

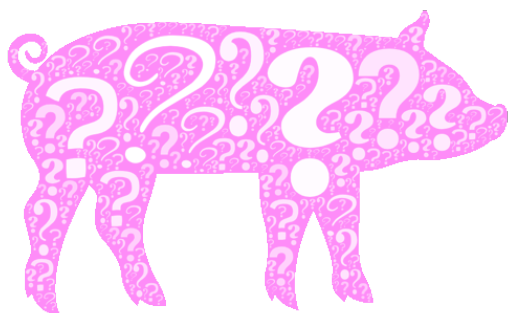


Models and tools for predicting feed and nutrient utilization in pigs and poultry

Nutritional models for pigs and poultry

A free software tool for research, development and education in genetics and nutrition

The challenge



How are nutrients digested? How are digested nutrients used in metabolism to produce meat and eggs? How does the genotype influence nutrient partitioning? Is it possible to detect perturbations that impair feed intake and growth? Is it possible to estimate the individual variation in a population if we have only a limited number of animals?

These questions can be explored by modelling, since this provides insight in the response of the animal to different scenarios. Different nutritional models have been developed and published, and some have served as a basis to develop software tools. However, few models are readily accessible for users.

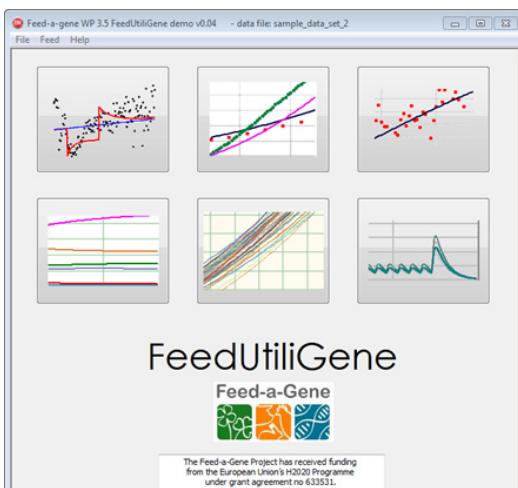


Our solutions

Feed-a-Gene has further developed existing models of nutrient digestion and metabolism for pigs and poultry. A robustness module has been developed that detects perturbations and characterizes the response of the animal in terms of resistance and resilience. A stochastic module simulates variation of individuals animals in a group and estimates the heterogeneity of the population.

These models have been implemented in the FeedUtiliGene software tool. Users can play with the models and visually understand their functioning.

FeedUtiliGene is a demonstration tool with a modular structure and interactive interface for a better understanding of the response of the animal to different conditions, including feed use mechanisms.

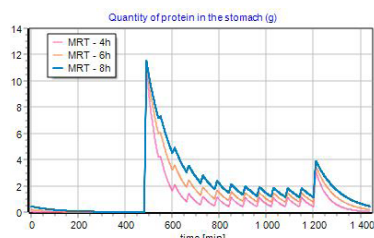


Novel technologies & concepts

The FeedUtiliGene software contains 6 modules: a digestion module, a parameter estimation module, a nutrient partitioning module simulating energy, amino acid, and phosphorus utilization, a fatty acid module for pigs, a robustness module, and a stochastic module.

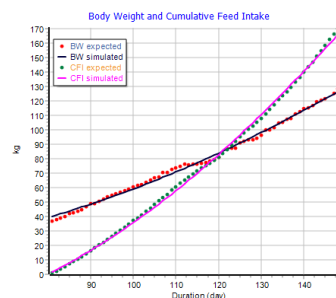
Digestive module

The digestive module is based on a generic model for pigs and poultry simulating the digestion all along the digestive tract. It predicts the digestible nutrient content of feed components or mixed feeds.



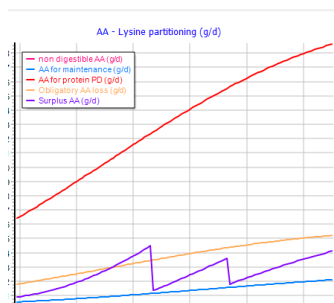
Parameter estimation module

The parameter estimation module adjusts the model parameters and model outputs to existing body weight and feed intake data.



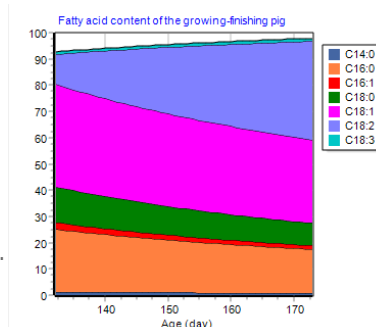
Nutrient partitioning module

This module simulates growth performance, body composition, and nitrogen and phosphorus excretion of pigs and broilers in relation to the diet and ambient temperature. It helps to define nutrient requirements and to reduce the environmental footprint of monogastric farm animals.



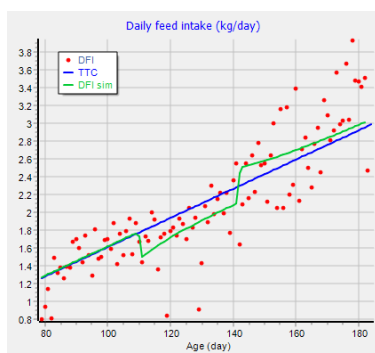
Fatty acid module

The fatty acid module estimates the fatty acid composition of the carcass of fattening pigs as affected by the level and source of fat.



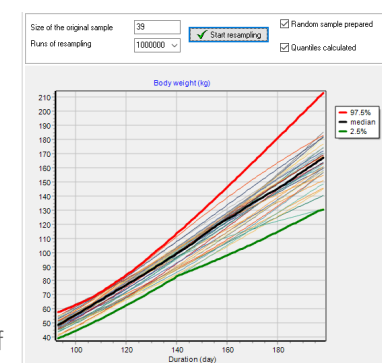
Robustness module

This module quantifies the robustness of the adaptive response of the animal in term of resistance and resilience, when facing known or unknown perturbations.



Stochastic module

This module addresses variation among individuals, which may originate from differences in nutrient partitioning. The module generates a population of animals with consideration of plausible individual variance.



Recommendations & benefits

FeedUtiliGene is a free software tool that can be used in education and extension services. It provides easy access to models developed in the project and published in peer-reviewed publications. The tool is useful for nutritionists and geneticists, and it provides insight on feed-use mechanisms and animal variation.