# Strategies to decrease Phosphorous excretion from pig populations

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# Motivation

- **Pigs contribute ~20% of total diffuse Phosphorous (P) load from livestock to waters of Great Britain**

- **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).**

# From individuals to populations
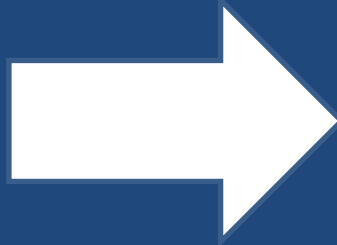
# Starting point

- **The deterministic (single pig) model that predicts P dietary intake, digestion, retention and excretion**

- **The model was used to predict the consequences of management strategies aiming at decreasing P excretion from groups of pigs**

- **There are several challenges associated with the conversion of a model from deterministic to stochastic**

# Estimation of P Requirements

1. Estimate Ph Requirements for maintenance ($P_{maint}$)

$$P_{maint} = p \cdot Pr \cdot Pr_m^{-0.27}$$

2. Estimate the net efficiency of P use for growth

   Current estimates range from 0.7- 0.97

3. Estimate the maximum capacity for P deposition ($PR_{max}$)

   P retention was made an isometric function of protein retention

# Consequences of the solution

- **The pig can be described by three parameters**

    1. **The Gompertz growth rate parameter (kg/d)**
    2. **Protein mass at maturity (kg)**
    3. **Lipid mass at maturity (kg)**

- **The breeders need to characterise their pigs in these terms**

# The prediction of P requirements of different pig genotypes defined by BSAS
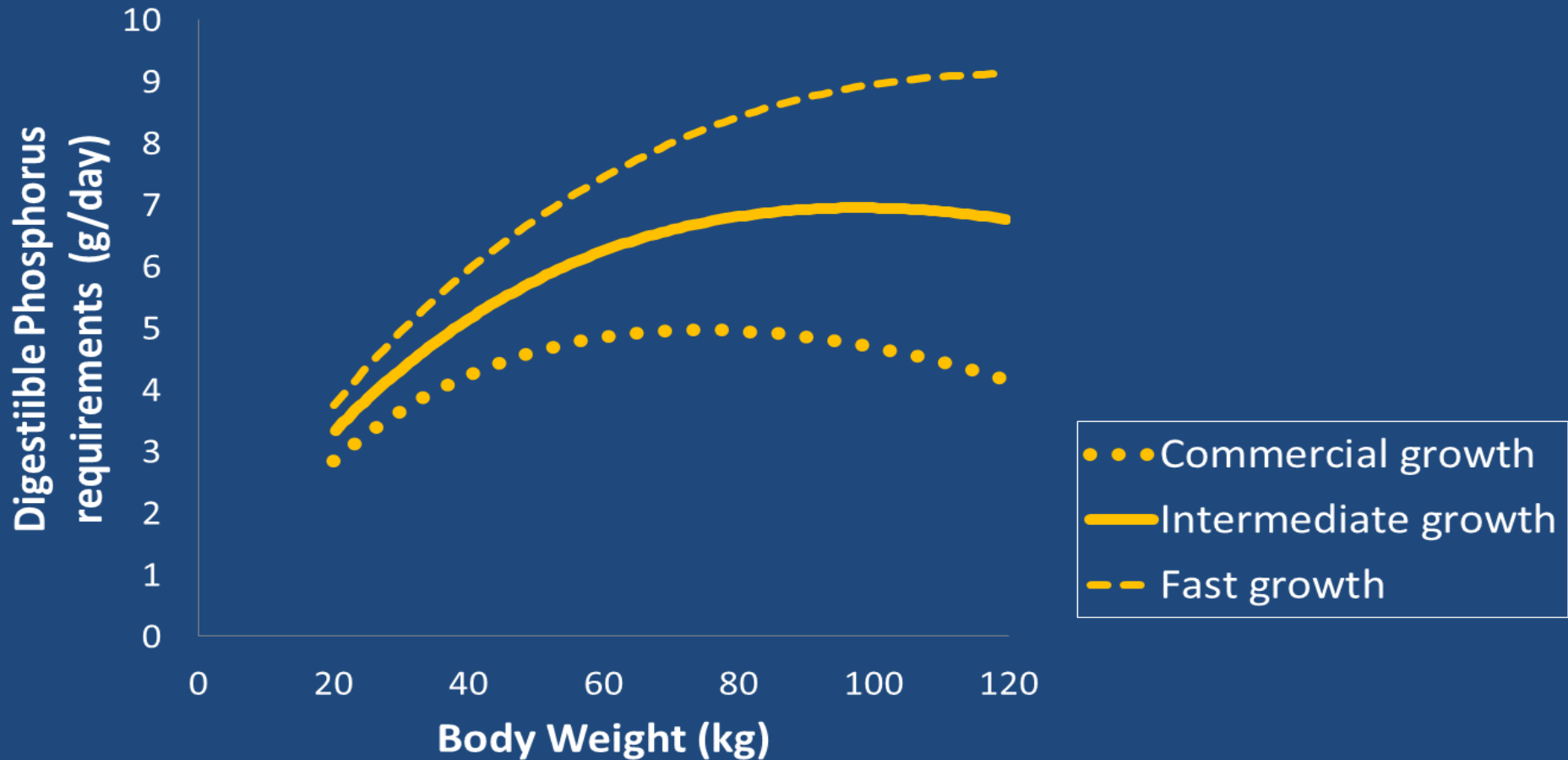
# Introducing stochasticity into the model

