

# EU Feed-a-Gene

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Locally adapted pork production in Brazil versus the  
Netherlands, 23 October 2018

Feed-a-Gene





## Introduction

- ▶ Intro EU Feed a Gene
- ▶ Activities within the project
- ▶ What does the project deliver?



EU funded  
Research  
project

2015  
2020

€10 M  
Budget

# Feed-a-Gene



Adapting the **feed**, the **animal**  
and the **feeding techniques**  
to improve the efficiency and  
sustainability of monogastric  
livestock production systems  
([www.feed-a-gene.eu](http://www.feed-a-gene.eu))

23  
Partners  
EU + China

15  
Industry

8  
Academic

# Feed-a-Gene



Adapting the **feed**, the **animal** and the **feeding techniques** to improve the efficiency and sustainability of monogastric livestock production systems



## Feed

Academic partners  
Feed ingredient producer  
Enzyme producer  
Feed processing equipment  
manufacturer



## Traits, models, and feeding techniques

Academic partners  
Precision farming equipment  
manufacturers



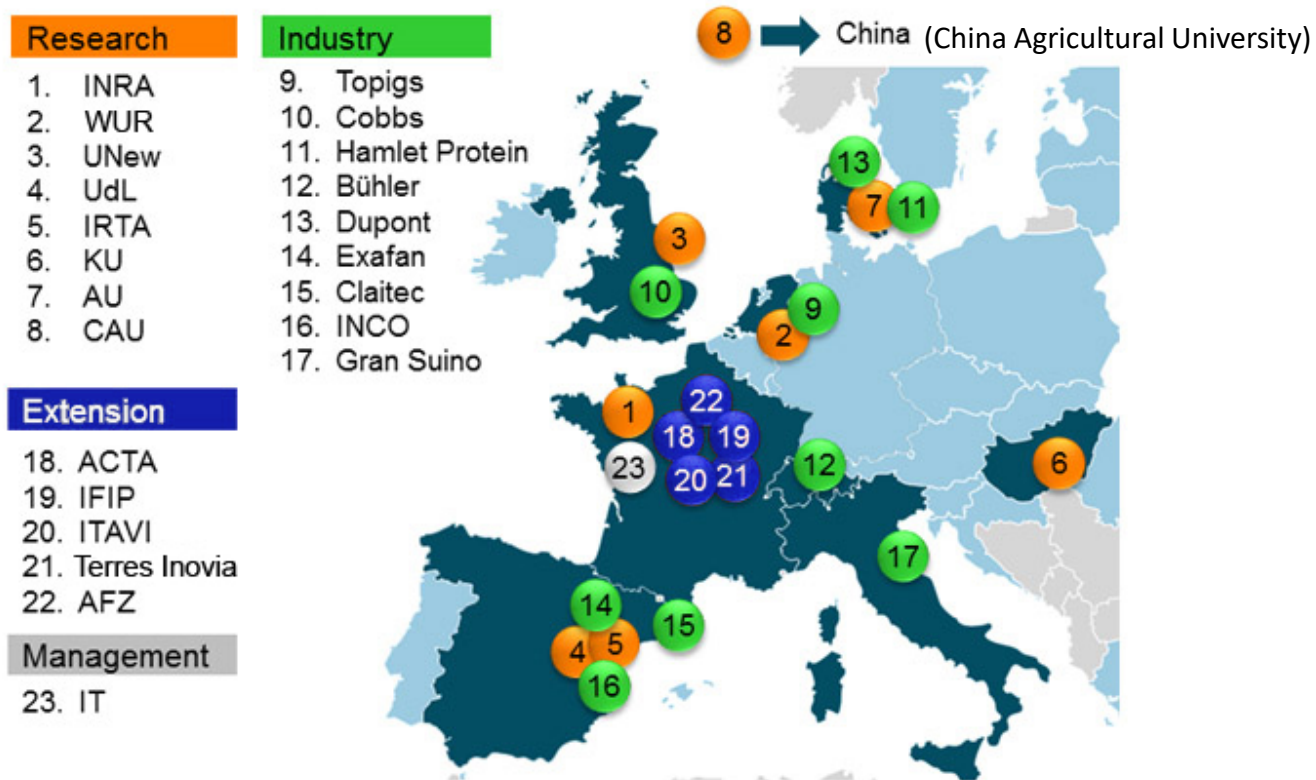
## Gene

Academic partners  
Pig breeder  
Poultry breeder

Interbranch organizations  
Extension services



## The Feed-a-Gene consortium





## Objectives of the Feed-a-Gene project



### Feed:

- ▶ Develop new local feed resources that are not/less in competition with food
- ▶ Improve the nutritional value of feed resources



