Integrated sustainability in pig production

Leman China conference, Chengdu, 27 October 2024

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A farmer who doesn't raise pigs is like a scholar who doesn't read books

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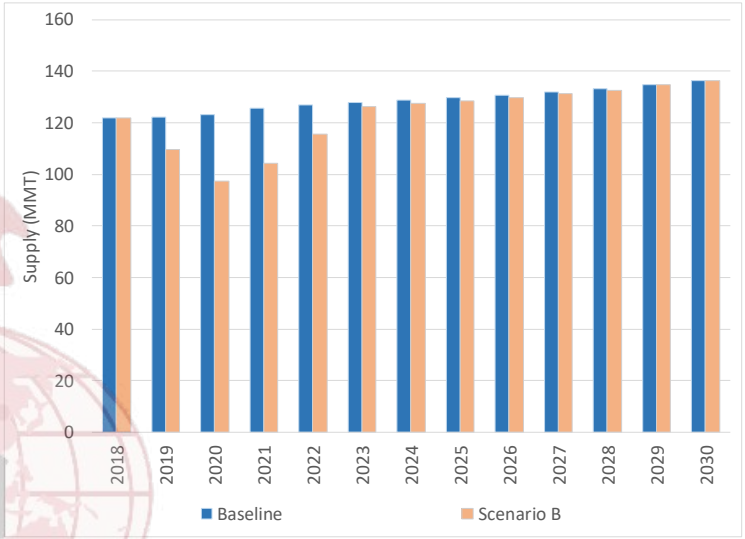
To explore the potential of nature to improve the quality of life

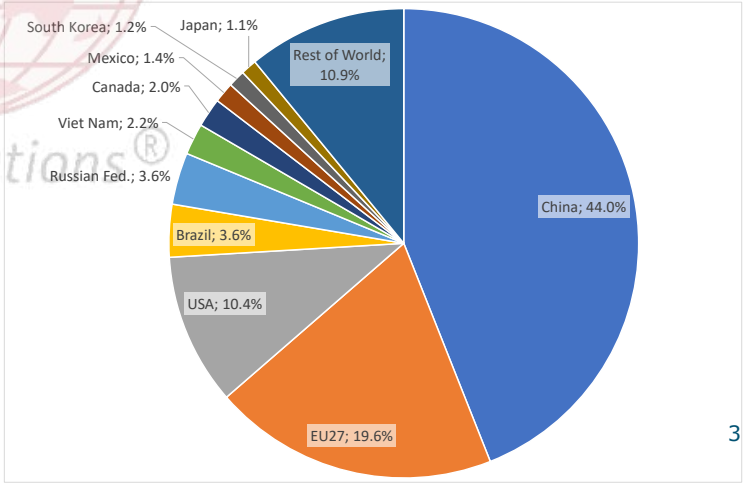
Photo: Rob Goossens

Pig meat for food

- Current production: 120 MMT (2021)
- Production 2050 est. 180MMT
- Increasing population and wealth
- Top-3: China – EU – USA



Based on Jongeneel et al., 2020



FAO (2021)

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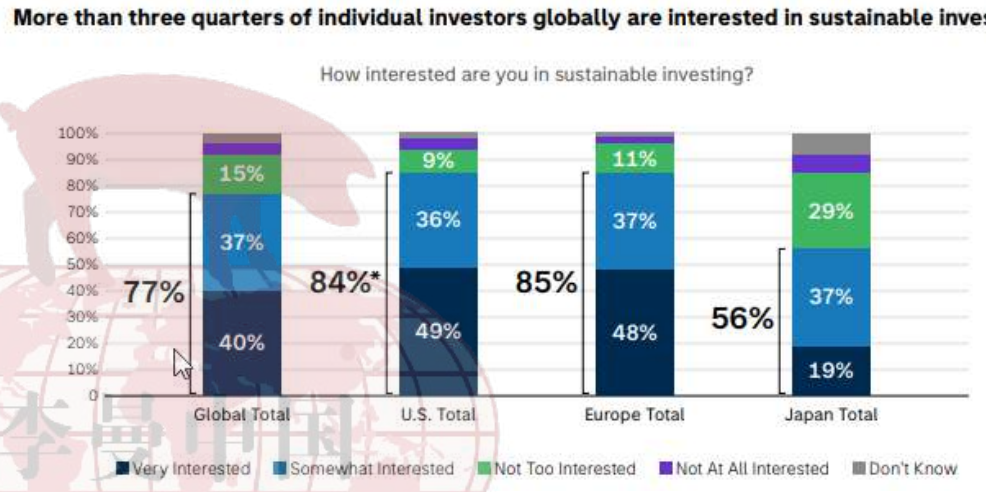
What then is Sustainability?

