Exploring options to recycle and prevent phosphorus waste in a food system

Session 41 – New insights into efficiency

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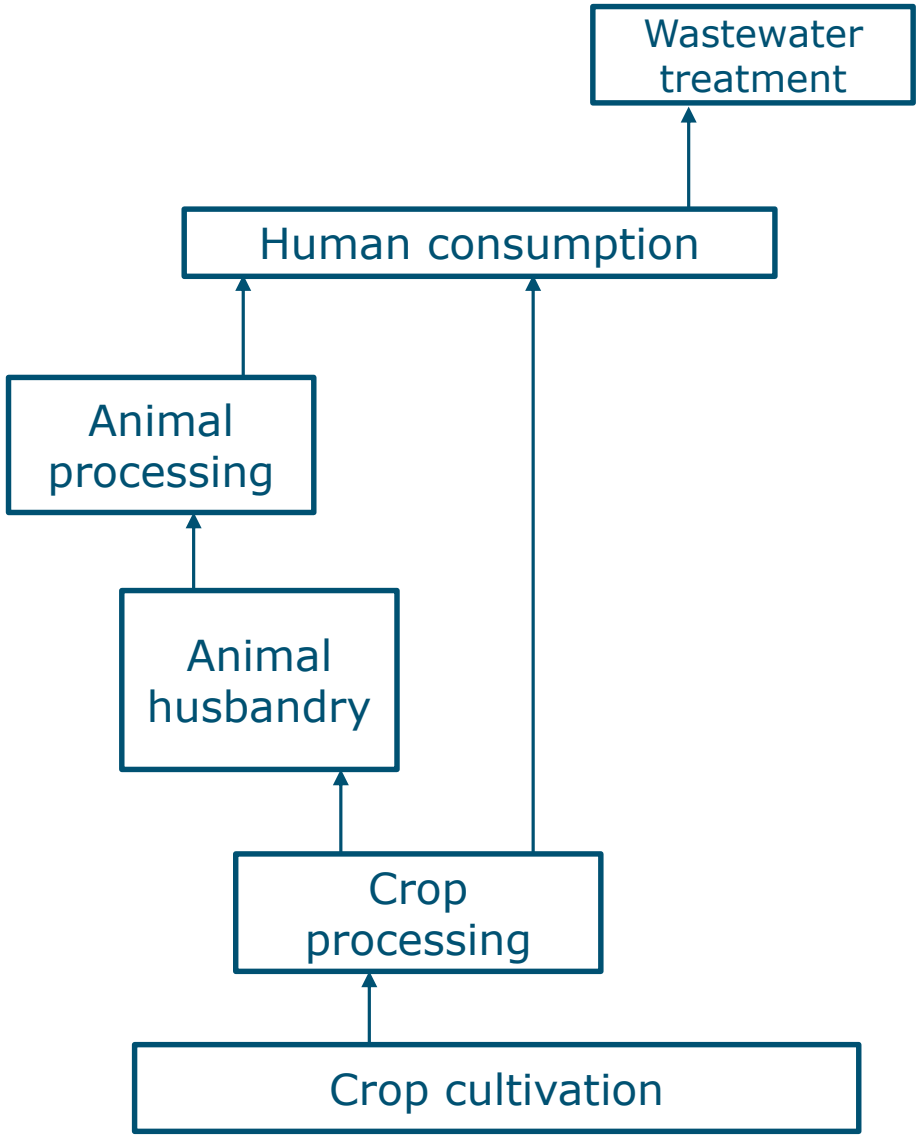
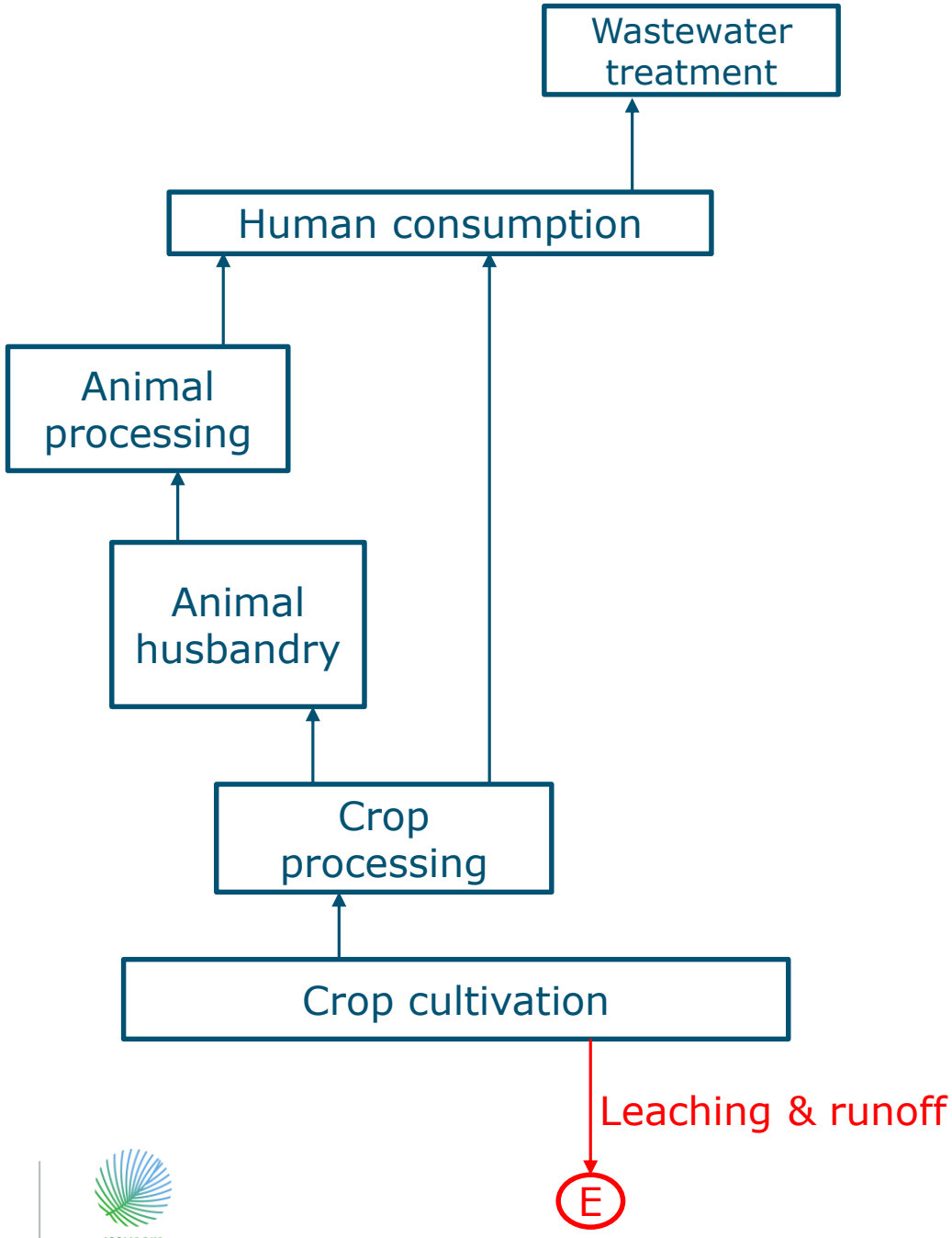