### Gene:

- ▶ Use of novel traits indicative for feed efficiency and robustness that can be used as selection criteria
- ▶ “Do better with feeds that may be worse”



### Traits, models, and feeding techniques:

- ▶ Appreciate variation among animals
- ▶ Develop precision feeding techniques
- ▶ Evaluate the overall sustainability

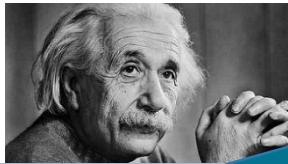


## It is all about variation

**Observe** variation in feeds, animals, and the environment



**Predict** using data-driven models and quantify interactions and variation



**Understand** the underlying mechanisms of variation



**Control** through livestock management (e.g., feeding, breeding)



## Contribution WUR to Feed-a-Gene

- Novel feed-processing technology to upgrade alternative feed ingredients (rapeseed and soybean protein concentrates) – in vitro characterization
- Nutrient metabolism and efficiency related traits in pigs to improve feed efficiency (birth weight of piglets; new biomarkers)
- Build and validate precision feeding system prototypes for growing pigs
- Selection strategies to account for crossbred and genomic data for a sustainable selection for feed efficiency in pigs





## New animal traits for innovative feeding and breeding strategies

### behaviour and welfare



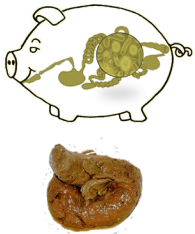
image analysis  
serotonin, cortisol

### individual feed intake



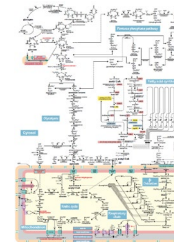
feed intake patterns  
feeding behavior

### digestive efficiency



digestibility markers  
gut health  
microbiota

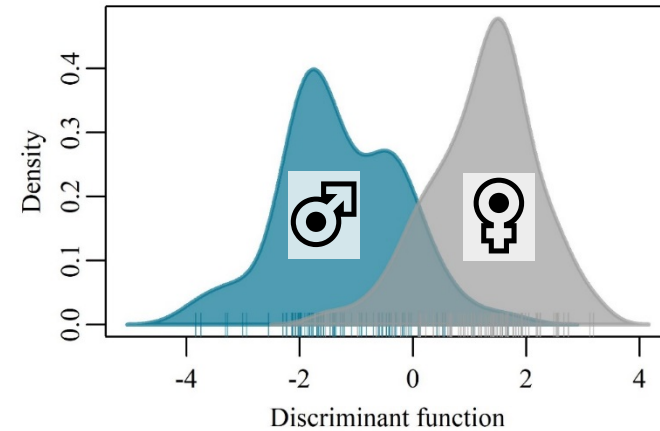
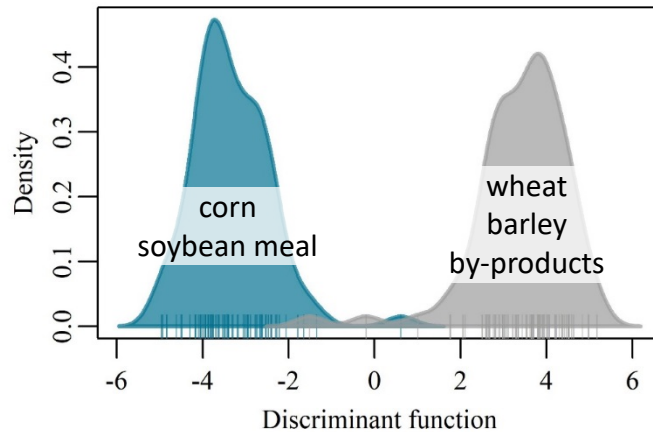
### metabolic efficiency