Sustainability is hot topic

- 77% investors demand for it
- Especially Millennials (96%) and Generation X (91%, in USA)



Source: Morgan Stanley, 2024

- European Union: Corporate Sustainability Reporting Directive

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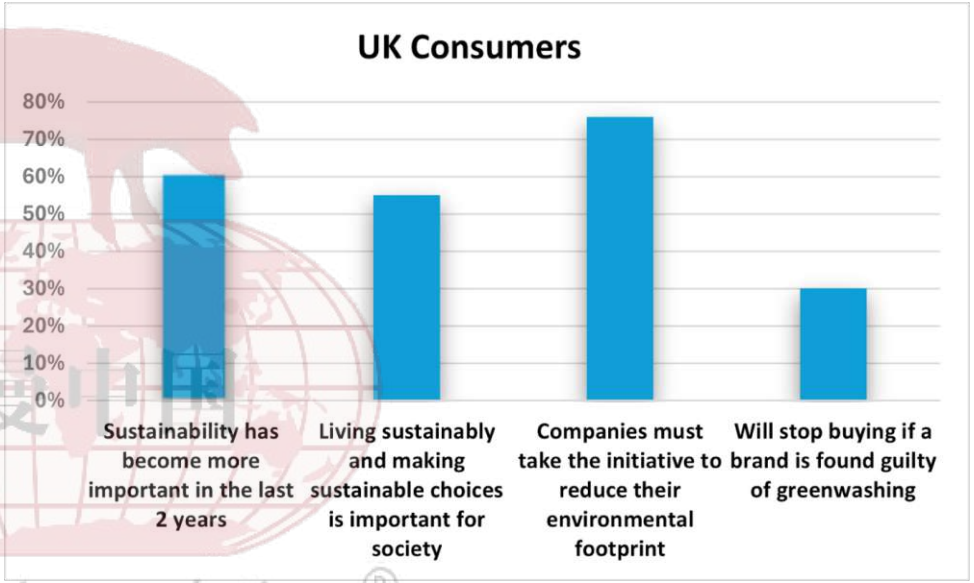
Also for consumers (although less)

- 60% UK consumers say sustainability more important
- 66% of all USA respondents consider sustainability when making a purchase
- In China, 41% of consumers say they want eco-friendly products