Wastewater treatment
Human consumption
Animal processing
Animal husbandry
Crop processing
Crop cultivation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Crop cultivation
Leaching & runoff
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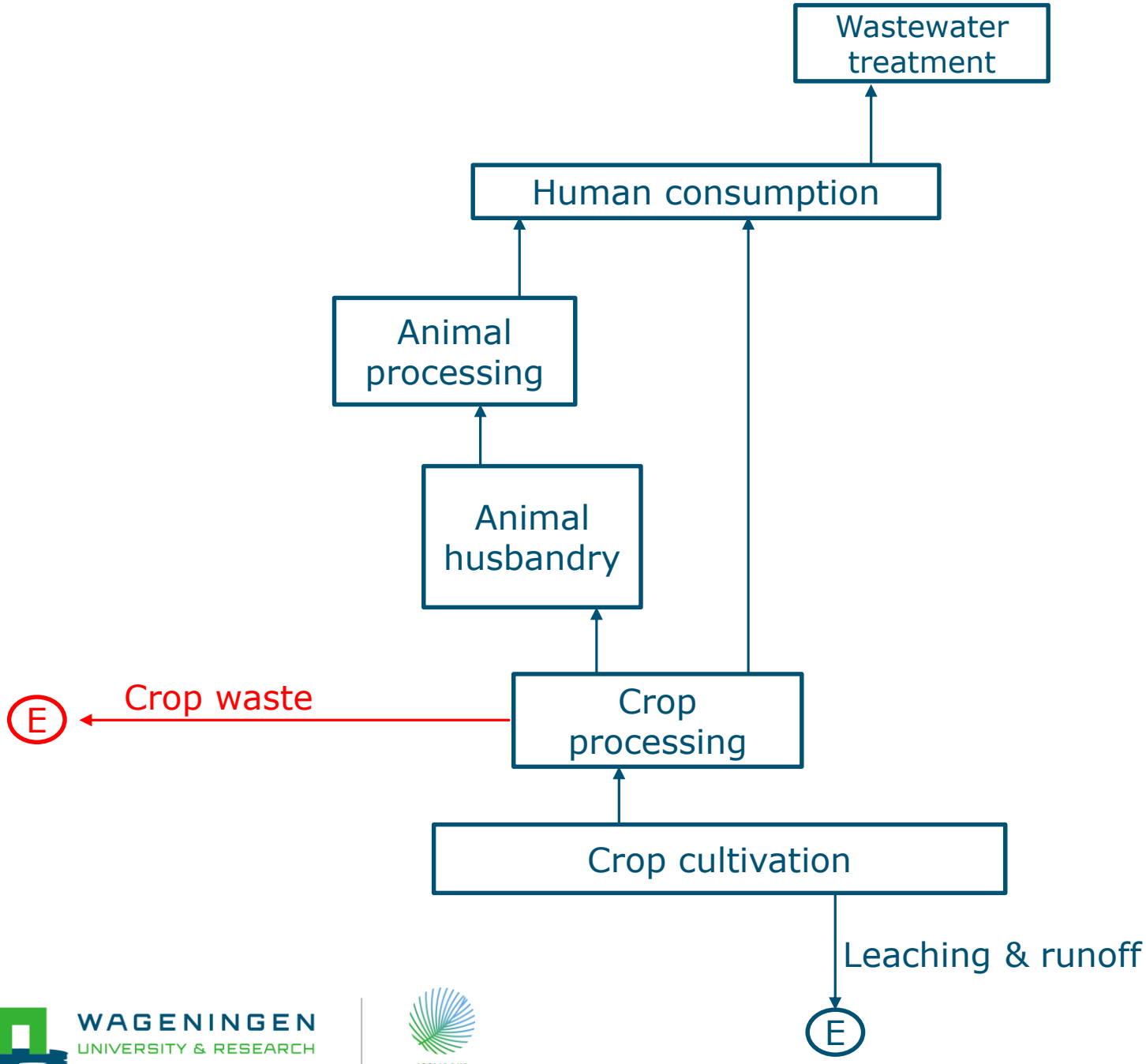
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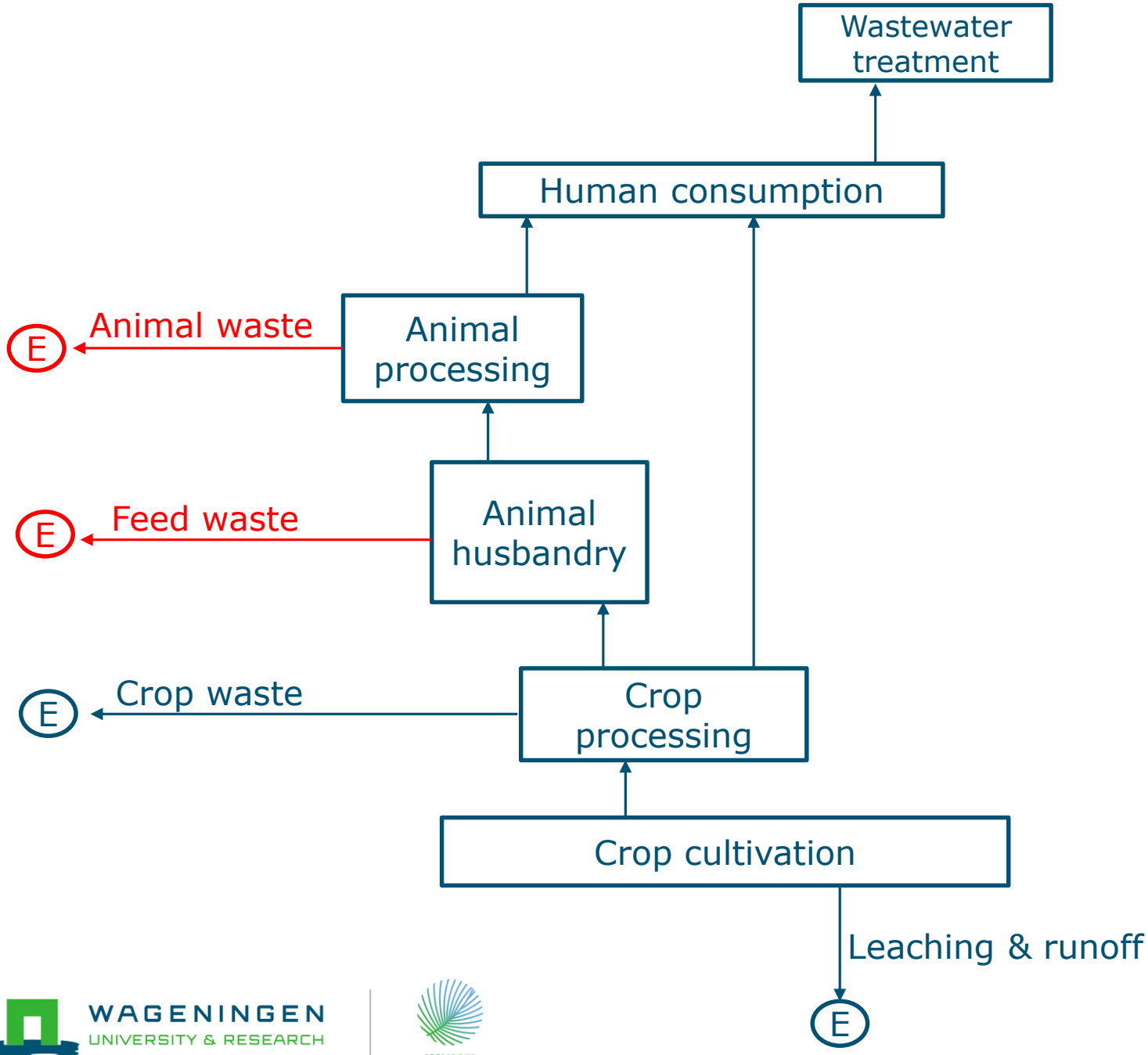