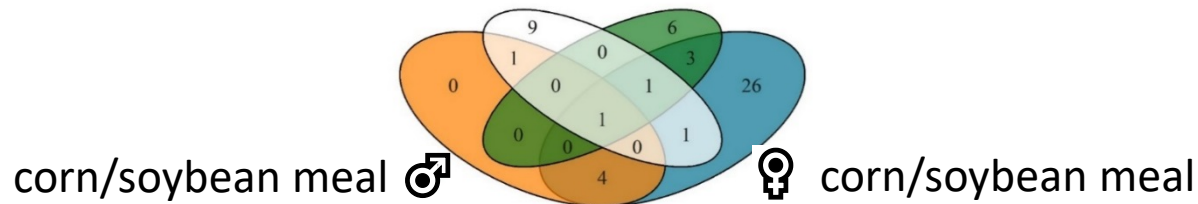
metabolomics



## Faecal microbiota as a trait to differentiate



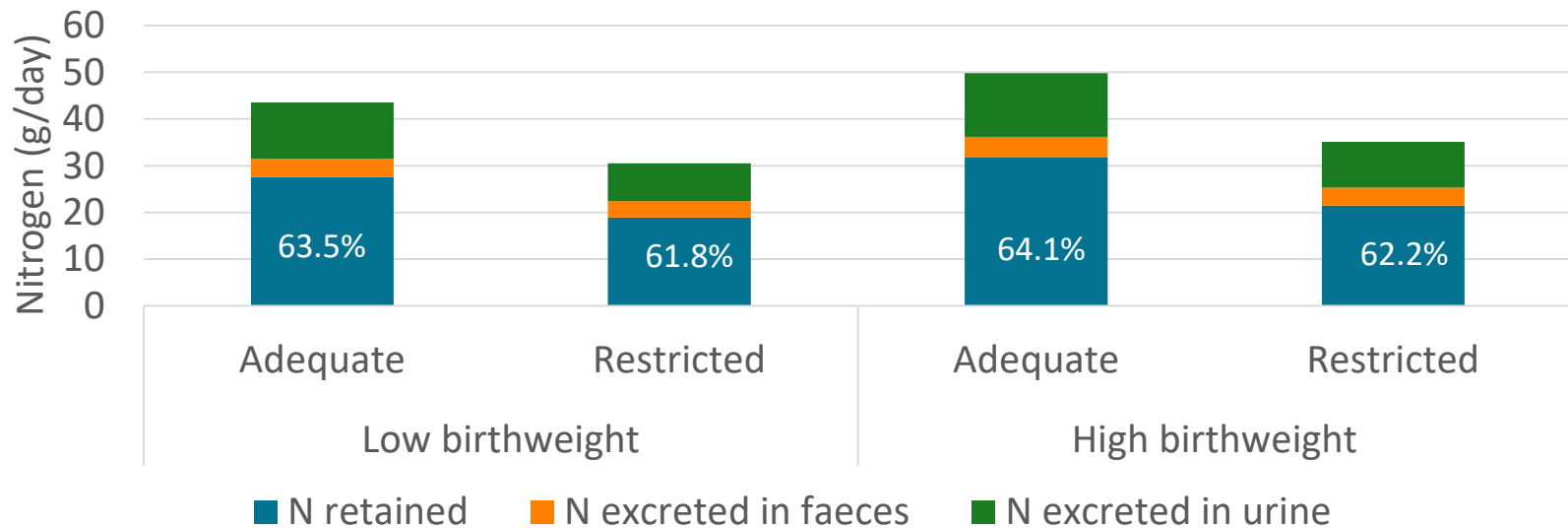
wheat/barley/by-products ♂ ♀ wheat/barley/by-products