- **Variation was introduced in:**
  - feed composition (variation in ingredient composition and mixing)
  - **pig genetic characteristics**
  - **Initial body weight**

- **The effect of two different strategies to reduce P excretion by populations of pigs was investigated**
  - **Phase feeding**
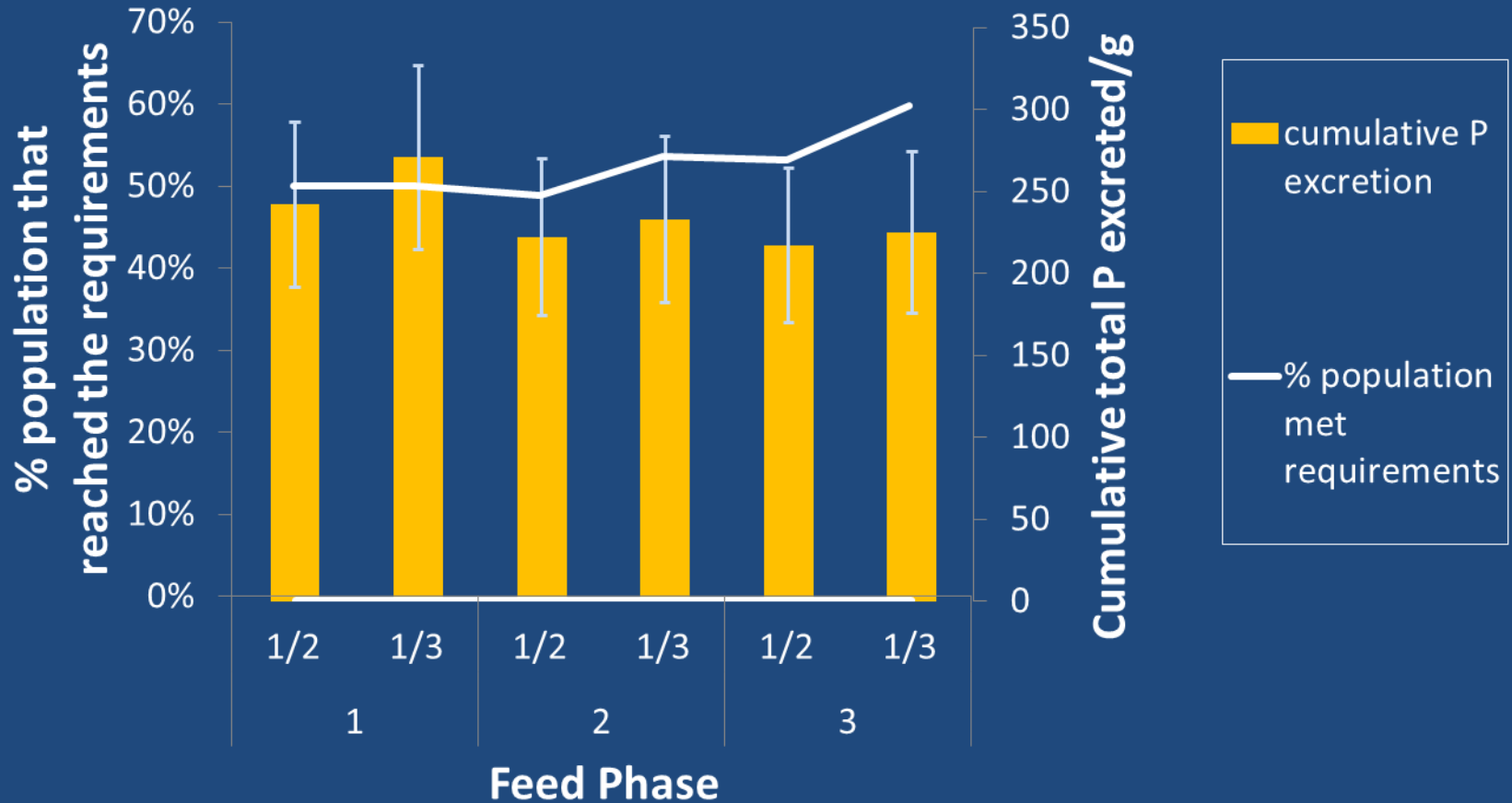  - **Sorting according to liveweight at 30 kg**

