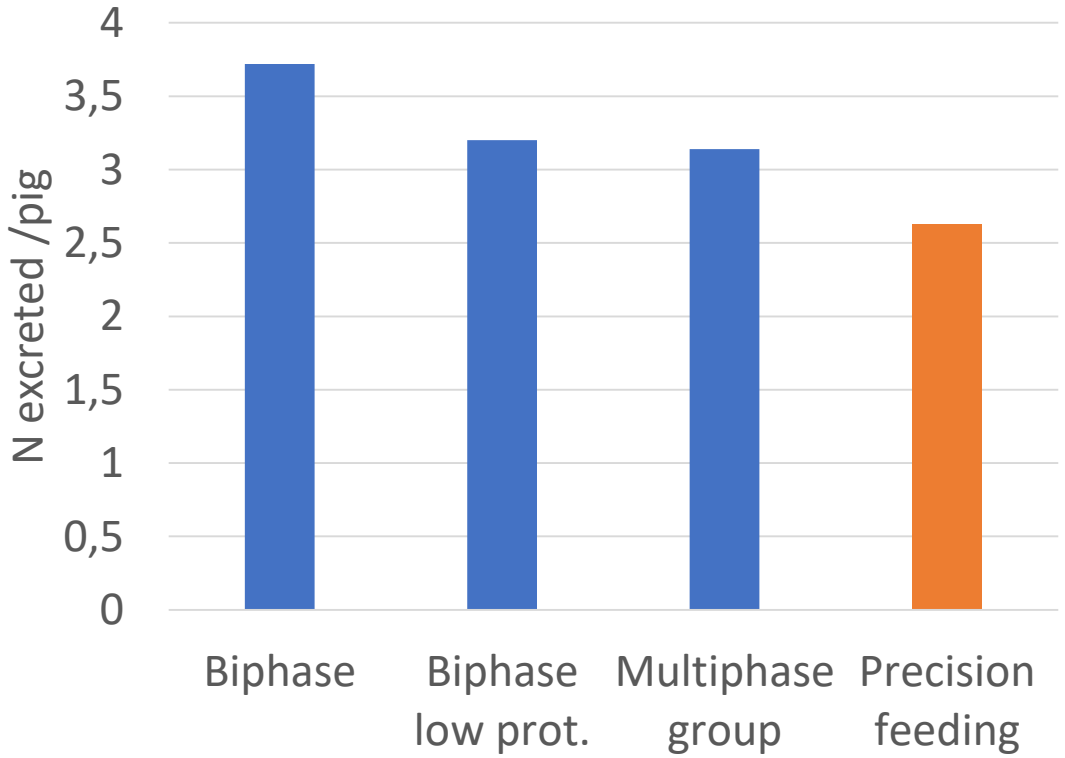
# Efficiency at animal scale

N retained / N intake =Animal N efficiency




*Portejoie et al., 2004*




*Garcia-Launay et al., 2020*



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# Efficiency at life cycle assessment level

