

# Modelling Phosphorous excretion by growing and finishing pig systems

Vasilis Symeou



School of Agriculture, Food and Rural Development  
Newcastle University, England

# Why are we interested in Phosphorous?

Supplementation of inorganic P is:

(1) **Expensive**

(2) **Non-renewable resource**



Environmental degradation:  
**Eutrophication**



Environmental degradation causes  
**bad publicity**



# Motivation

- Pigs contribute ~20% of total diffuse Phosphorous (P) load from livestock to waters of Great Britain (Defra, 2009)
- A BPEX–commissioned review (2008) suggested that many UK pig diets were formulated to exceed recommended standards for P levels to meet requirements; this excess contributes to the high levels of P in excreta
- The Industry had little confidence in estimating digP content of diets and P requirements of pigs of different genotypes (BSAS standards).

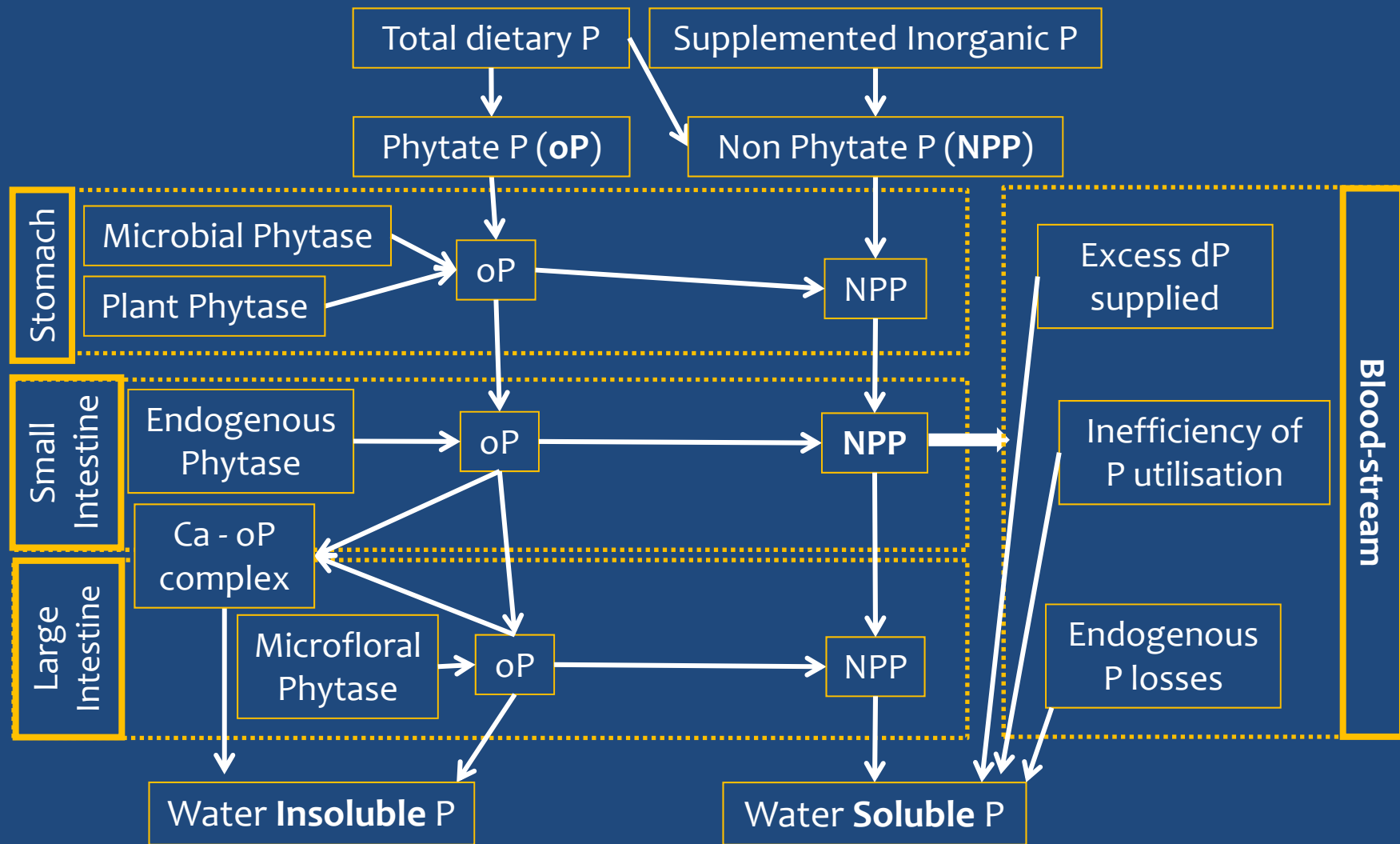
# Project steps

- Review our current knowledge of P digestion, metabolism and excretion
- **Construct a model of P intake, digestion, retention and excretion (single animal model)**
- **Test and evaluate the above model**
- Develop a population model of P intake, digestion, retention and excretion (stochastic model)
- **Use the stochastic model to develop strategies that minimise P excretion by pigs**

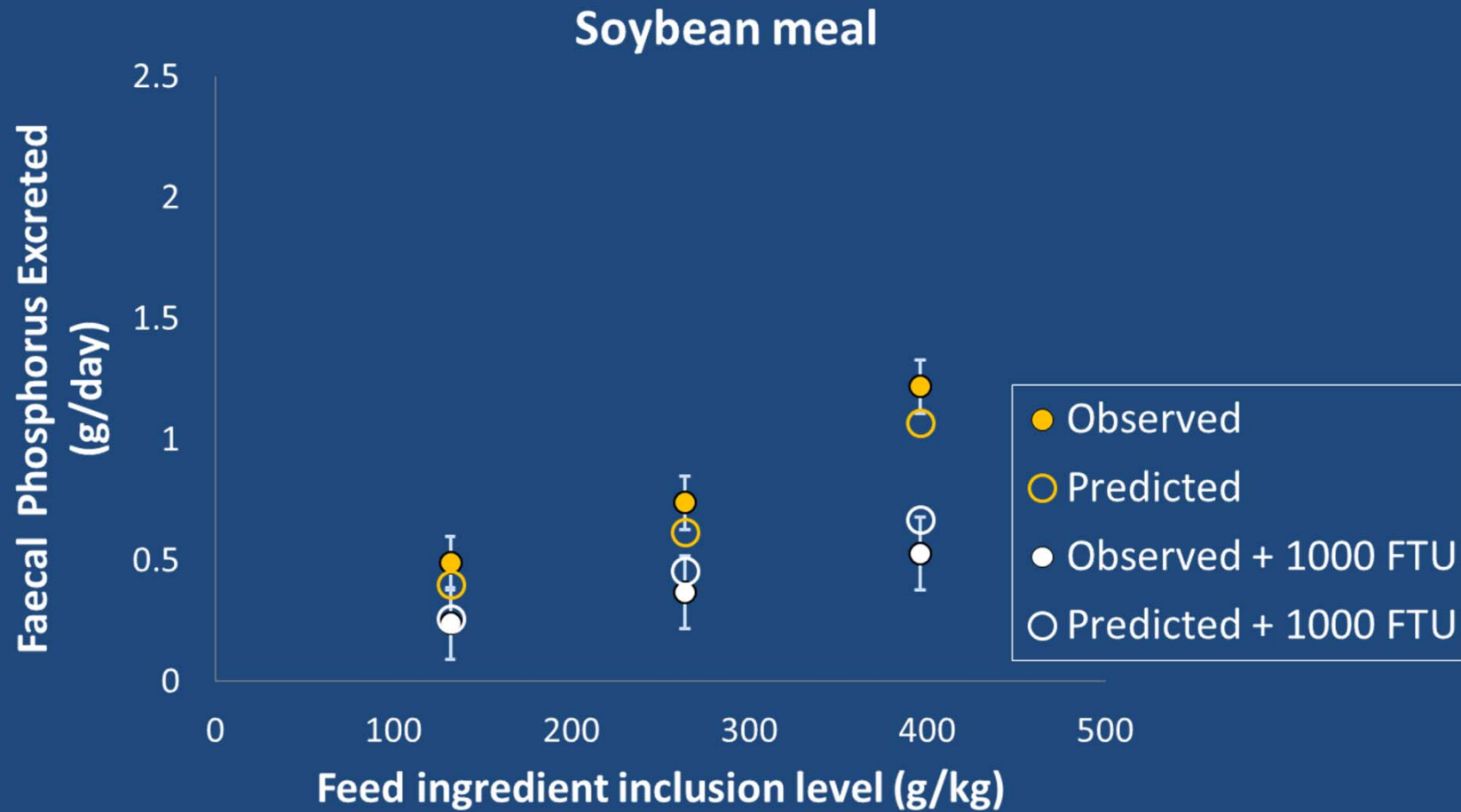
# The necessary steps to predict P excretion