Source: McKinsey, 2020



Source: Meaningful planet

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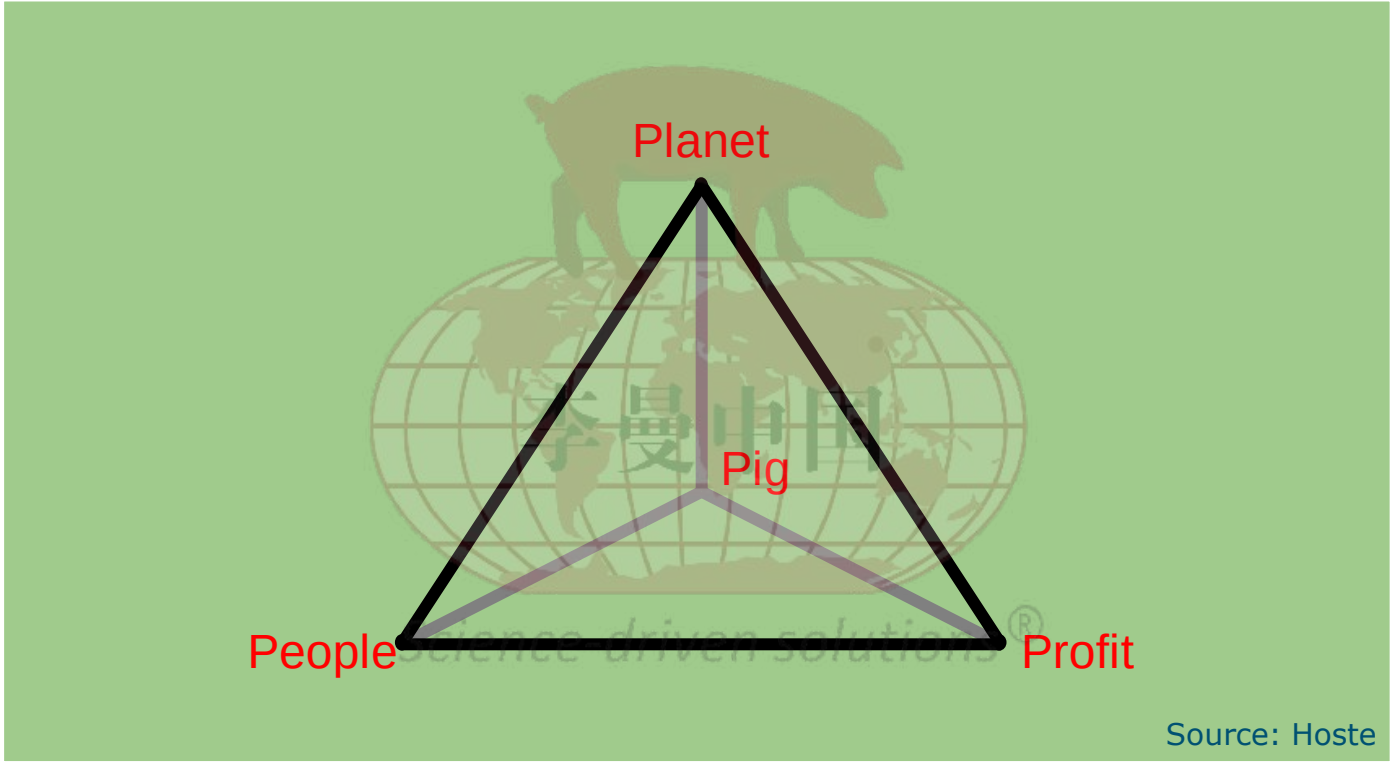
Different approaches about Sustainability

- Brundtland (1987): “Meeting the needs of the present without compromising the ability of future generations to meet their own needs”

4P concept of sustainability



Source: Hoste

1. People

Photo: Pluimveeweb Agrio

- Concerned employees and skilled managers
- Lack of workers – increase efficiency, automation
- Smart farming, only for smart farmers
- Product safety – integrated supply chain control
- Societal acceptance

➔ Unlock human skills: awareness, responsibility, drive

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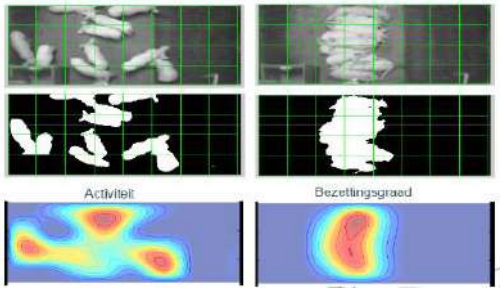
Sensors and big data

Current use of sensor data
- Controlling environment
- Controlling feed/water
- Weighing & sorting
- Connecting data: cloud-based solutions

Future developments
- Strong growth of new sensor-based applications
- Affordable RFID tags for all individual pigs
- Bio sensors (Lab on a Chip): detecting pathogens
- Non-invasive sensors: monitor health and welfare status by camera, audio, thermal and NIRS technology



Sources pictures: Boerderij, Fancom, Nedap, AgriSyst

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2. Pig

- Animal health & biosecurity
- Animal welfare
- Zootechnical performance

➔ Focus on animals

Photo's: WUR; Robert Hoste

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Breeding robust & resilient pigs

- **Robust & resilient** contributes to sustainable animal farming
    - Able to cope with more dynamic living conditions and wider range production systems (better use of local resources)
    - Better health (less medication & wasted resources due to clinical symptoms and mortality)
    - Opportunities for better animal welfare (more stimulating environment)
- Paradigm shift in animal farming: From controlling disturbances to absorbing their impact