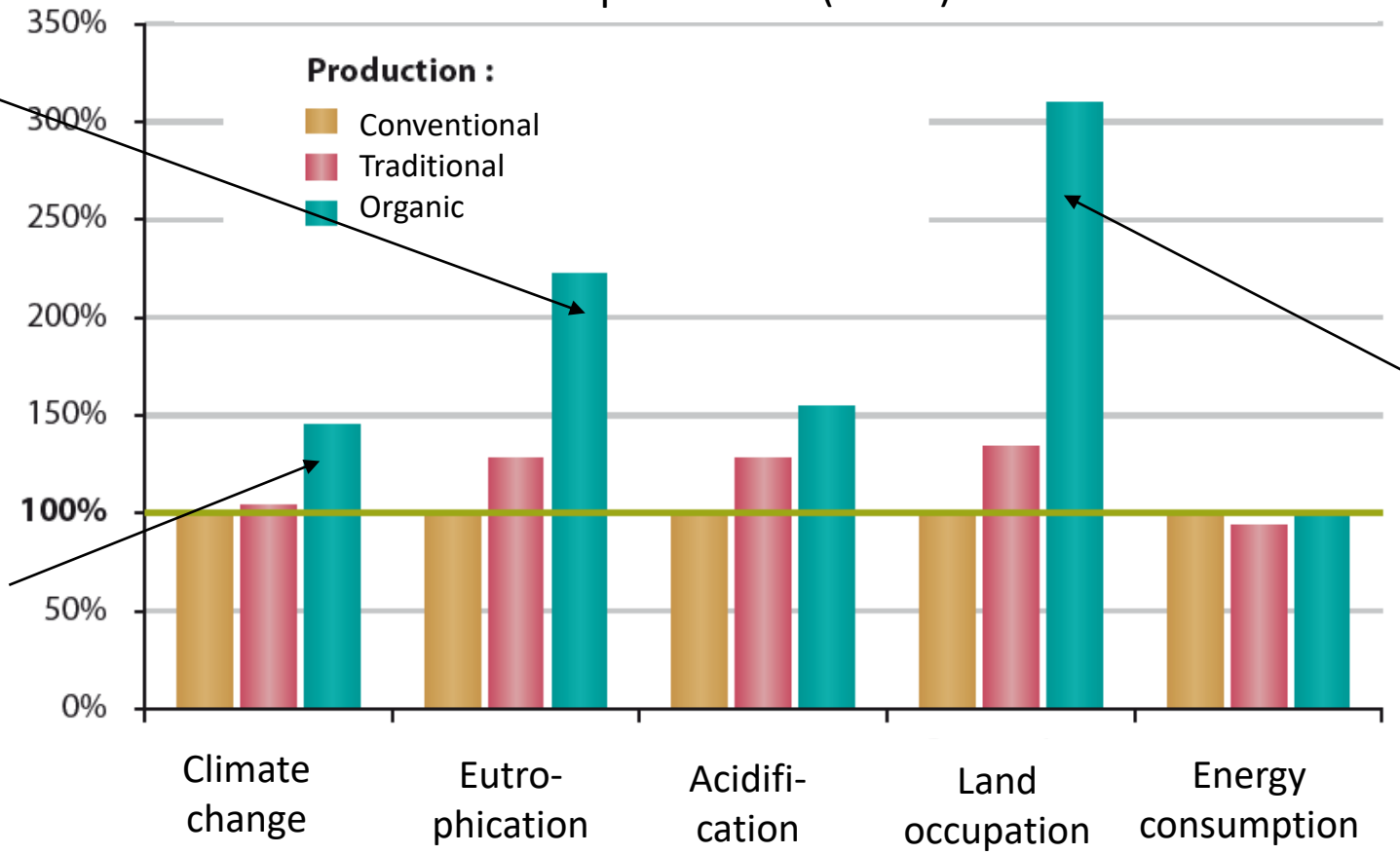
Ex : kg
eq CO2 / kg pig

=C footprint

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

Access to outdoor : nitrates leaching

Use of straw in buildings (greenhouse gas emissions)




Technical performances (productivity, feed conversion ratio)