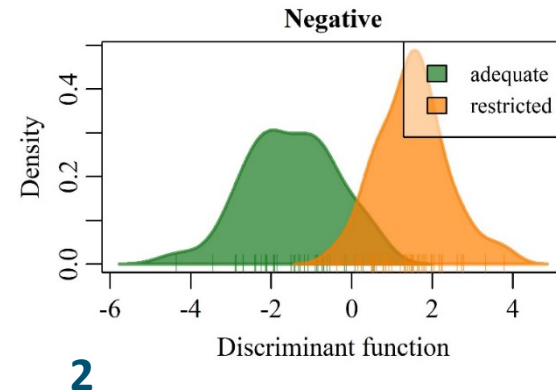
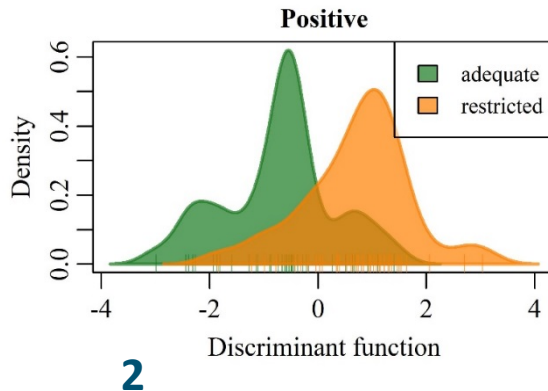
## Birth weight of piglets and N-efficiency later in life

### Nitrogen intake and allocation

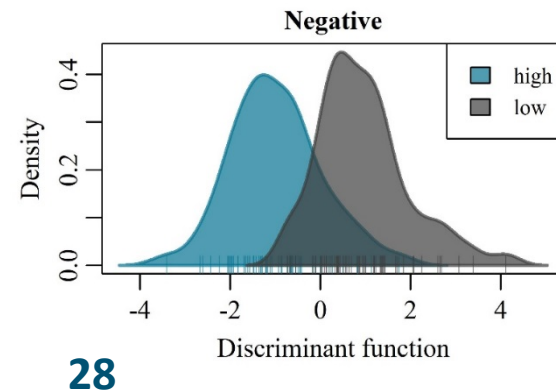
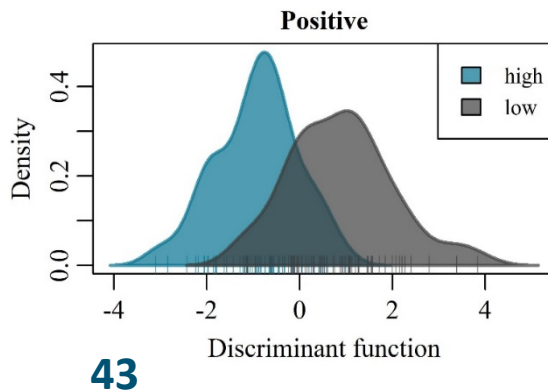