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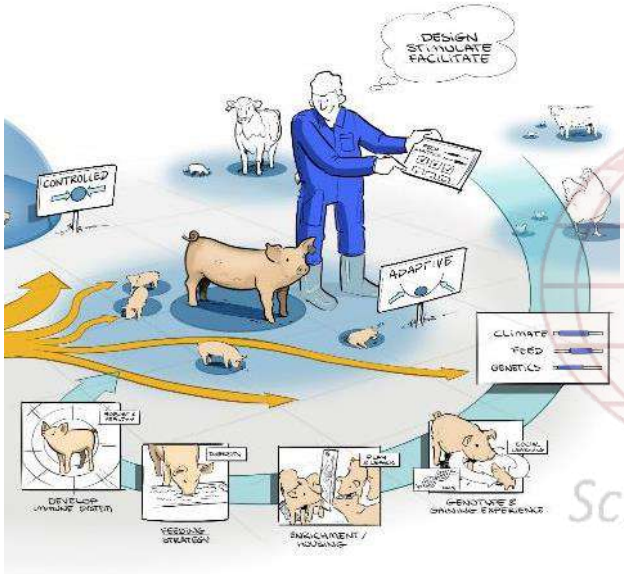
Van der Lee et al., 2022; Ten Napel et al., 2016

Healthy and resilient livestock



- Diminish the risk factors with hygiene measures and vaccination
- Meanwhile increase resilience of animals to improve the intrinsic capacity of the animal

Van Dixhoorn et al., 2016

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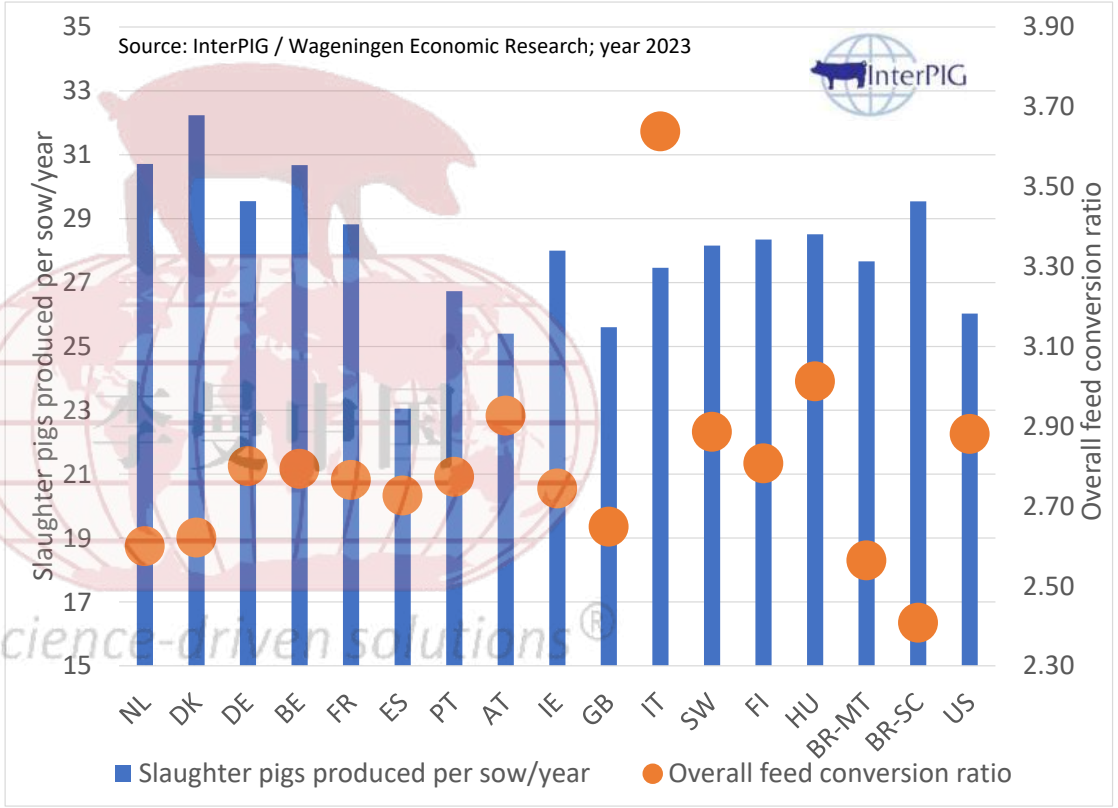
Huge efficiency potential