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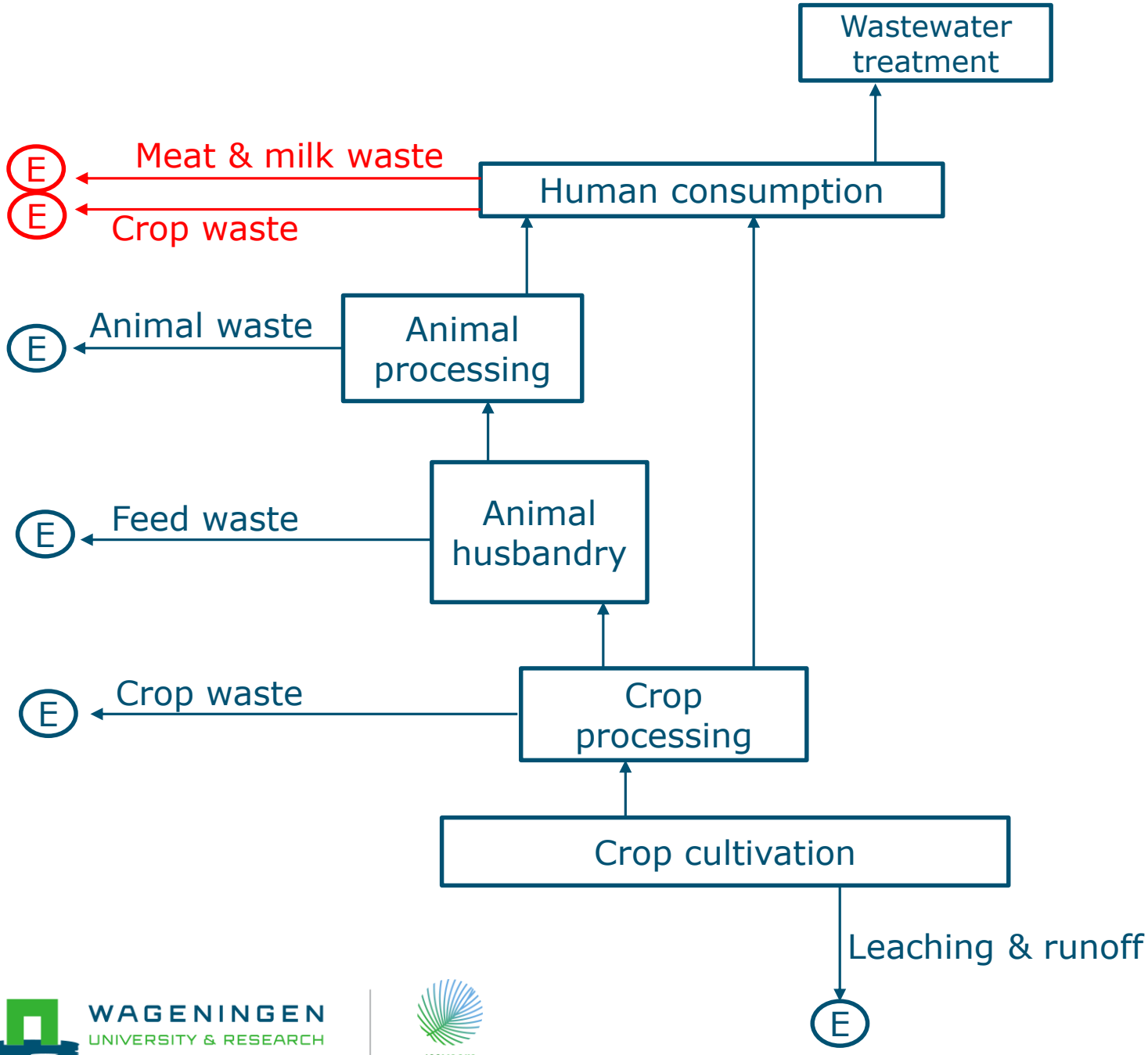

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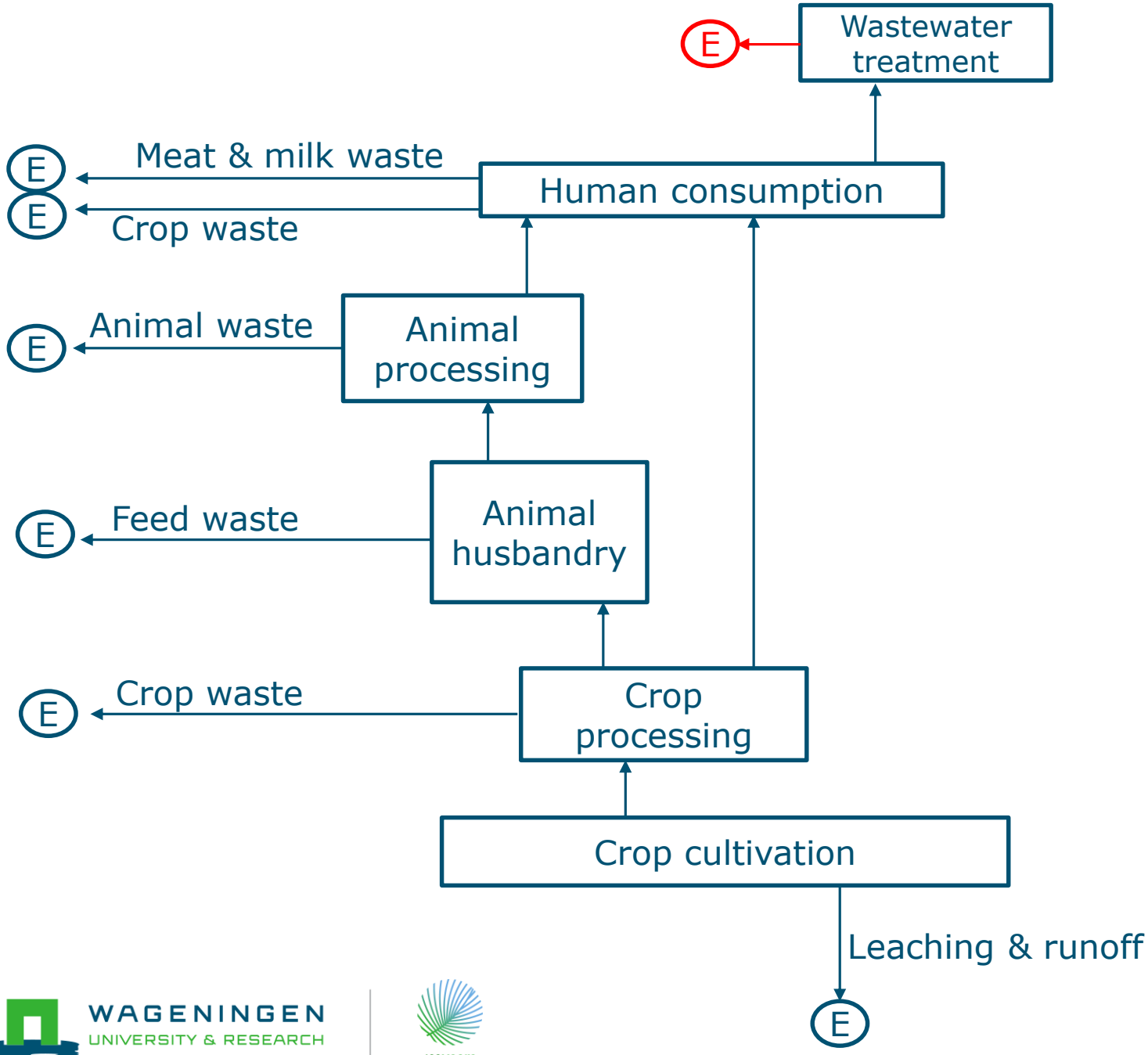

