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SusPig – Sustainability of Pig Production through Improved Feed Efficiency

Wendy Mercedes Rauw

Mid-term COFUNDED Projects Seminar
10-11 April 2019, Wageningen (Netherlands)

EUROPEAN RESEARCH AREA ON SUSTAINABLE ANIMAL PRODUCTION

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Project description

Production output must be met by feed input
Modern pigs → high quality feeds → soybean meal

Dependency = interest in local feeds and feedstuff co-products ☞ different type of animal?

Aim: Can improved feed efficiency be sustained with climate change and more reliance on local feeds?
& Evaluate environmental, social and economic impacts ☞ new sustainable production systems

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Preliminary results

- High producing pigs = more susceptible to heat stress
- Blood biomarkers (health and fitness) for feed efficiency in ~ 1000 pigs & other measurements
- Potential for feed efficiency not fully realized on high fiber (e.g., rapeseed) → next = legumes
- Efficiency on concentrate vs acorns r = -0.55**
- Lean tissue growth and maintenance have highest effect on environmental impacts

→ High feed efficiency = an advantage

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Contribution to SusAn research objectives

1. To improve the competitiveness and resilience of the entire animal production chain

→ *Novel production systems that are less dependent on feed imports*

2. To make prudent and efficient use of natural resources

→ *Local crops land, feed nutrients and novel genetics*

3. Opportunities for converting non-edible feedstuffs into animal products

→ *Novel feed ingredients (local, co-products)*

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Contribution to SusAn research objectives

4. To produce animal products which are of high quality for consumers and the processing industry

→ *Iberian ham (acorns)*

☞ *novel niche products?*

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Contribution to SusAn research objectives

5. To minimise emissions to soils and water and to the atmosphere

→ *LCA for environmental impact*

☞ *High feed efficiency = an advantage*

6. To develop systems meeting societal needs and values → *Social LCA underway*

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Pillars of sustainability

Economic competitiveness ☞
Reduced feed costs, improved robustness, less dependency on international markets

Social acceptability ☞
Improved animal welfare and consumer acceptance of pig production and breeding practices
→ Social LCA

Environmental protection ☞
Improved efficiency reduces emissions
→ LCA for environmental impact

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Links between pillars of sustainability

In particularly relevant because of trade-offs:

↑ feed efficiency = ↑ economic competitiveness & ↑ environmental protection, but may ↓ animal welfare (social acceptability)

Alternative feed resources = ↓ feed efficiency = ↓ economic competitiveness but ↑ independence on international markets, ↑ social acceptability

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Transnational collaboration: *added value*

Spain (2x), France (2x), UK, Norway, Sweden, USA, Australia ☞ multi-disciplinary!

Blood biomarkers: FR, ES, AU, USA

Heat stress: AU, USA, ES, FR

Transcriptomic and microbiota profiles: NO, ES

LCA analyses: UK, SE, FR, NO

Breeding models: USA, FR, ES

↳ <u>Combination of skills</u> (LCA + Genetics)!

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Transnational collaboration:

implementation of results

Direct transfer of results to pork producers,
Direct cooperation with feed production industry, breeding company & local pig breed producer

Combined efforts: LCA models

↳ <u>Development of new holistic sustainable pig production systems</u>

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Multi actor approach:

involvement of stakeholders

Initial: working together with stakeholders

☞

Obtaining results ☞ Popular Publications

☞

New cooperations ☞ Attract more stakeholders

= <u>long-term</u> cooperation & transfer to stakeholders

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Multi actor approach: *validation of outcomes*

- Fundamental research → corr. FE and robustness
- Direct applications in industry → biomarkers FE
- Working with industry future applications
  → SNP genotyping
  → FE on different feeds
- Development of LCAs and novel production system
  → Future applications

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Cross-scale approach

Farm: Improving feed efficiency & robustness to a wide variety of environments (e.g., heat stress)

Regional: Local crop production (legumes, rapeseed, {spruce, kelp})

National: National production systems (Iberian pigs)

European: Reduced dependency on imported feeds

→ Novel production systems, LCAs

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Cross-scale approach:

Impact of knowledge acquisition

Working together with stakeholders

Obtaining results ☞ Popular Publications

Attract new stakeholders

Consider new alternative feeds

= ***long-term process***

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Margareth Øverland
March 29 at 8:12 AM ·

The minister of Food and Agriculture was visiting Foods of Norway recently

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MINISTERIO DE AGRICULTURA, PESCA Y ALIMENTACIÓN

DIRECCIÓN GENERAL DE PRODUCCIONES Y MERCADOS AGRARIOS

Jornada-Taller sobre de Cultivos Proteicos en España

Madrid, 10 de abril de 2019.