Extensive system which needs more space

*Agribalyse : Espagnol, 2015*



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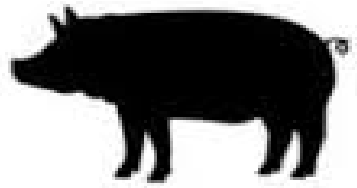
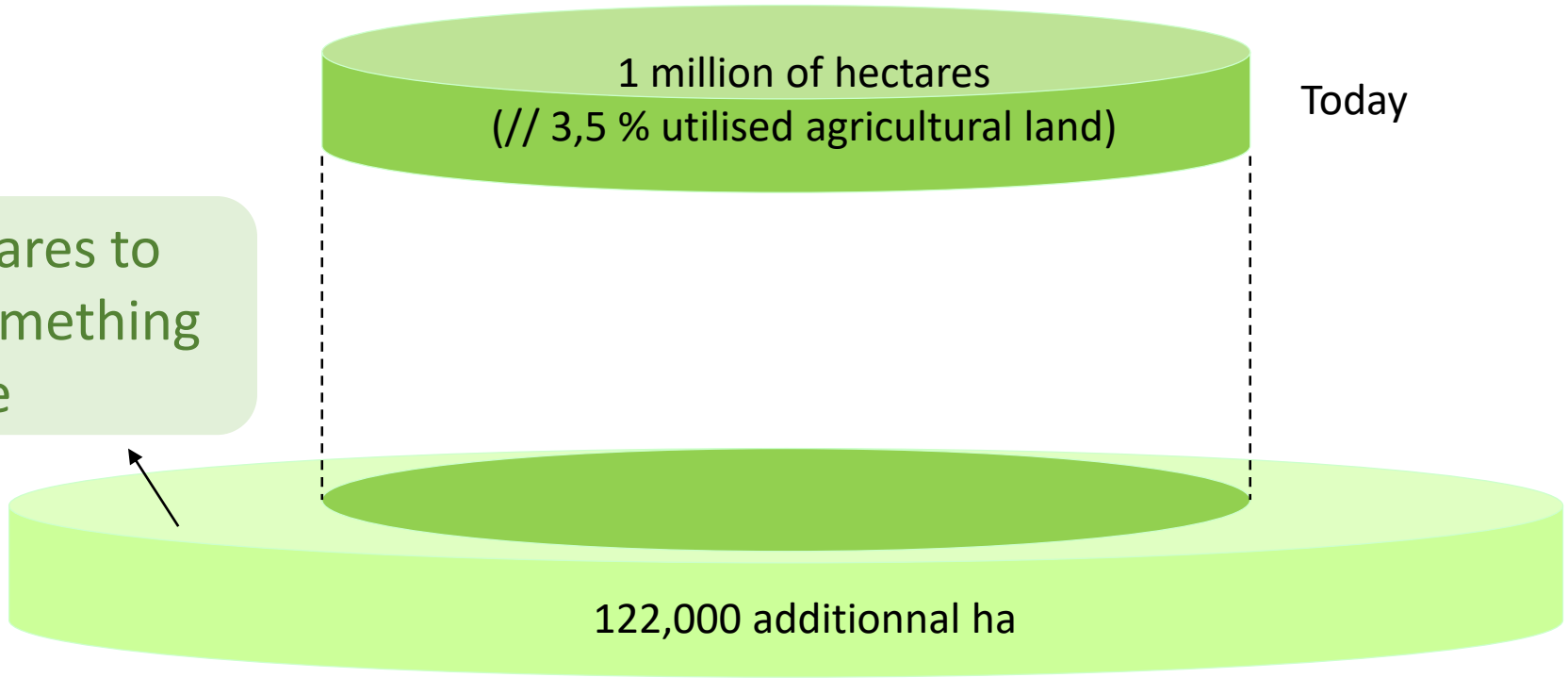
# Efficiency at life cycle assessment level