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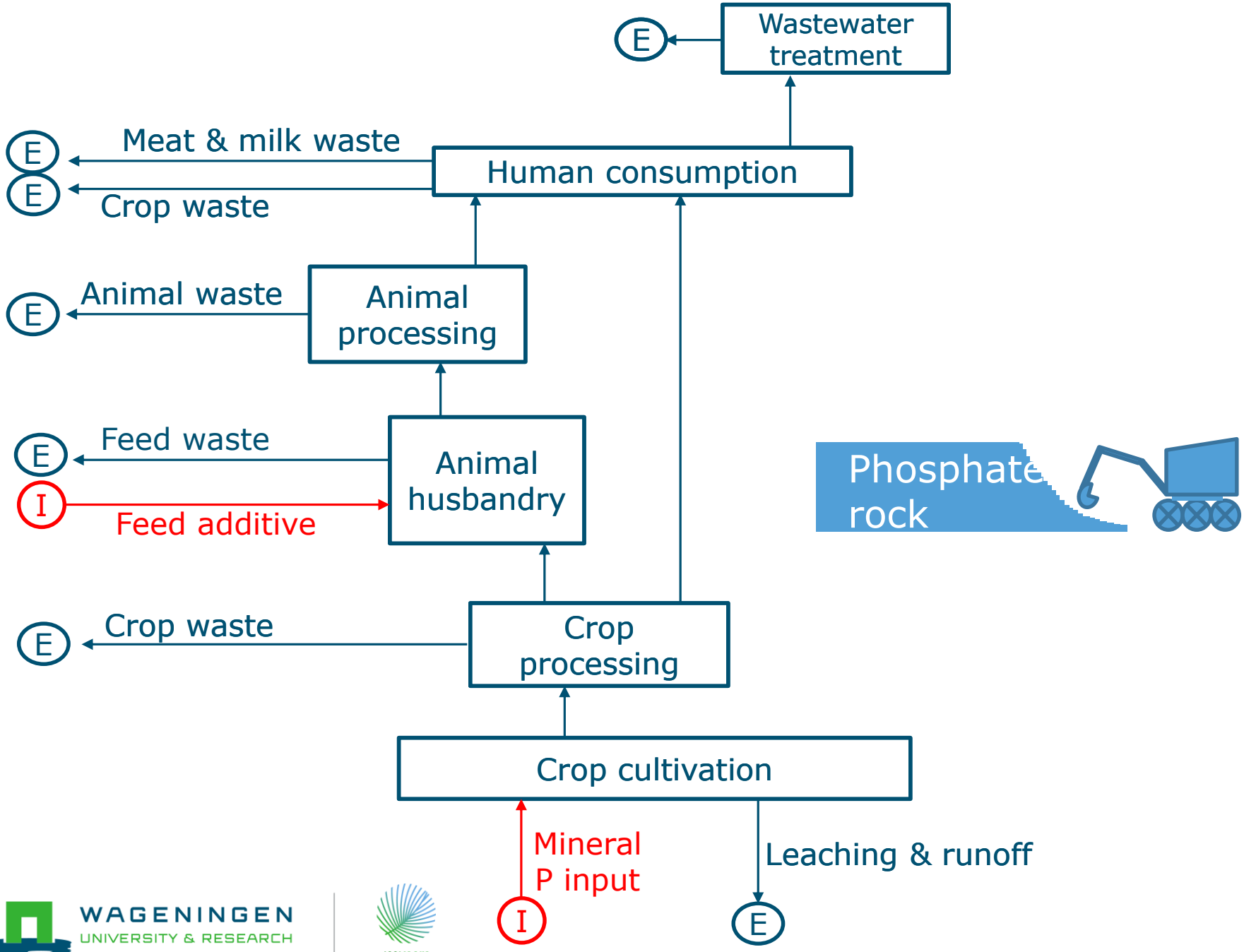

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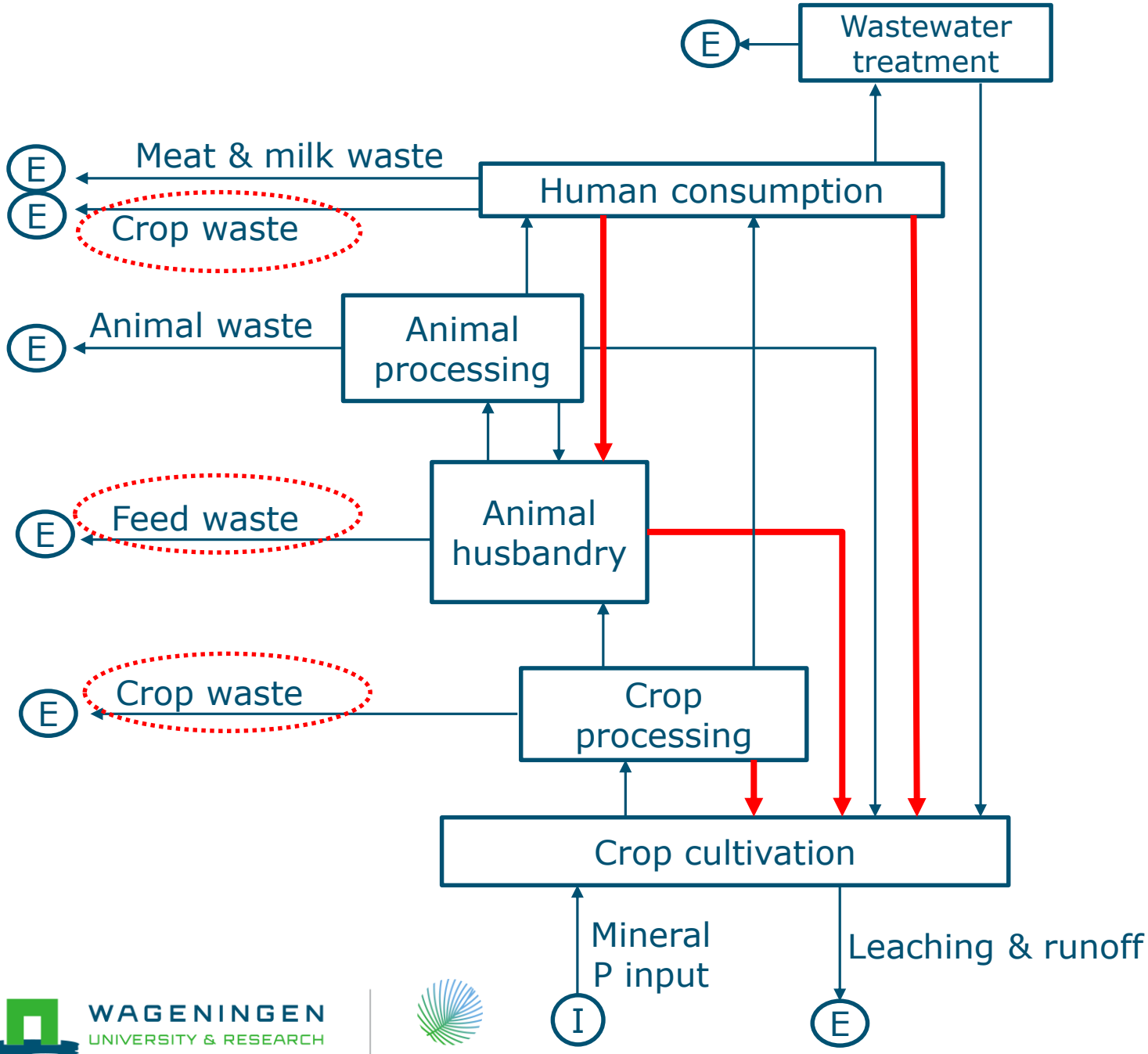
Research objective