# Biomarkers for N-efficiency in pigs in blood

## ■ Diet

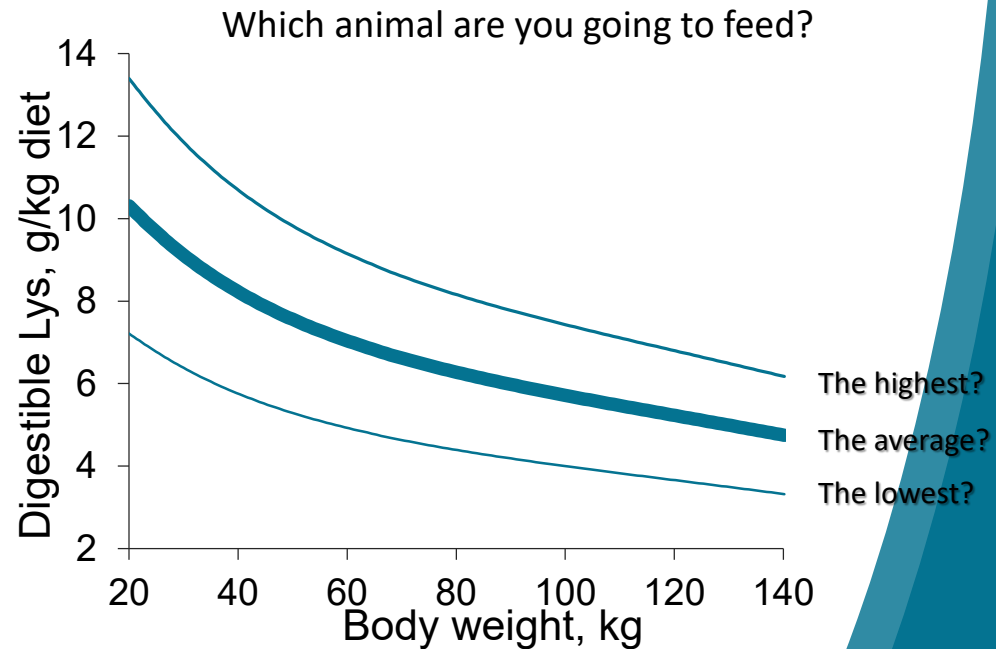
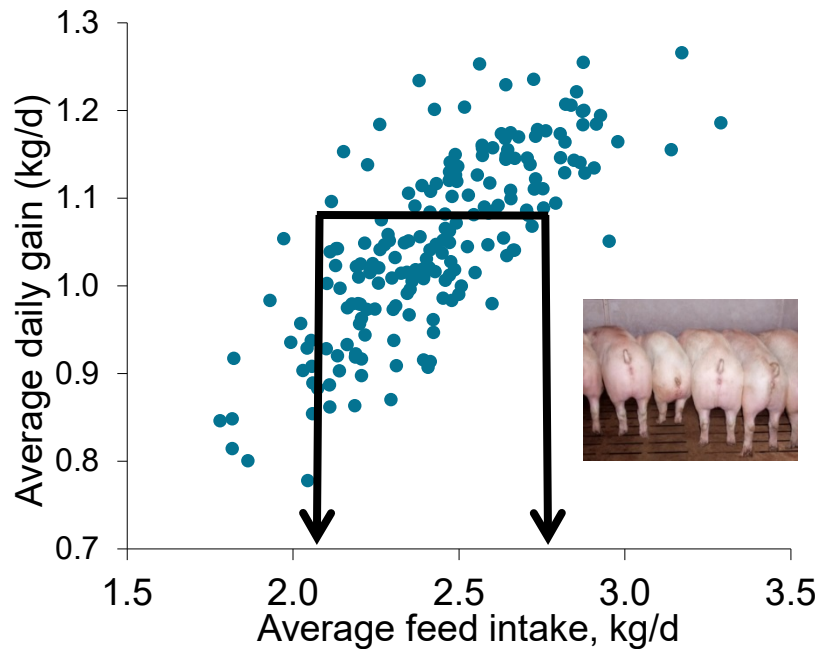