Land use by the French pig production



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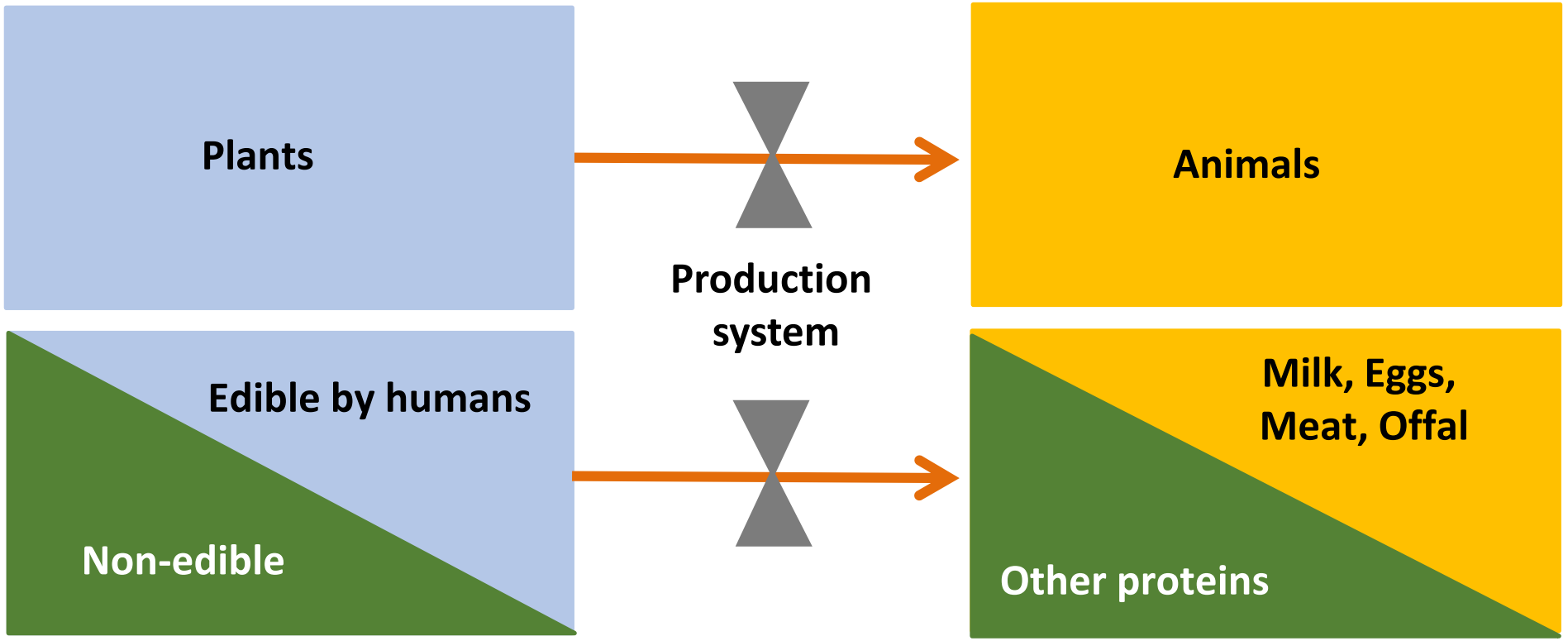
# Protein efficiency




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

Laisse et al. (2018)



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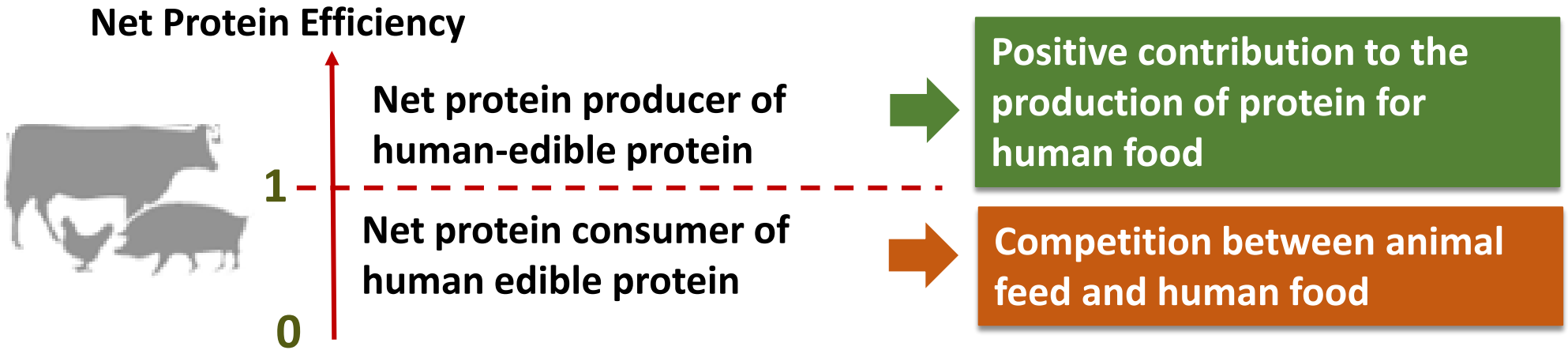
# Net protein efficiency