# Different phase feeding strategies
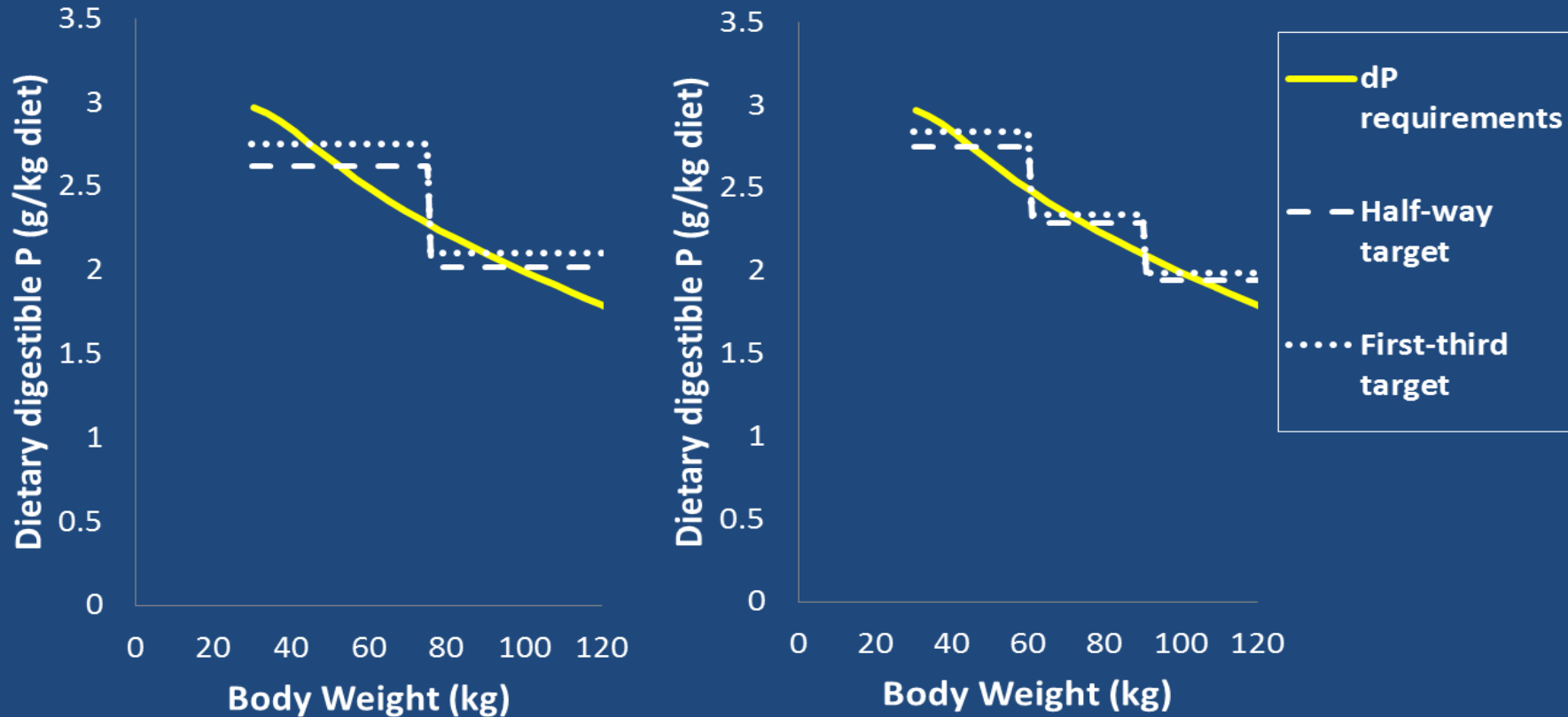
