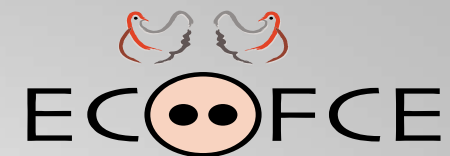# EFFICIENT & ECOLOGICALLY-FRIENDLY PIG AND POULTRY PRODUCTION.

A WHOLE-SYSTEMS APPROACH TO OPTIMISING FEED EFFICIENCY
AND REDUCING THE ECOLOGICAL FOOTPRINT OF MONOGASTRICS.

ECO FCE

BASIC DATA

Funding:
EU-FP7
(€ 6 million)

Start date:
1 February 2013

Duration:
48 months
(2013 to 2016)

COOPERATION

KEY ADVANCES FROM ECO FCE AND HOW THEY WILL SHAPE THE FUTURE

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The focus of ECO FCE was to:

Advance understanding and knowledge to

♦ Improve the feed use efficiency and reduce the ecological impact of pigs and chickens

The potential impact of ECO FCE

Based on a 5% improvement in FE, on 10% of the pigs and chickens in the countries involved in the project

♦ Feed costs ↓ **€13.7M/yr**

♦ N excretion ↓ **2300 tonne/yr**

♦ P excretion ↓ **400 tonne/year**

ECO FCE addressed these through:

♦ Use of current knowledge

♦ Investigating new feeding strategies

♦ Advancing the understanding of common factors attributable to high and low feed efficiency potential

♦ Identification of genetic regions coding for improved feed efficiency

♦ Development of new statistical models to select for improved feed efficiency

Outcomes from search of current knowledge

♦A vast array of knowledge exists **BUT**

♦The quality of this information is highly variable **AND**

♦The consistency of information across publications is low

♦This makes :

  ♦ The full utilisation of this knowledge impossible to achieve and

  ♦ Meta analysis on a large scale very difficult

ECO FCE proposes the adoption of:

♦ A system to improve the consistency of M&M information in peer review papers, (Arrive guidelines (NC3R's))

♦ An automated upload of M&M and Results information

♦ ECO FCE has developed the knowledge, through trail and error, to advance such concepts.

Outcomes from feeding systems

- Nutritional conditioning of broilers has potential to improve early life performance of birds and reduce P excretion

- *In Ovo* symbiotic in chickens and inoculation early in the pigs life can have life long effects on gut microbiota

- Precision feeding of pigs in commercial penning can improve feed efficiency, especially of males

Outcomes from feeding systems

◆ The efficacy of enzymes differs greatly depending on feed ingredient

◆ In vitro tests for enzyme efficacy show promise in their ability to assess the relative impact of enzymes on different raw materials.

◆ Enzymes/ingredient combinations:

- ◆ Galactosidase in soya bean meal based diets showed promised

- ◆ Xylanase/ß Glucanase in wheat DDGS/RSM based diets – no effects

- ◆ Protease in wheat DDGS/RSM based diets – no effects

Pigs - high vs low feed efficiency

ECOFCE

	Difference between High and Low RFI?
Microbiota richness and diversity	N
Composition of low relative abundance taxa	Y (But inconsistent across site)
Feeding Behaviour	Y
Mucosal Permeability (Jejunum)	Y
Activation of the Jejunum immune response	Y
Differentially expressed genes (DEGs)	Liver - 803 Duodenum – 62, Jejunum – 86 Hypothalamus - 78

COOPERATION

Chickens - high vs low feed efficiency

	Different between High and Low RFI?
Bacterial OTU's	Y (but inconsistent between sites)
Mucosal Permeability (Jejunum)	Y
Activation of the Jejunum immune response	Y
Differentially expressed genes	Duodenum – 172, Jejunum – 120 Ileum - 81

Genetic regions for FE

♦ Entropy analyses and multi-marker strategies ID'ed major genomic regions for FE on chicken chromosomes 1 and Z.

♦ For Pigs - Entropy analyses suggested the most informative SNP'S for FE related traits were mainly located on chromosomes: 1, 4, 5, 7, 9, 12, 14 and 17 (Potential candidate genes: Water homeostasis, glycolysis, mitochondria assembly and beta-oxidation)

♦ ECO FCE, with industry partners, developed an industry directed panel of SNP markers to breed faster for improved feed efficiency amongst breeding stock.

Genetic Models

♦ Modelling confirmed that improved feed efficiency was better achieved through selection for RFI than for FCR

♦ Manipulation of the Genomic Feature Model (GFBLUP), using information from the project, resulted in it having a better predictive ability than the standard GBLUP

Some key areas of Future potential

ECOFCE

♦ Automation of current knowledge

♦ More clarity is required on enzyme/ingredient combinations which have impact

♦ Harnessing the impact of early life gut microbiota

♦ Genotype x Environment

♦ Integrating Multi layers of 'Omics' into breeding models

Discussion…