## ■ Birth weight



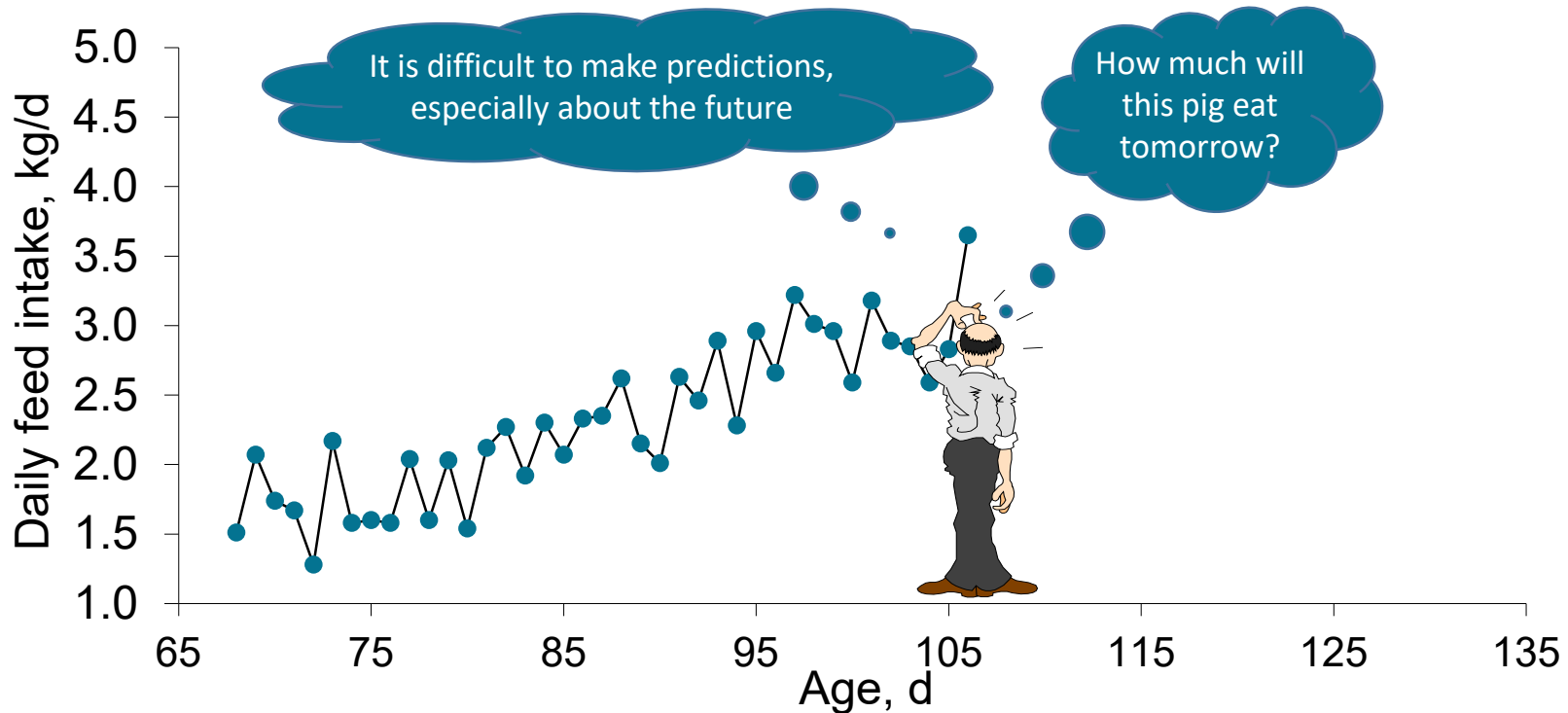


## Managing variation among individuals through precision livestock feeding



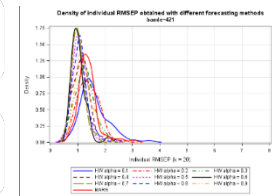
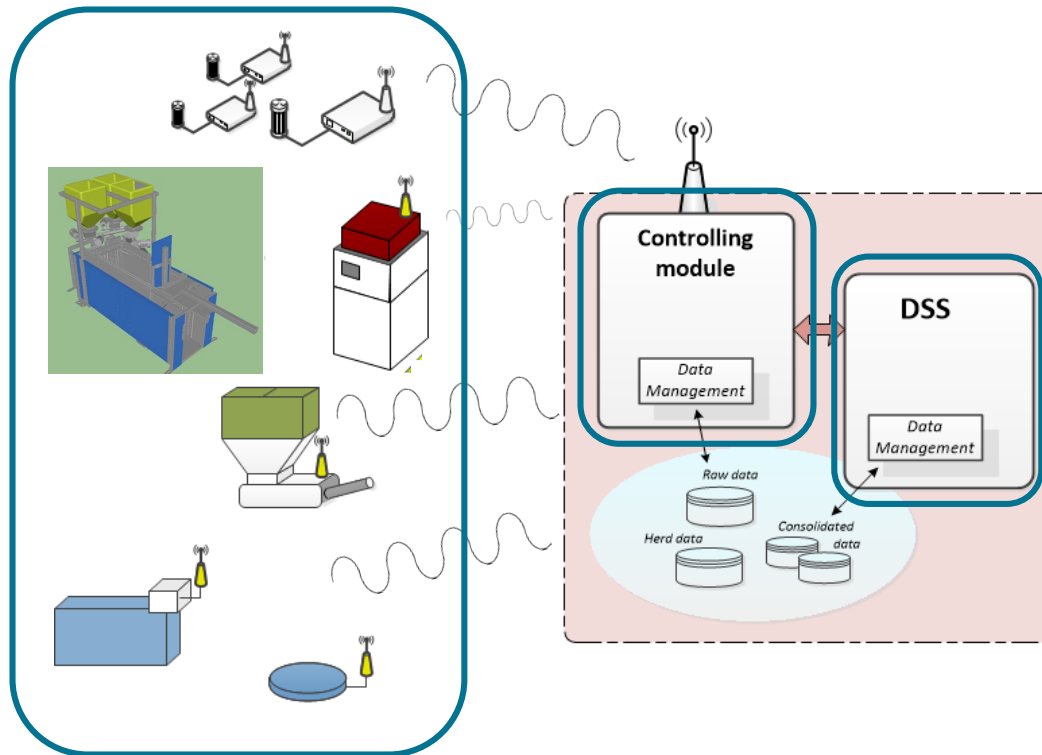