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

**Interpretation :**




Laisse et al. (2018)

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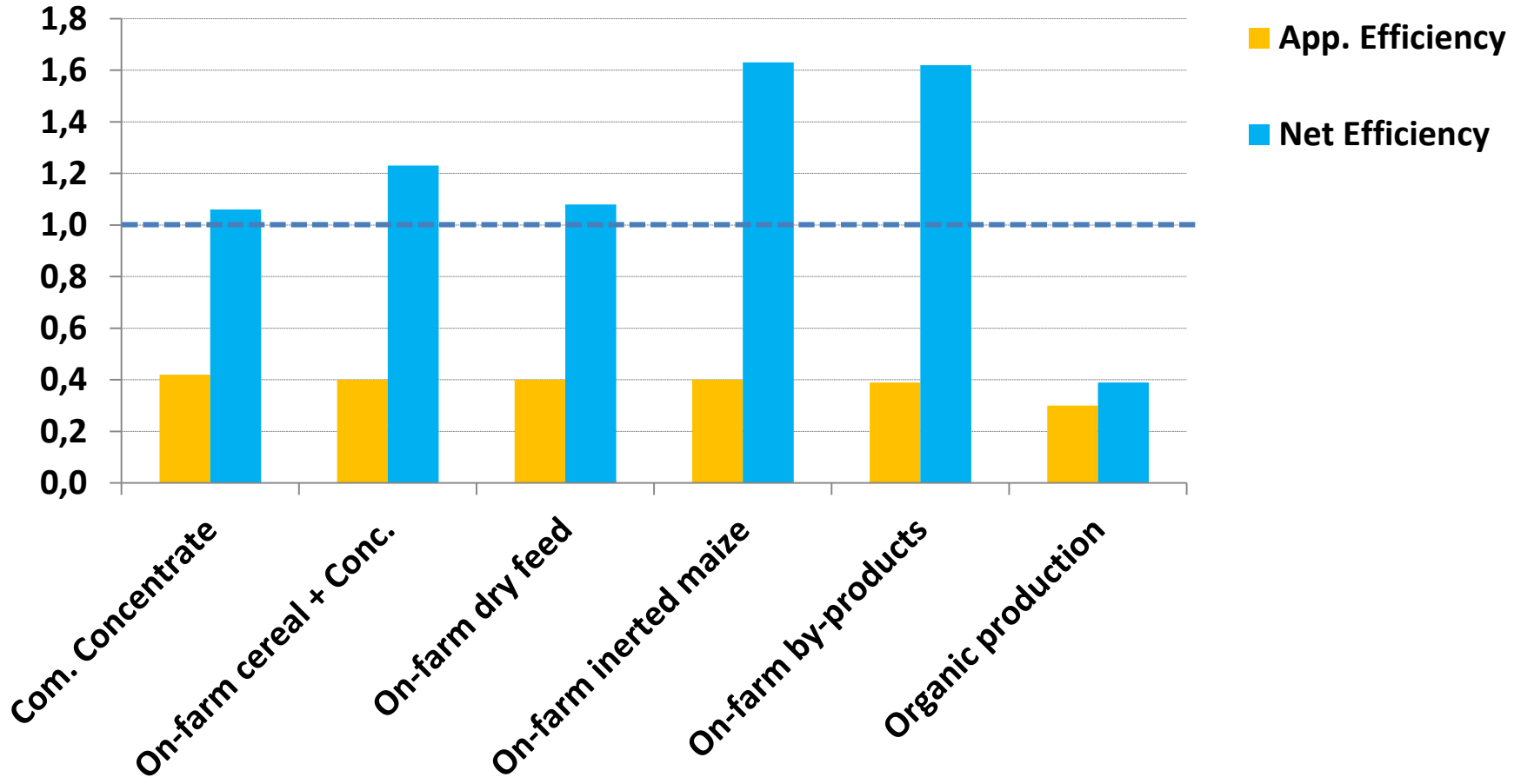
# Net protein efficiency