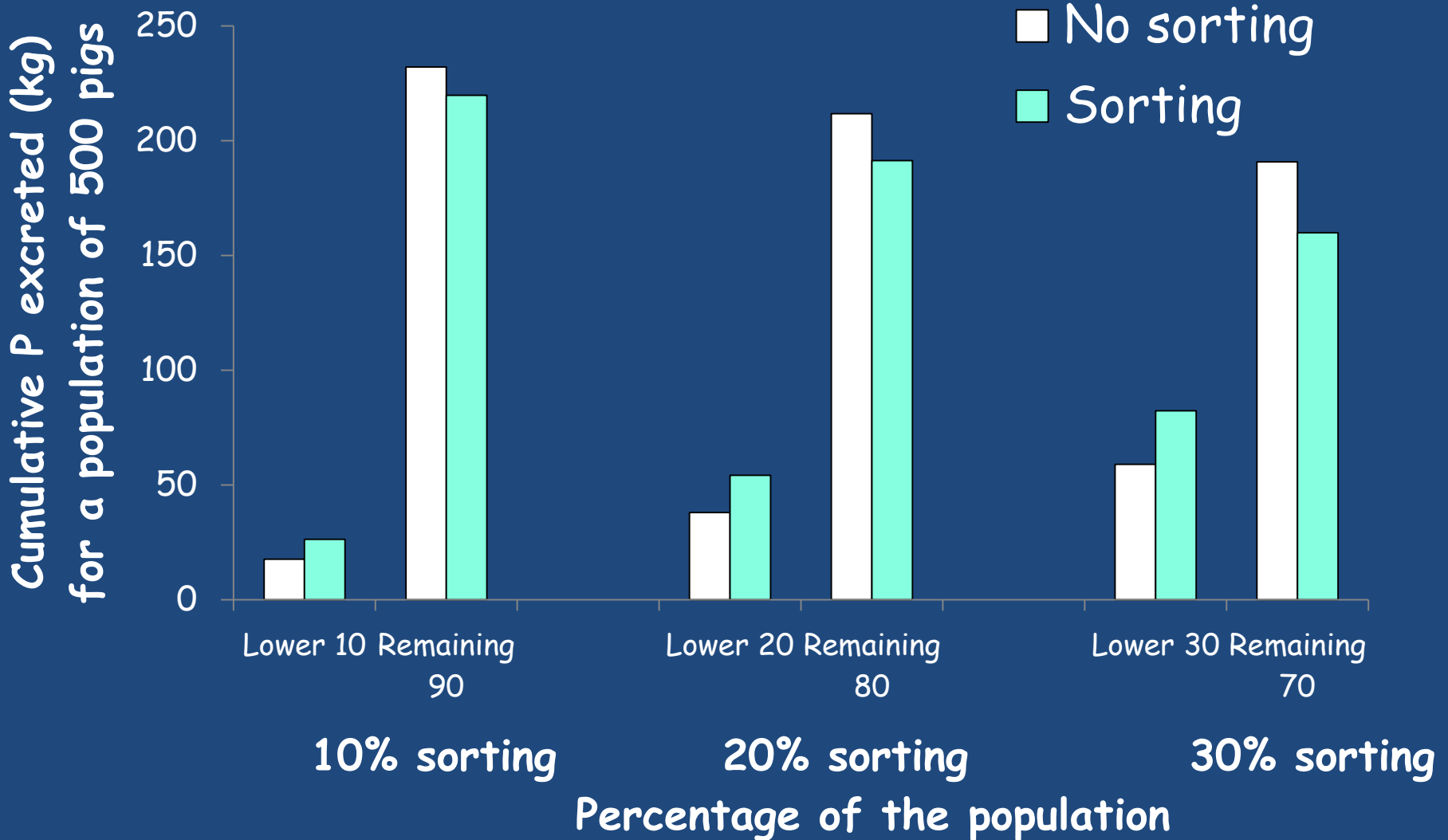**Amount of total P excreted by different phase – feeding regimes**