## Precision livestock feeding is about observing, predicting, and control

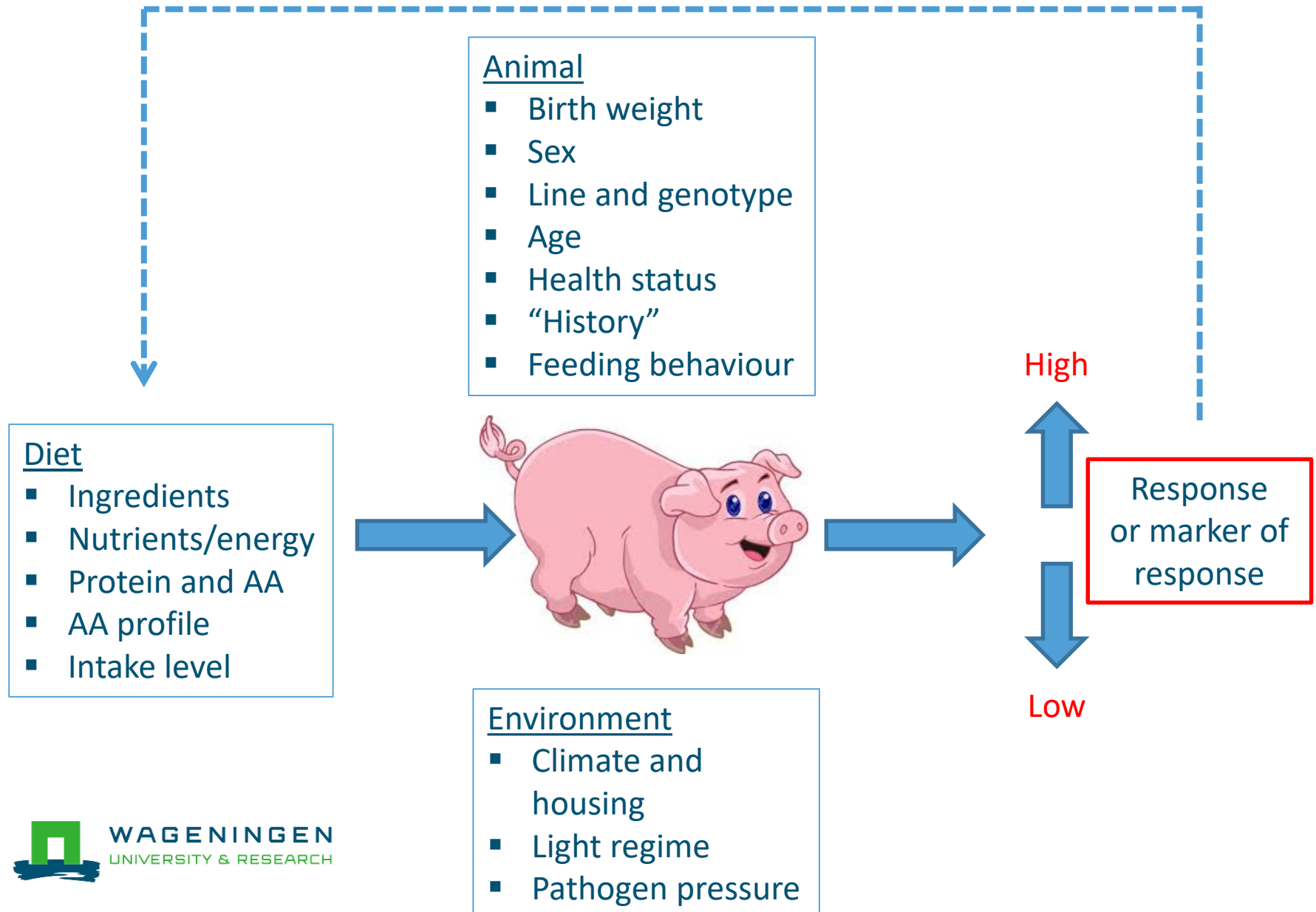




## Management systems for precision livestock feeding



# Precision Livestock Feeding







## System prototypes are now being tested

### ▀ Growing pigs

▀ Restricted feeding

▀ Ad-libitum feeding



### ▀ Sows

▀ *Gestation*

▀ *Lactation*





## Why breeding?

- ▶ Adapting the animal = Breeding & genetic selection!
- ▶ How to select *the best animals* for feed efficiency?
- ▶ Measure:
  - ▶ Individual feed efficiency (FE)
  - ▶ New traits predicting FE *early in life*
  - ▶ Under practical circumstances!