**Effect of pig feeding on protein apparent and net protein efficiency**




Laisse et al. (2018)



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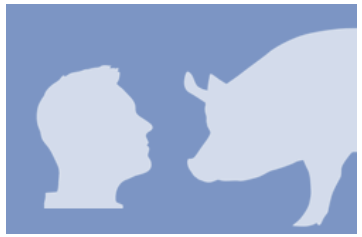
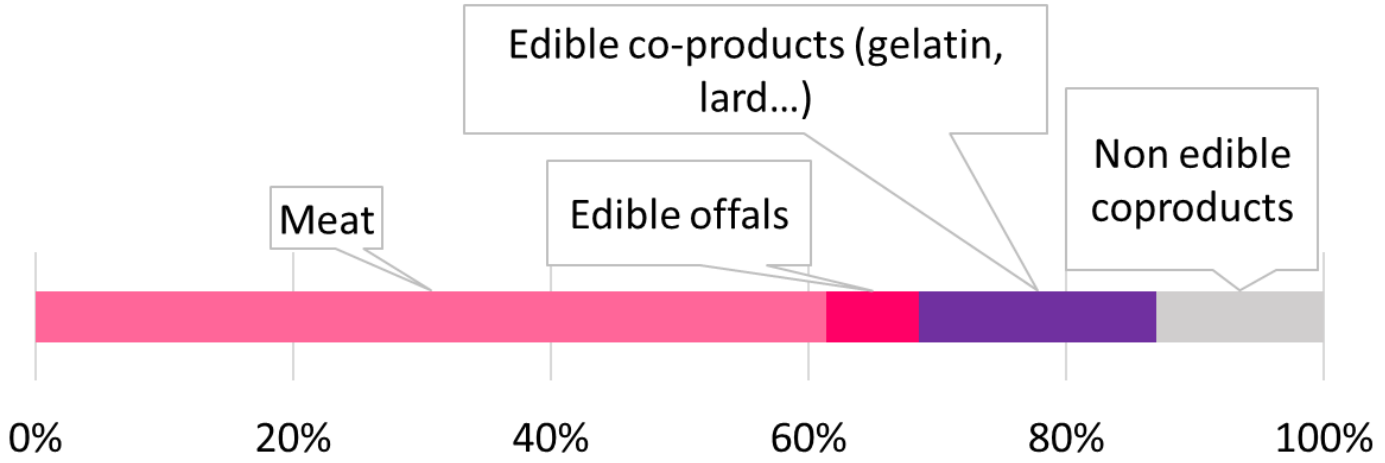
# Net protein efficiency