Variation among countries

MSY 15 – 32

OFCR 2.4 - >4.0

Overall feed conversion ratio: total feed consumption farrow-finish, per kg live weight output



Source: InterPIG / Wageningen Economic Research; year 2023

Efficiency development

Increasing performance needed, ánd possible

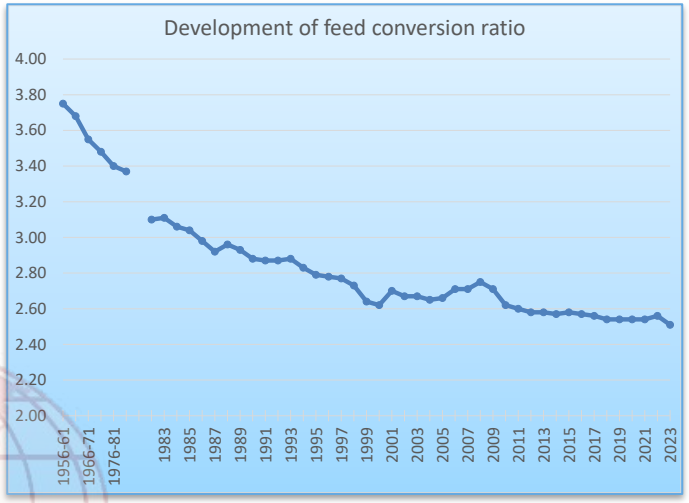
Assume improved efficiency:

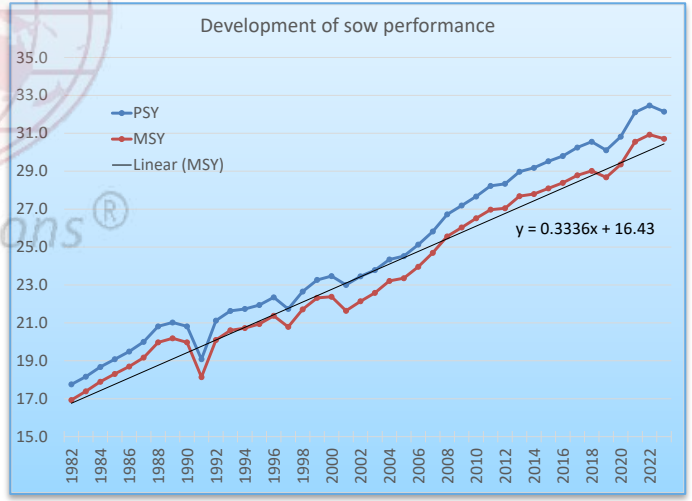
MSY 16 → 22

OFCR 4 → 3

Same feed amount: +33% pig meat

And -30% sows needed





Source: WUR and undisclosed source

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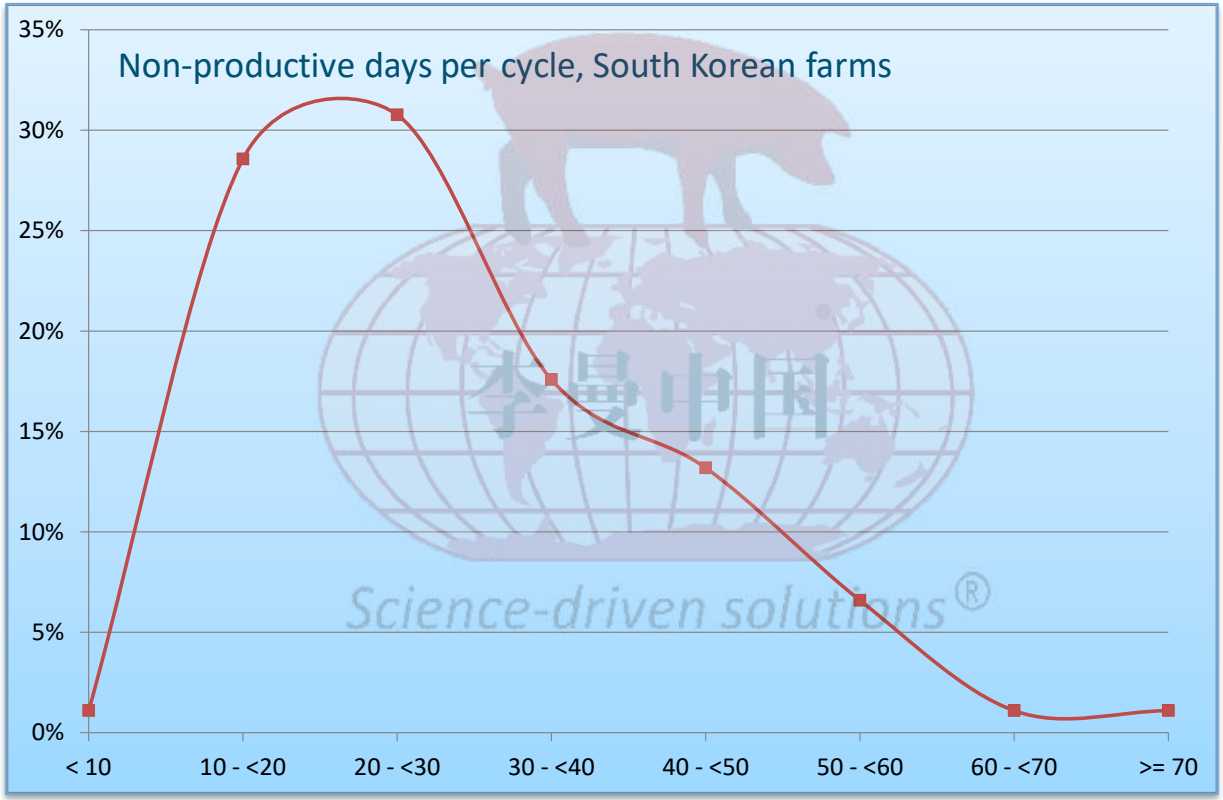
Lack of intentional management



Average: 23.1 day/cycle; NL avg. 14 days/cycle (2023)

Source: PigPlan data 2018, elaborated; Wageningen Economic Research

Increasing attention to animal welfare

- Towards more ‘natural behavior’
- Cage free housing pregnant sows
- Free farrowing
- Ban on mutilations (tails, castration etc.)
- In combination with reduction of antibiotics for public health reasons

Photo: WUR

Hoste et al., 2023

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3. Planet

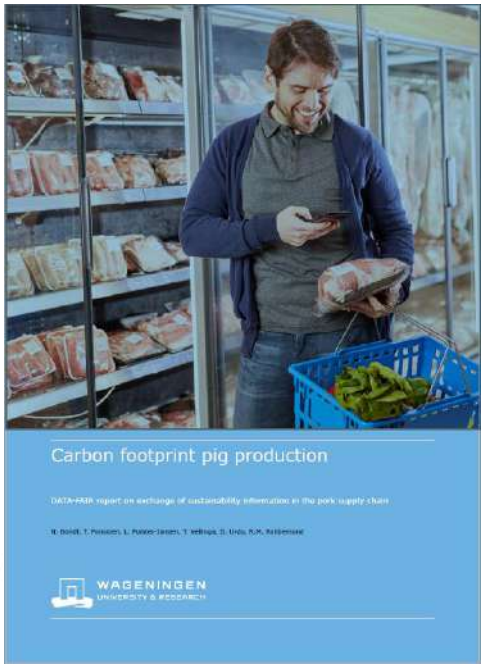
- Environmental footprint (emissions, soils, feed efficiency)
- Protein demand – insects, processed animal proteins, etc.
- Lowering food losses
- Consumer shift towards chicken

➔ Transfer the Earth to the next generation

Life Cycle Assessment (LCA)

- Emissions in the whole production chain, expressed per kg product
- Standards developed for LCA: ISO 14040 and 14044; LEAP (FAO); PEF (EU)
- Developed (shadow) PEFcr method for Dutch pig production

Courtesy Pim Mostert, WUR



Report Bondt et al., 2020
https://edepot.wur.nl/514323

Yang et al., 2023; Mostert et al., 2023; Vellinga et al., 2024; De Vries et al., 2023; Bondt et al., 2020; etc.