## Selection *versus* pork production

### Selection:

- Purebred lines



- High bio-security farms



### Pork production:

- Crossbred animals



- Commercial farms



*Building models* to use **commercial data** in selection

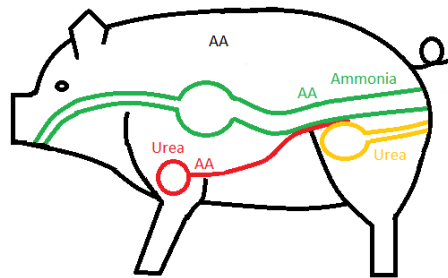


## New traits predicting feed efficiency

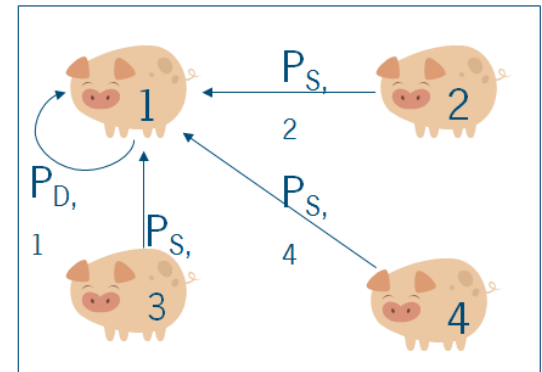
*Develop breeding strategies for FE based on new traits*



**Microbiome**



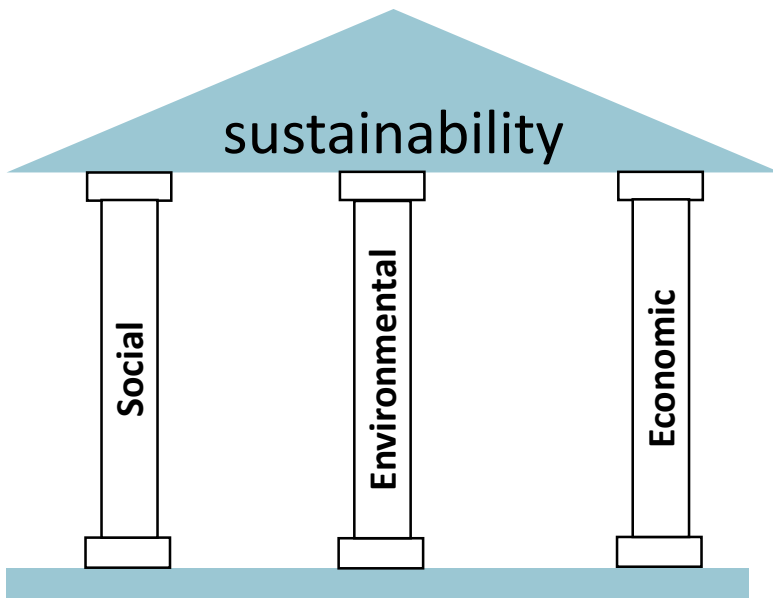
**Digestibility**



**Behaviour**



## Sustainability evaluation



- ▀ Identification of sustainability indicators
- ▀ Life Cycle Assessment of some of the proposed management systems
- ▀ Cost-benefit analysis
- ▀ Evaluation of consumer and farmer attitudes
- ▀ Overall sustainability appraisal



## Conclusions

- Livestock production and animal-derived products are part of a sustainable food supply
- There is a potential to increase the efficiency and robustness of livestock production systems
- There is no “one-size-fits-all”.  
Variation (among animals and systems), differentiation (of products), and segmentation (of markets) are essential
- Information-based technologies (e.g., precision livestock farming) have a great potential and are inevitable.  
Are we ready for it?



## Acknowledgments

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# Thank you for your attention!