1. Describe feed composition in necessary and consistent terms
2. Describe the animal in sufficient terms to estimate (maximum) rates of P deposition (Requirements)
3. Develop a P digestion module
4. Predict the different forms of P excreted

# Overview of the P Digestion - Excretion module

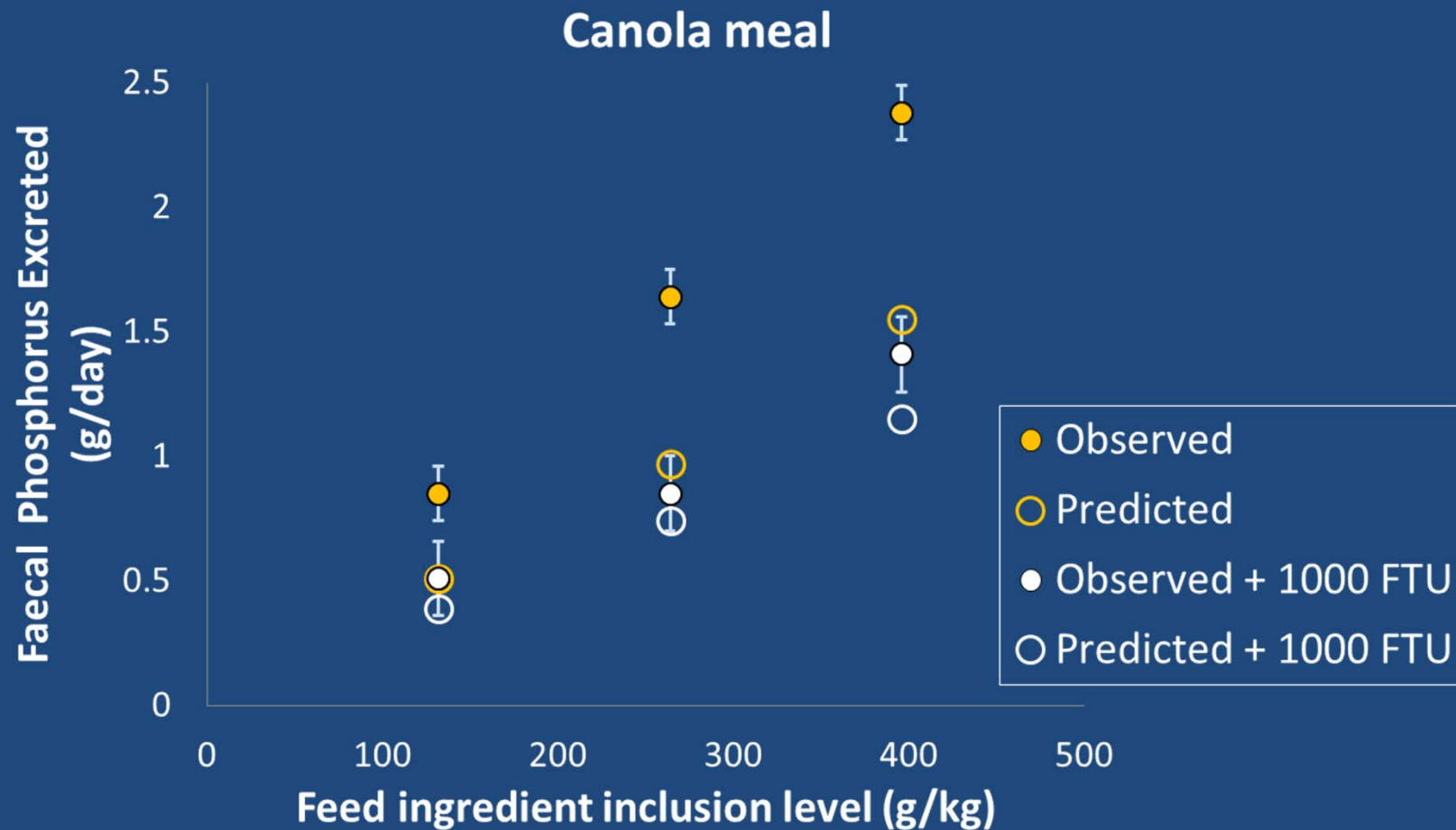


# Feecal P excreted by soyabean based diets supplemented with phytase



Akinmusire & Adeola (2009)