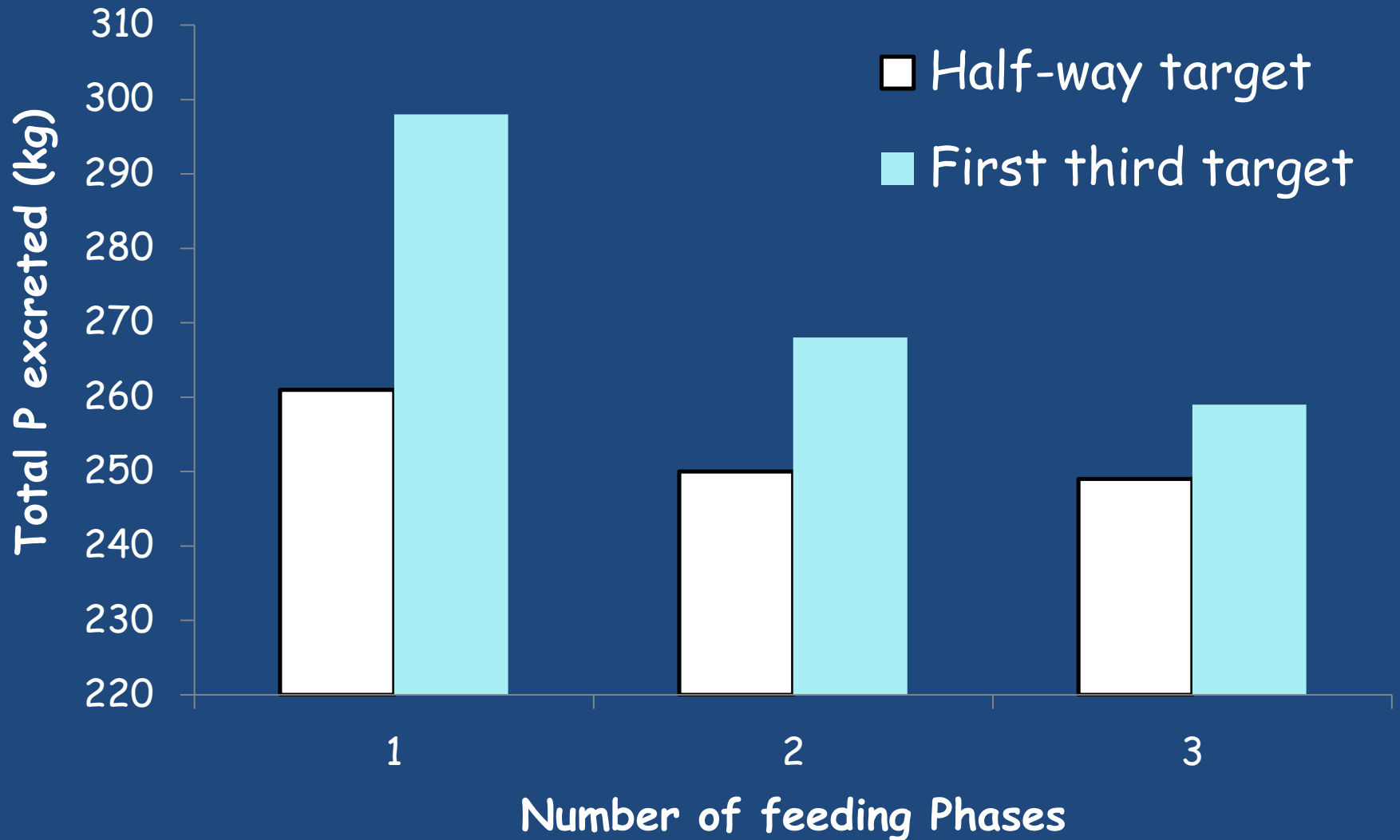
# Consequences of phase feeding