To assess the potential of preventing and recycling phosphorus (P) waste in the food system, in order to reduce the dependency on mineral P

Material and methods

- Closed food system
- Parameterised: Netherlands
- 1800 x 10^3 ha cropland + marginal land
- Population: 17 mln people
- ≥ 2000 kcal and 57 gr protein/cap/day
- Selection of representative crops
- Dairy cows and pigs
- Small P soil losses and no net accumulation
- Baseline and alternative situations
- 0-80% protein from animals



Baseline situation

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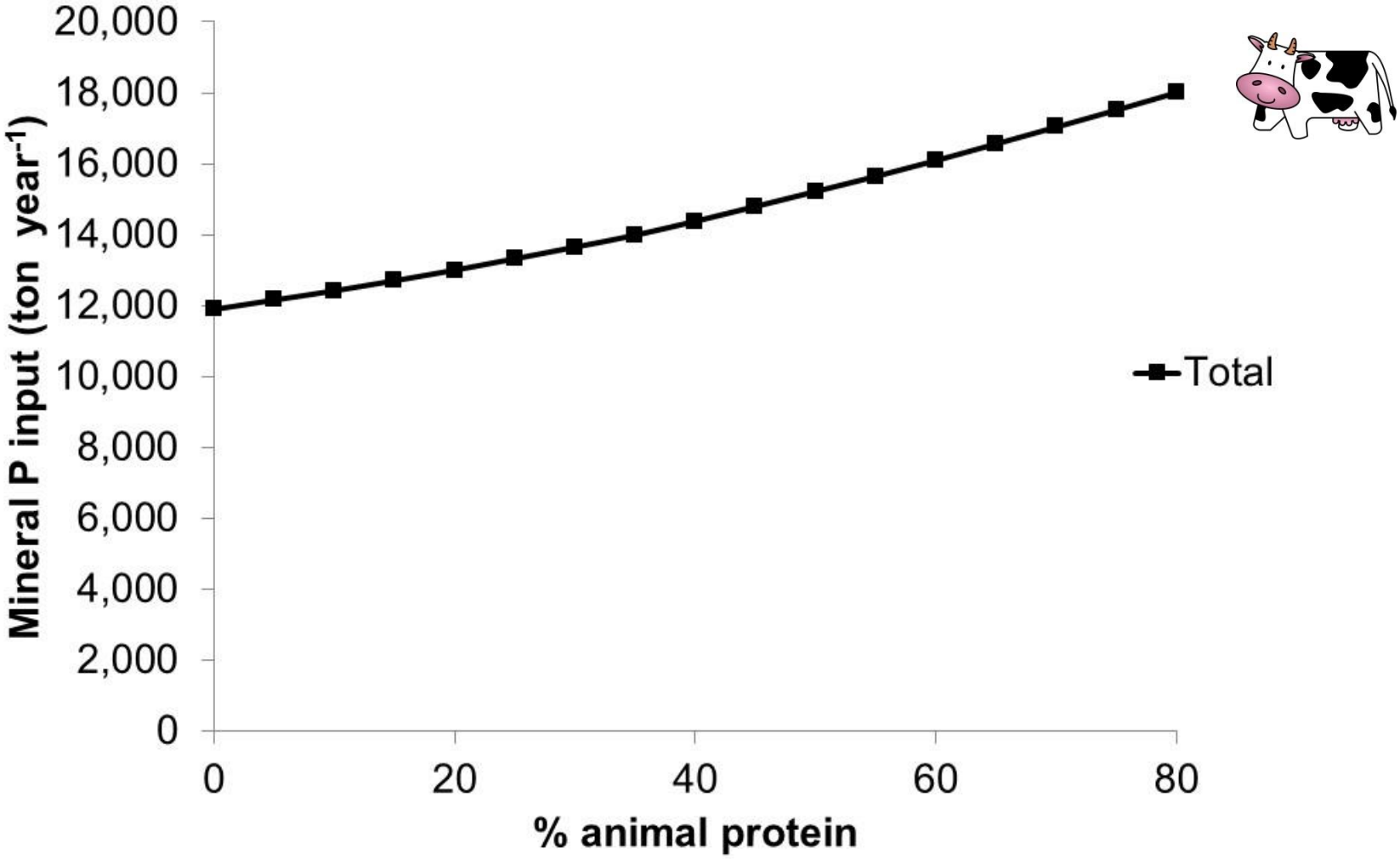
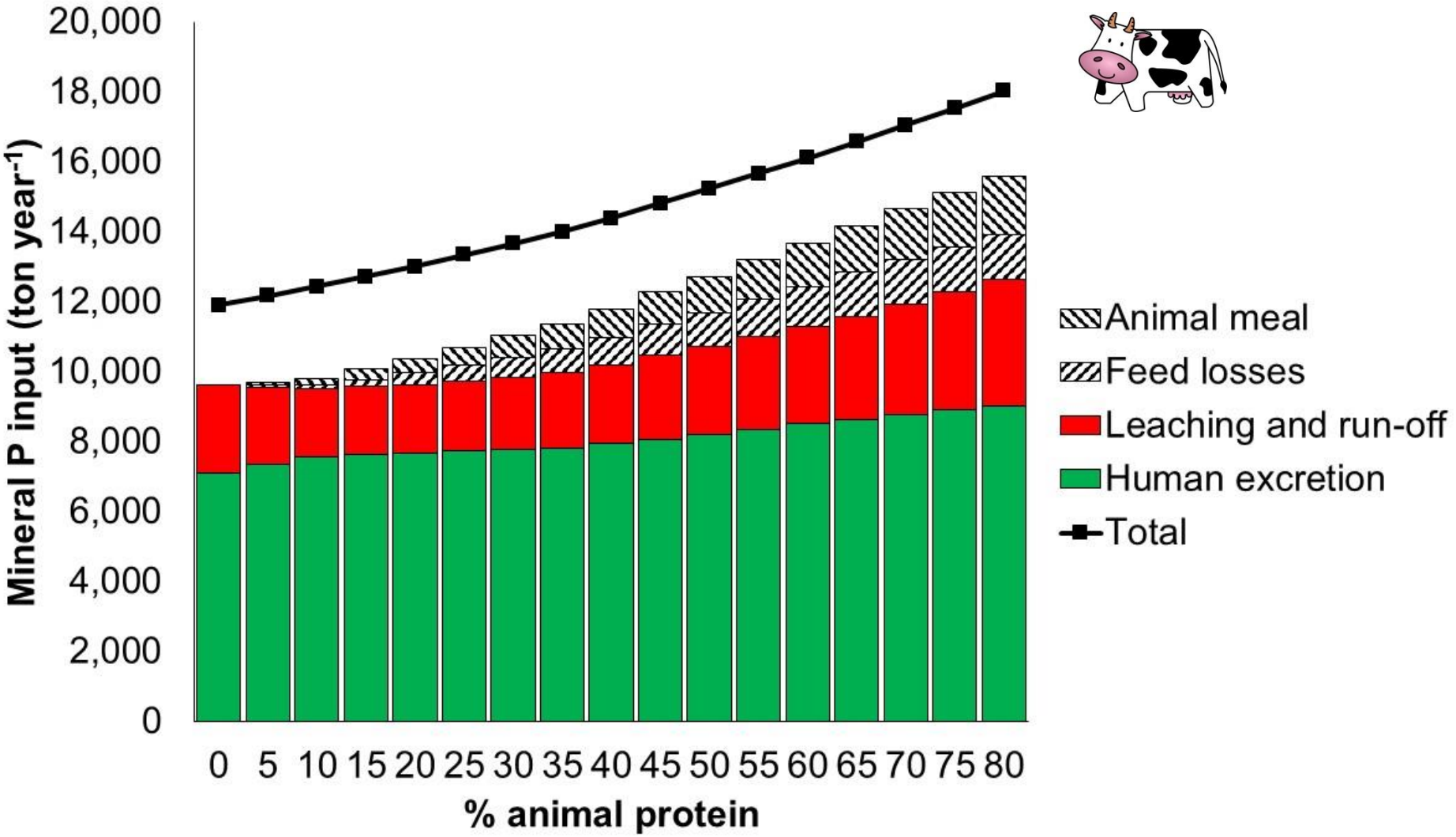
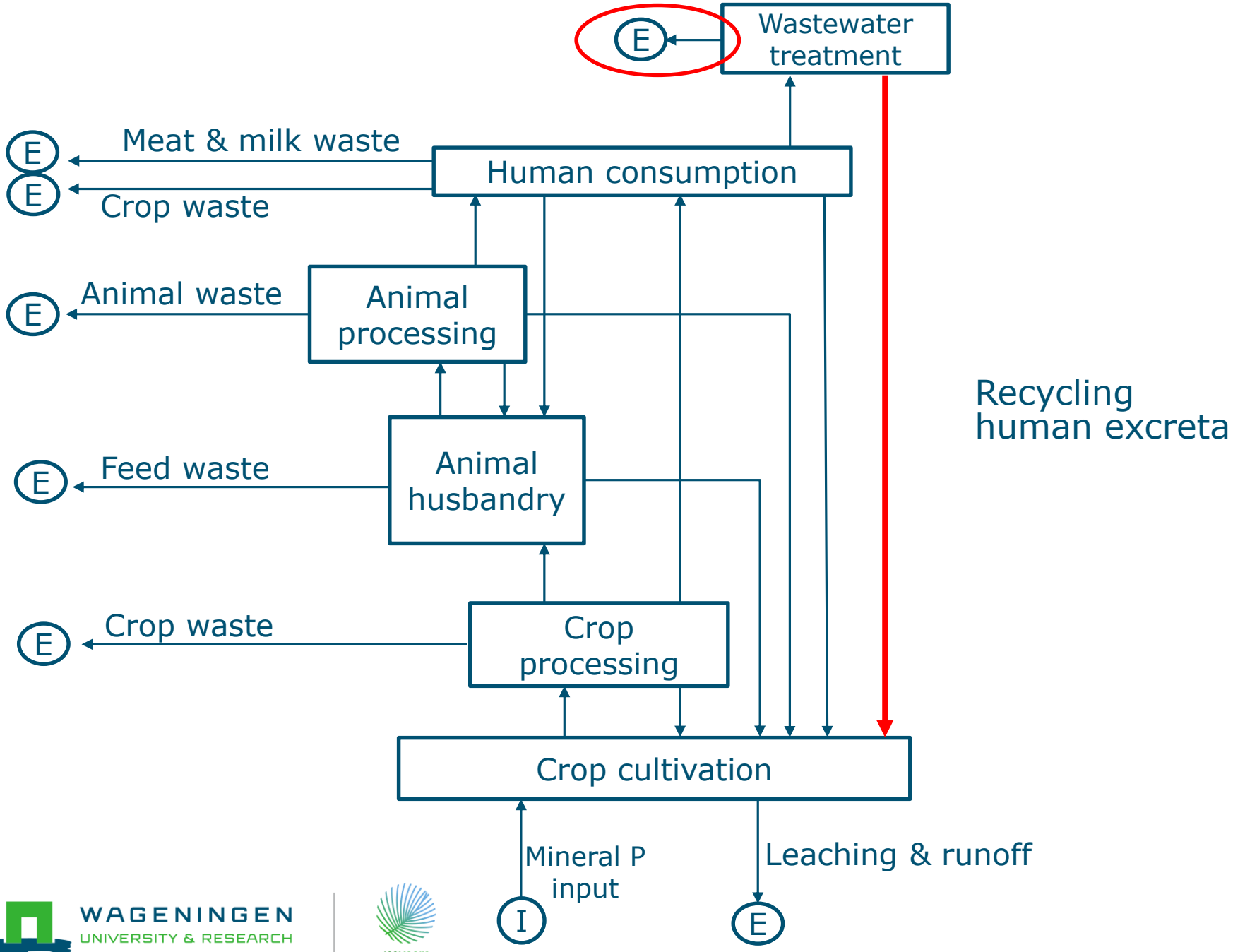
Baseline situation