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

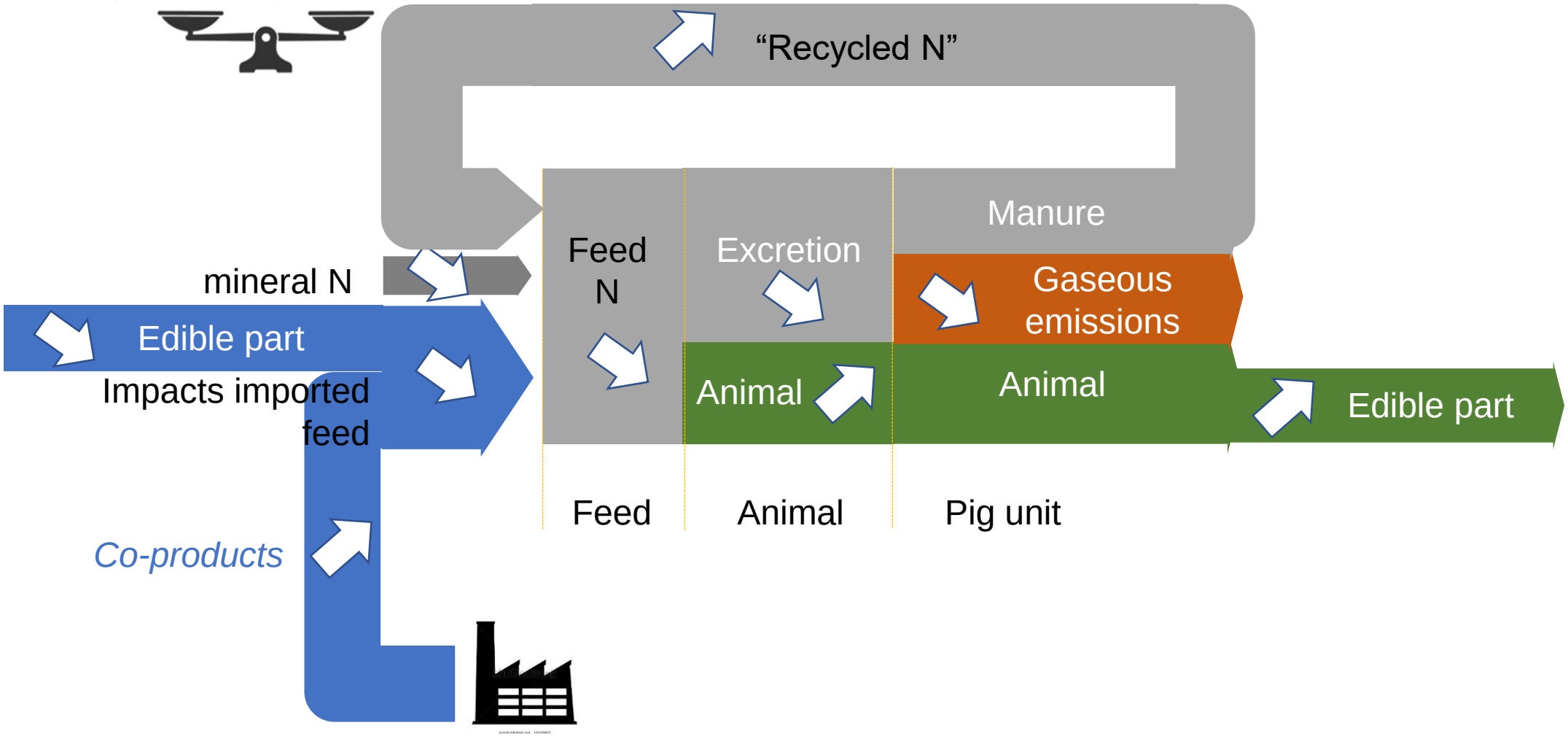
| | Protein |
|---|---|
| Pasture | 0 |
| Maize Silage | 10 |
| Maize grain | 15 |
| Wheat grain | 66 |
| Peas grais | 74 |
| Rapeseed grain | 0 |
| Wheat co-products | 90 |
| Soybean meal | 60 |
| Rapeseed, sunflower meal | 0 |
| Other co-products | 0 |

## 2. Proteins from a pig



# Complementarity of efficiencies at different levels

Kg animal edible protein / 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 ressources 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) |
| | | N at pig unit gate (g N/kg of growth) |
| | Phosphorous | Phosphorous excreted (g $P_2O_5$/kg of growth) |
| Gaseous emissions | $NH_3$ | Direct emissions of ammonia (g $NH_3$/kg of growth) |
| | GES | Emissions of greenhouse gazes (kg eq $CO_2$/kg live weight pig at farm gate) |
| Waste production | Waste | Waste produced (g waste/kg of growth) |