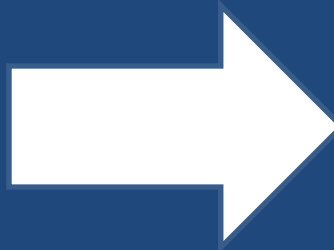
# Feecal P excreted by canola based diets supplemented with phytase



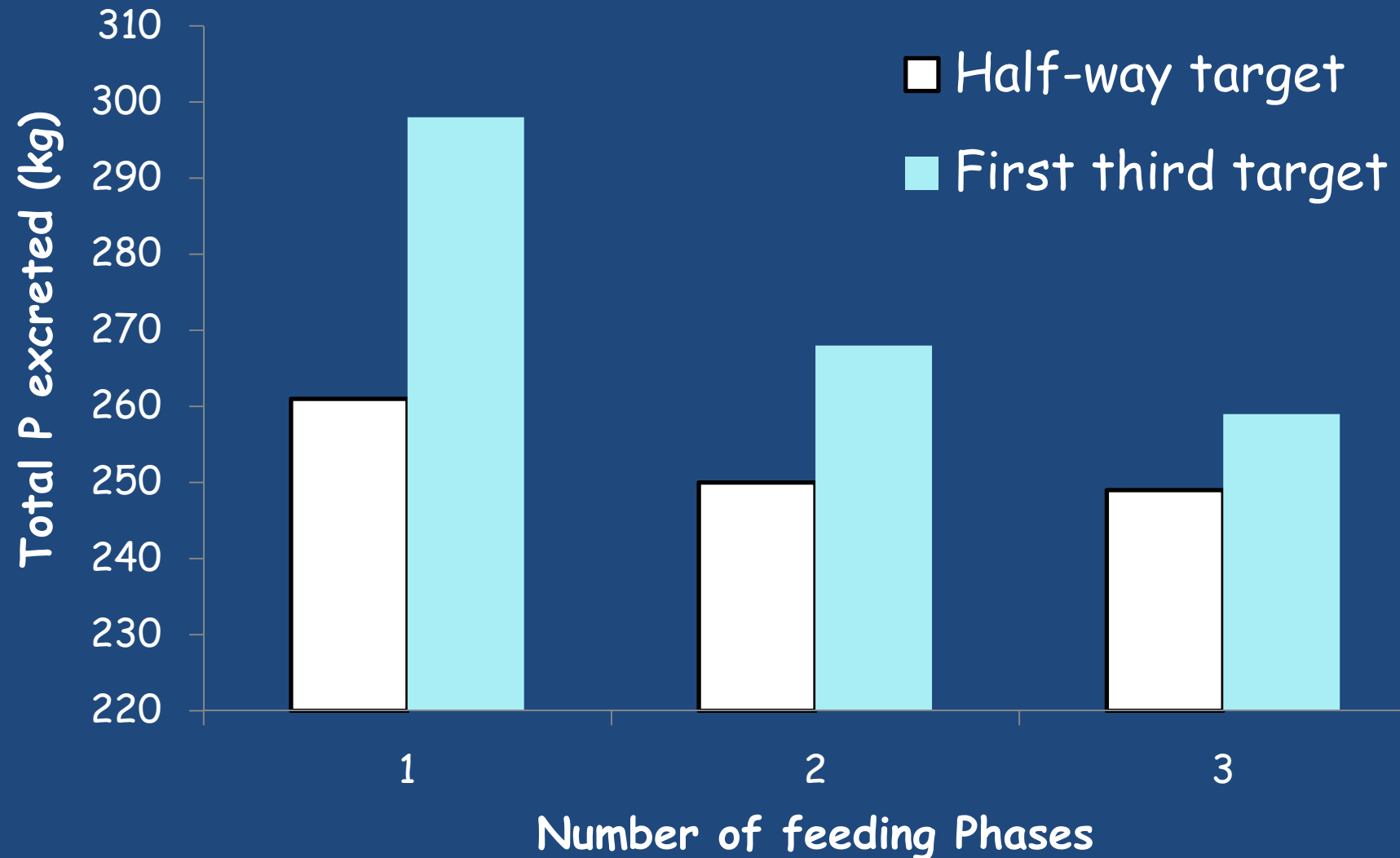
Akinmusire & Adeola (2009)