Baseline situation





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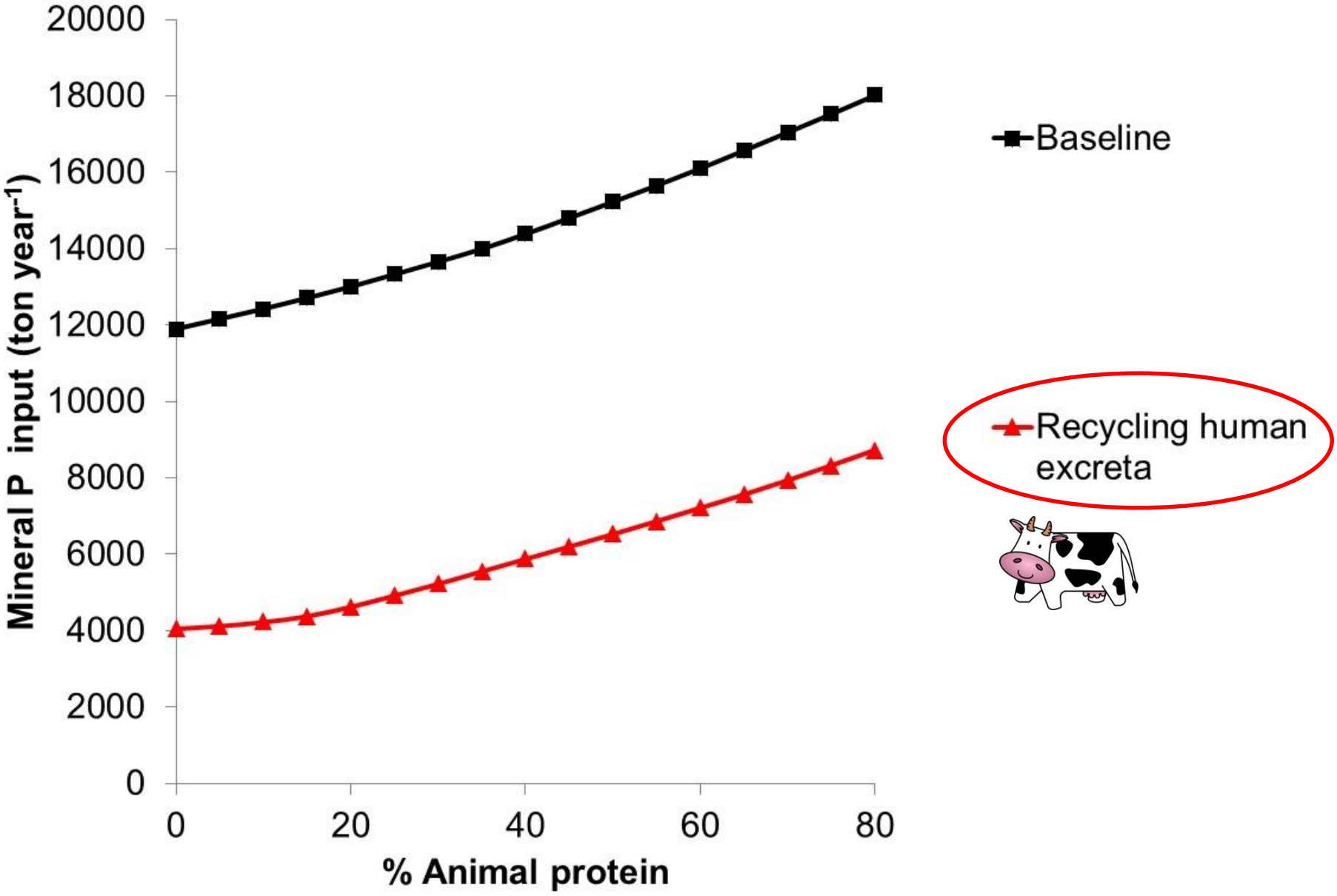

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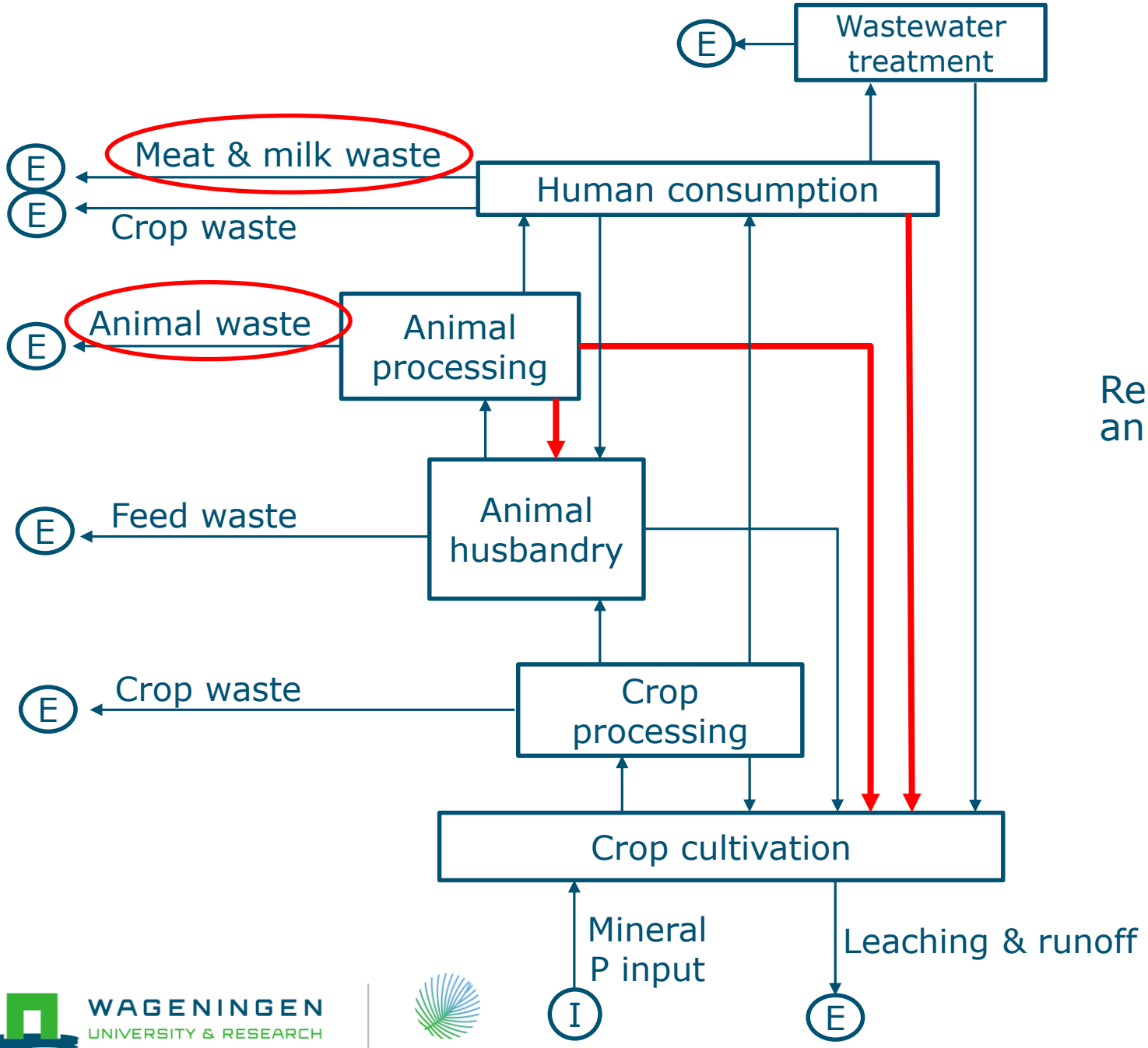