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# 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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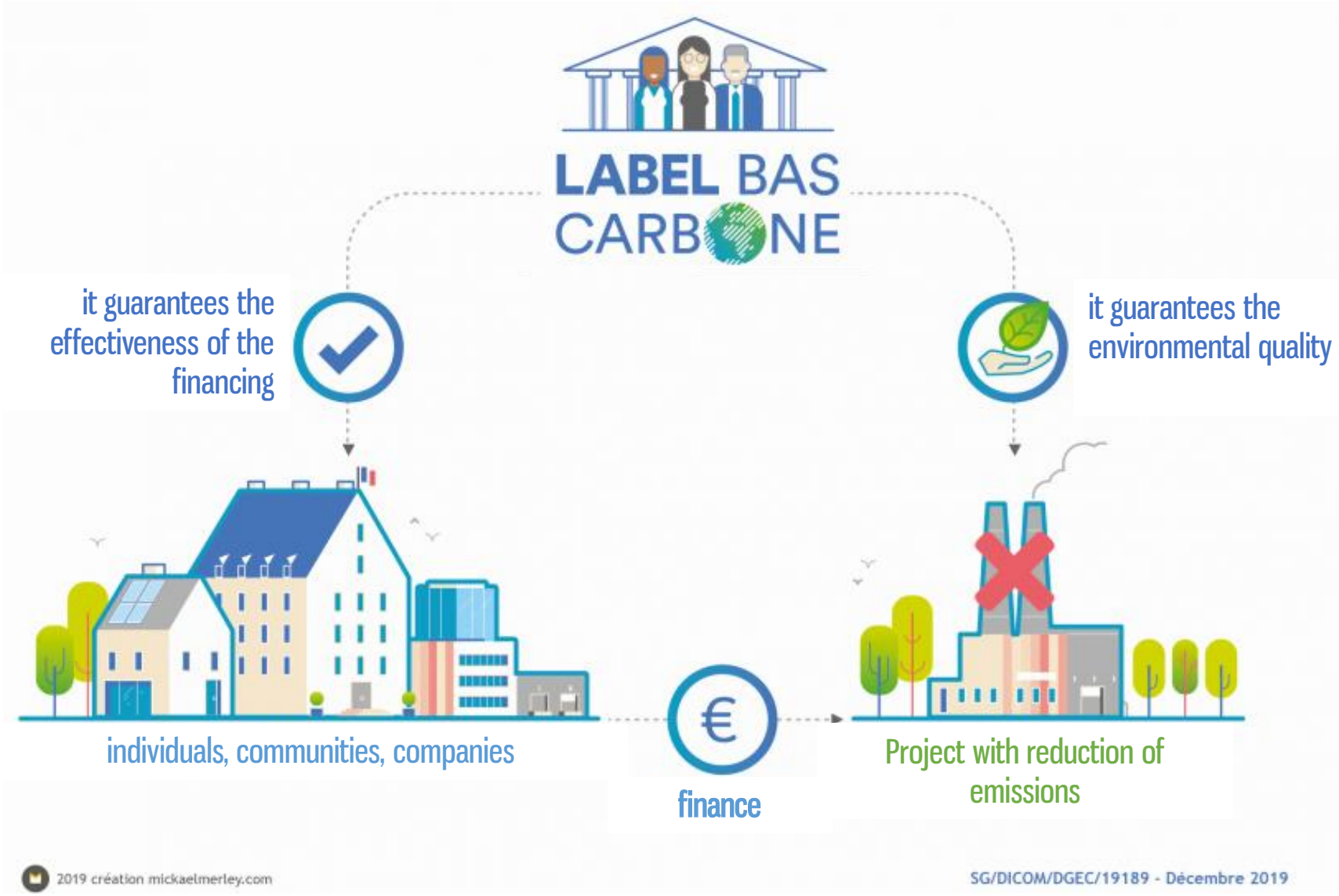
# The case of Label Bas Carbone




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



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