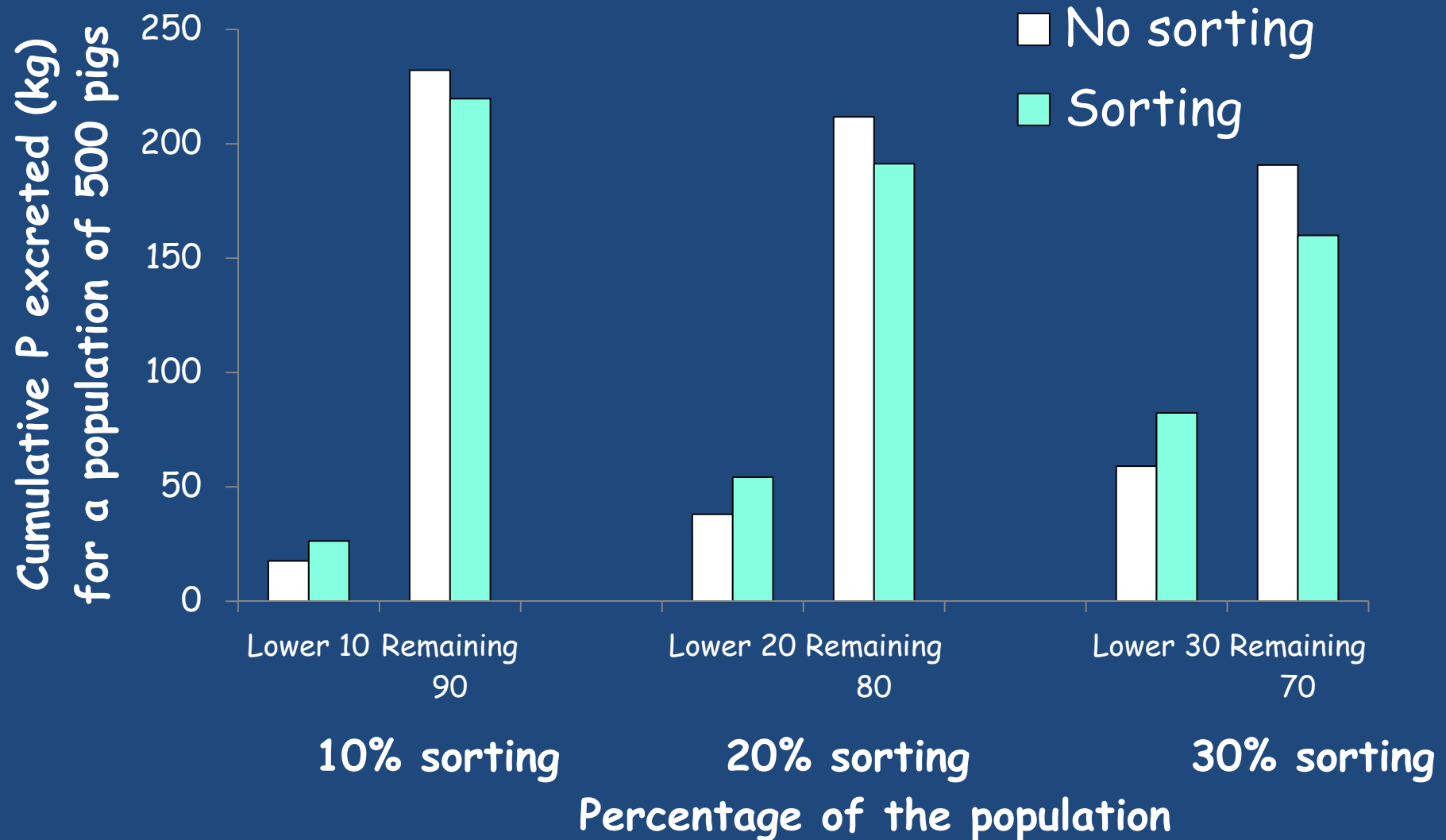
# From individuals to populations



# Amount of total P excreted by different phase – feeding regimes



# Amount of total P excreted during different sorting regimes



# Conclusions

- A stochastic model that predicts dietary P intake, digestion, retention and excretion for pig populations has been developed
- The model predicts food intake on foods of different compositions, rather than having intake as an input
- The model allows to quantify the consequences of different management scenarios on P excretion (including its different forms)