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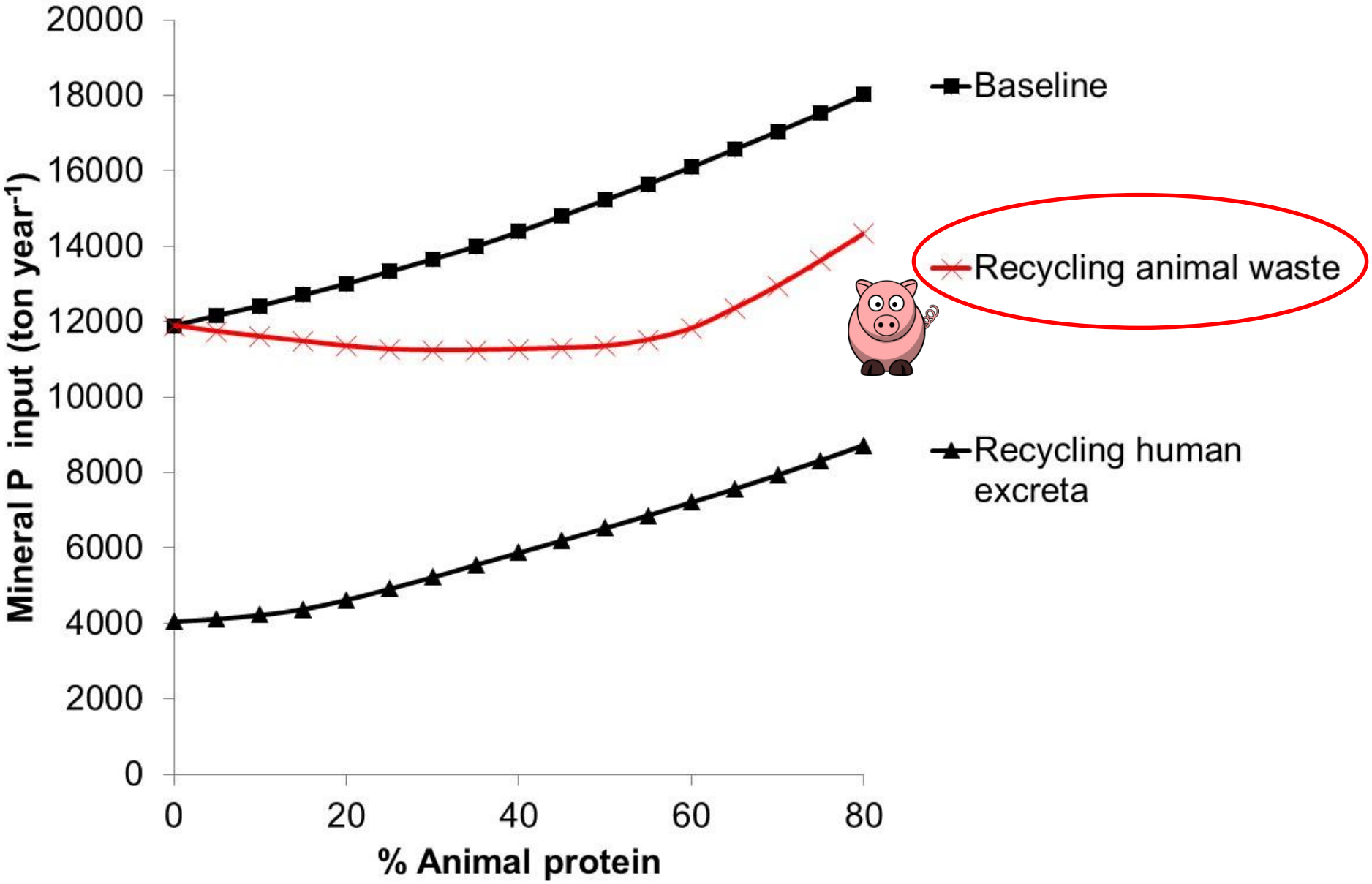

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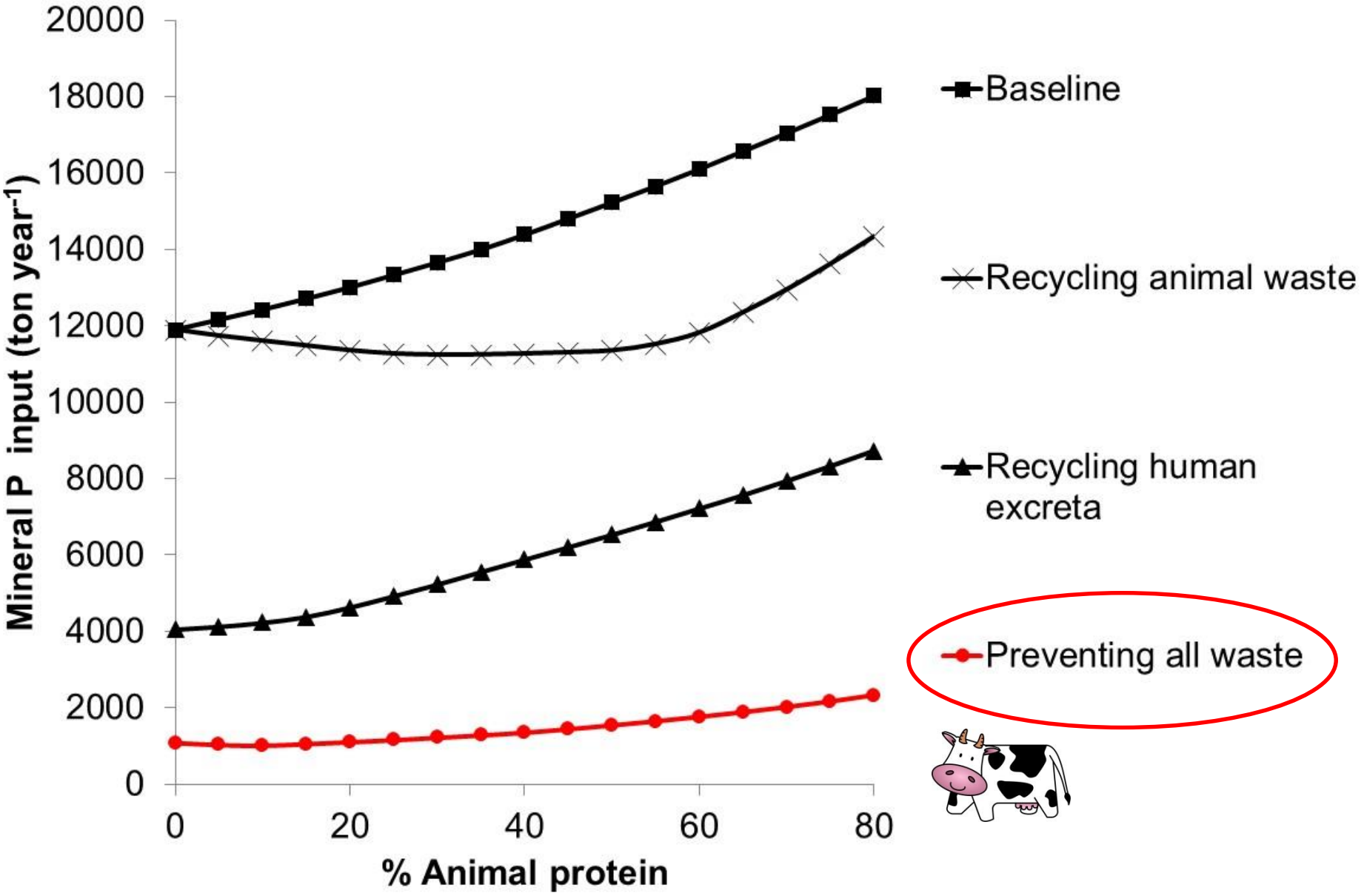
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Mineral P input (ton year-1)
0
20
40
60
80
% Animal protein
Baseline
Recycling animal waste
Recycling human excreta
Preventing all waste

Conclusions

- Preventing, recycling and animal protein consumption
- Optimal % animal protein depends on strategy
- Recycling human excreta most potential
- Waste prevention: 90% reduction in mineral P input

Discussion

- Determining factors
  - Strategies
  - P:N ratio of products
  - Ability to convert human inedible crop products
- Illustrated principles, applicable to other food systems
- Technical/legal feasibility of strategies

Thank you!

Van Kernebeek et al (2018). Closing the phosphorus cycle in a food system: Insights from a modelling exercise. *Animal, 12*(8), 1755-1765