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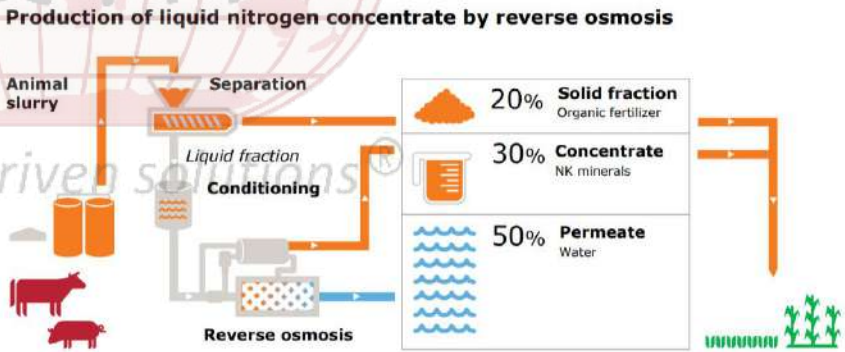
Emissions and manure

- Reduce emissions from housing systems, like Air scrubbers
- Research on Separation urine and feces, quick manure removal from barn, manure cooling, acidification, dilution and flushing etc.
- Manure processing



Aarnink et al., 2022

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Use of by-products

- Use of by-products of human food industry
- Non-sellable final products
- Replaces part of regular feed ingredients

➔ Relates to Circular production

Roskam et al., in press

Photo: Robert Hoste

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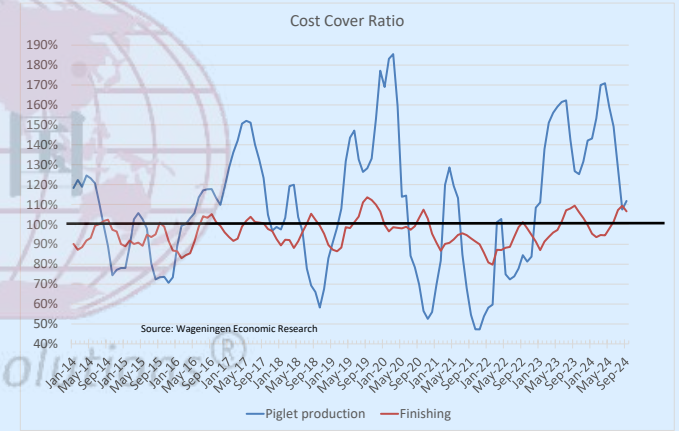
4. Profit

- Profit is a precondition
- Cost approach vs added value
- Fluctuating prices
- Risk management
- Supply chain management



➔ Balance the challenges and opportunities

Hoste and Benus, 2023; Berkhout et al., 2022

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Opposite and parallel effects - examples

- Beter Leven program: welfare, costs, emissions
- Emission reduction vs costs
- Healthy animals (pigs) give more labour joy (people), lower cost (profit) and better feed efficiency (planet)
- Higher labour input (people, profit) could lead to higher performance (4P)
- Breeding live born vs. vital pigs

Conclusion: Developing solutions require a balanced approach

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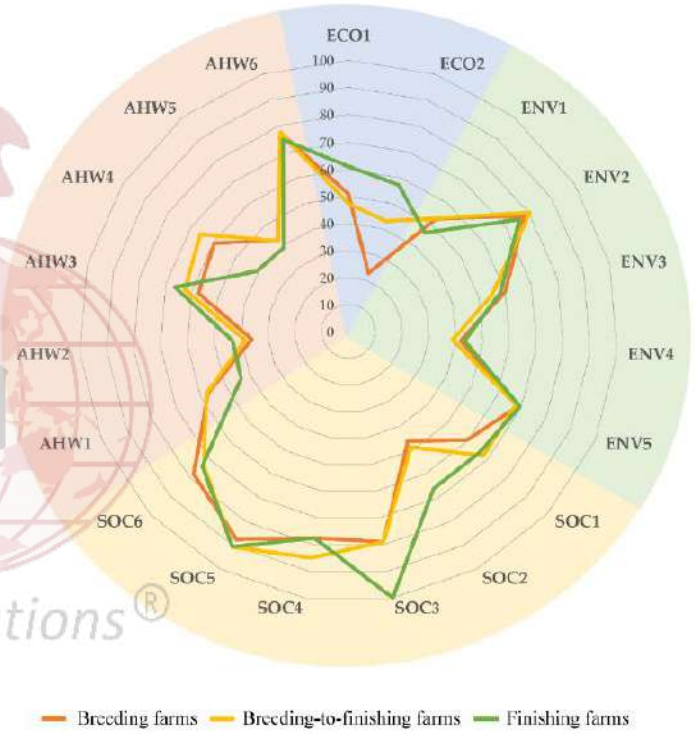
European project SusPigSys