# ' Sorting' as a feeding strategy

- **Pigs of different BW have  different requirements for P at a point in time**

- **Would there be benefits in terms of P excretion if light pigs are fed differently from heavy ones (sorting)?**

- **Different variations of sorting can apply – here the simplest one was considered**

Amount of total P excreted during different sorting regimes

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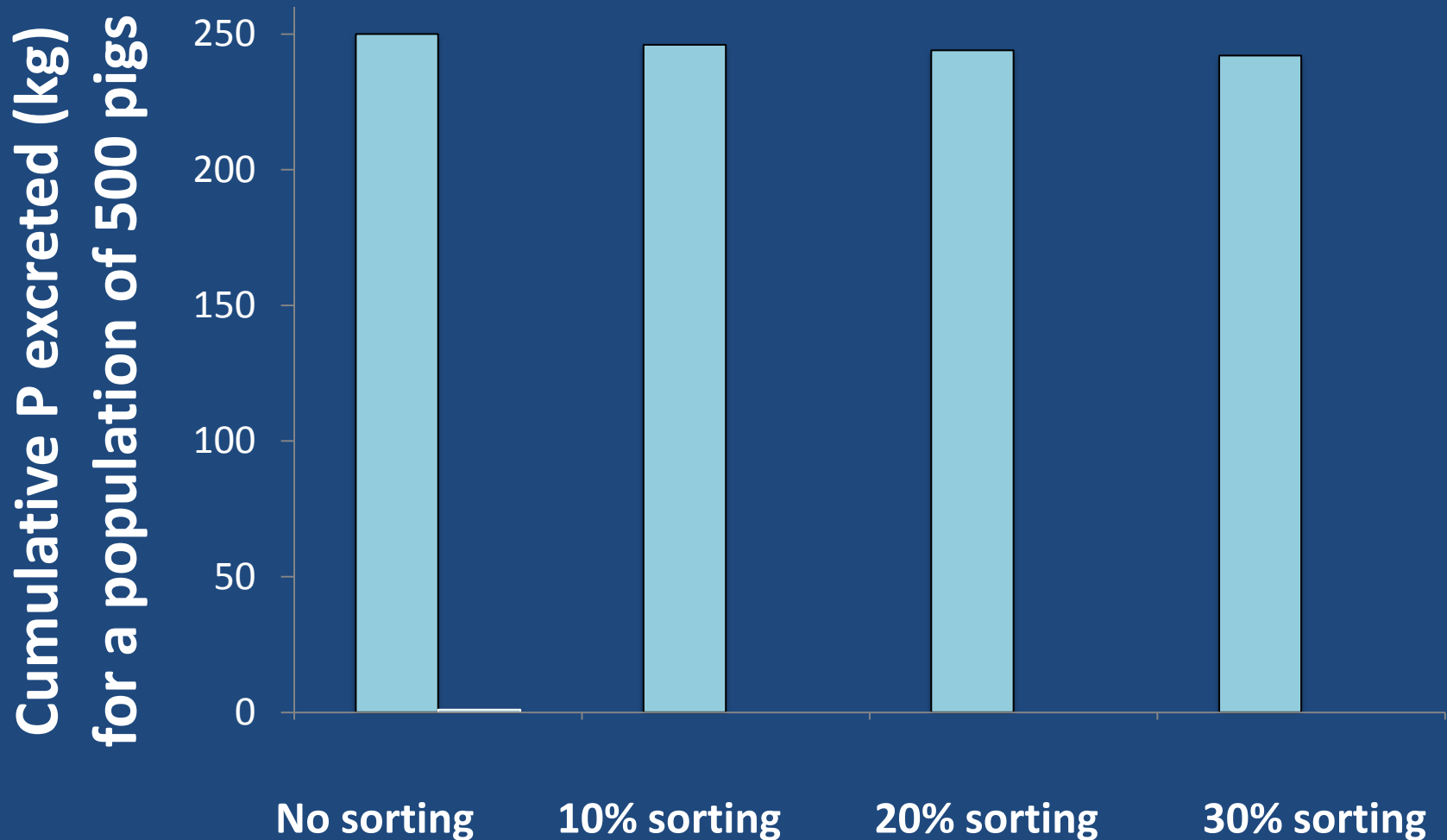
# Conclusions

- **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 FI as an input**

- **The model allows to quantify the consequences of different management scenarios on P excretion (including its different forms)**

# Thank you !!!