Gran Vía de San Francisco, nº 4-6

AGENDA

Salón de actos

09.30 -10.00 Recepción-café

10.00 -10.15 Inauguración de la Jornada- Directora General de Producciones y Mercados Agrarios

10:15 -14:00 PONENCIAS

10:15 -11:15 POLÍTICAS E INSTRUMENTOS

- Plan Proteico de la UE – "Una oportunidad" SGCHIAO
- Política Agrícola Común (Post 2020) y el encaje de los cultivos proteicos – SGCHIAO
- Programas de Promoción de la UE para productos agroalimentarios- "una oportunidad para promover los beneficios de las proteínas vegetales (alimentación humana y animal – Salud y Medio Ambiente".
- Plan de Proteína Vegetal y Estrategia de Proteínas Vegetales en Francia – Mª José Hernández Mendoza (Consejera MAPA-Francia).

11:15 -12:30 **Prácticas agronómicas y beneficios medioambientales. Investigación e Innovación**

- CSIC- Instituto de Agricultura Sostenible (Diego Rubiales): "*Prioridades de Investigación Estratégicas en el Sector de las Leguminosas*"
- ITCYL – Alicia y Emilio – "*Programas de mejora de leguminosas para consumo humano y animal - el alberjón ¿una oportunidad?*""

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Dissemination and communication strategy

Review Article "Sustainability of pig production through improved feed efficiency"

Obtaining results ☞

Peer-reviewed articles
Popular Publications

LCA Models, stakeholders ☞ Full presentation of results
Including video material
& Teaching material

= ***long-term process***

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Dissemination and communication strategy

SUSPIG

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11th International Conference on Life Cycle Assessment of Food (LCA Food 2018) in conjunction with the 6th LCA AgriFood Asia and 7th International Conference on Green and Sustainable Innovation (ICGSI) 16-20 October 2018, Bangkok, Thailand

A Framework To Account For The Potential Environmental Impacts That May Arise From Genetic Changes In Pigs

Mathias Bo Ottosen, Stephen Mackenzie, Michael Wallace, Ilias Kyriazakis

Agriculture, SNES, Newcastle University, Newcastle Upon Tyne, England

We have developed a framework to account for the environmental impacts that may arise from genetic changes in pigs. An LCA model was built for a typical commercial Danish pig system, taking into account a number of pig traits that may be genetically correlated; the traits included were both sow- and growing pig-related. Through testing traits systematically both one at a time and in correlated clusters, i.e. accounting for the fact that some traits are genetically correlated, our model was able to show the importance of considering correlation between traits when modelling the environmental impact of breeding strategy. The model was highly sensitive to average daily gain between 30-100kg and energy used for maintenance, but also for clusters containing typical sow performance traits, such as weight gains and losses through gestation and lactation, and lactation feed intake. In future work we will consider how changes in these traits will affect the environmental impact of pig systems. This is the first time an LCA capable of showing the implications of breeding strategies for environmental impact has been developed for pig systems.

69th Annual Meeting of the EAAP, Dubrovnik, Croatia, 2018

Relationship Between Feed Efficiency And Physiological Stress Parameters In Duroc X Iberian Pigs

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Selection for improved feed efficiency may reduce the ability of animals to respond to environmental challenges. Alternatively, selection may result in animals with a reduced stress response. Fifty-three crossbred Duroc × Iberian barrows were used in this study. During the fattening period, feed consumed and body weight were recorded 22 times every 3 to 8 days over a period of 124 days. Body weight gain (BWG) was calculated and residual feed intake (RFI) was estimated for three

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THANKS!

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