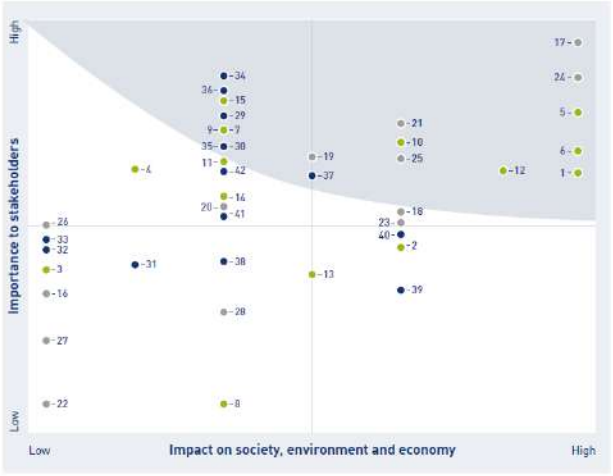
- Development of a tool for integrated sustainability measurement and benchmarking
- Based on variety of pig farms in 7 European countries
- Economy ranks lowest on average

E.g., ECO1 Technical efficiency, ECO2 Economic resilience



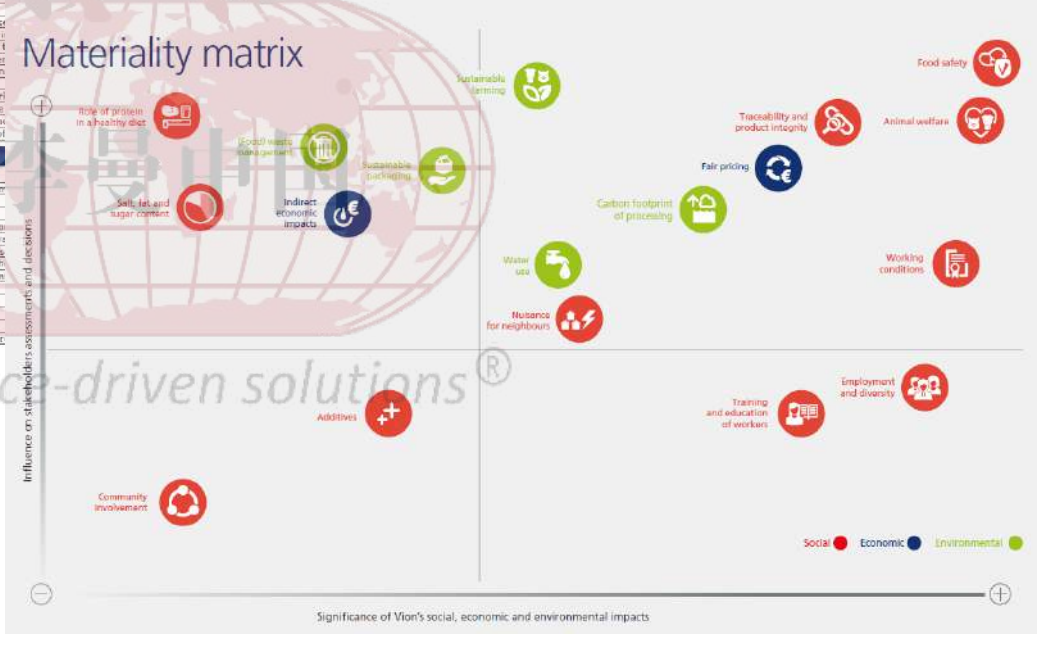
Ruckli et al., 2021; 2022

Company examples: materiality matrix



ForFarmers (feed company)
Annual report 2022

Vion Food (meat company)
Annual report 2019



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Take-home messages

- Sustainability will be of continuous importance in pig production
- Existing variation among farms and between countries show ample room to improve, with substantial economic benefits
- Focus on increased efficiency in animal production, with healthy pigs has multiple advantages
- Integrated focus on People, Pigs, Planet and Profit

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Thank you for your attention

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