Assessment of animal welfare and environmental impact

C. Leeb

Scientific Workshop on Organic Pig Production
Hovborg
June 12th-13th 2013
Organic pigs outdoors
Organic pigs indoors with concrete outside run
Overview

• Introduction to ProPIG
• How to assess animal welfare and environmental impact?
  – Examples
• How to/how do they relate to each other?
• Conclusions
ERA-net CORE Organic II ProPIG (2011-2014)

Farm specific strategies to reduce environmental impact by improving health, welfare and nutrition of organic pigs

**Aim** of this project,

- to investigate the **interaction of animal health and welfare**, with nutrition and environmental impact
- to create and disseminate a **tool to improve both aspects** of organic pig production.
Introduction

Partners

- 9 Partners in 8 Countries (AT, CH, CZ, DE, DK, FR, IT, UK)
- Coordination: C. Leeb, Austria

Austria: C. Winckler, G. Rudolph and C. Leeb (BOKU)
Czechia: J. Urban (Bio-I), G. Illman (IAS, Prague)
Denmark: T. Rousing, J.T. Soerensen (Aarhus Univ.)
France: A. Prunier, J.Y. Dourmand, F. Vertes (INRA)
Germany: S. Dippel (FLI) and C. Simatke (BAT)
Italy: D. Bochicchio (CRA-SUI)
Switzerland: B. Früh, M. Meier, A. Berner (FIBL)
UK: S. Edwards, G. Butler (Univ. Newcastle)
(Sweden: E. Salomon, K. Lindgren, A.K. Lind (JTI))
ProPIG
"Three Systems"

75 farms in 8 countries

To identify

- animal - environment interactions
- in three systems:
  - Indoor with concrete outside run
  - Partly outdoor
  - Outdoor

Hypothesis

All systems are able to ensure good welfare and low environmental impact when well managed
ProPIG

Farm specific strategies for improvement

To develop and implement

• **Farm specific strategies** to:
  – reduce **environmental impacts**
  – by improving health, welfare, nutrition and management

• To **disseminate knowledge** to national advisory bodies and farmers
WP1: Definition of systems and development of assessment protocols of animal health, welfare and environmental impacts

WP leader: UK, Sandra Edwards/Gillian Butler

- Definition of **Systems** (indoor/partly indoor/outdoor)
- Development of Assessment protocols
  - Animal health and Welfare: e.g. Clinical scoring, medicine records
  - Environmental impact: LCA, nutrient balances
  - Farmer: qualitative interviews, basic economical data
- **Automatic** recording and feedback: **PigSUrfer**
- „**Decision Support Tool“** for environmental impact
WP 2: On-farm assessment and application of improvement strategies of animal health, welfare and environmental impacts
WP leader: Denmark, Tine Rousing

Prospective cohort observational study
75 farms (3 systems of 25 farms each)
Training and Interobserver Repeatability
3 Farm visits

1. Visit Assessment
2. Visit Farm plan
3. Visit Implementation of measures
WP 3: Analysis, evaluation and dissemination

WP leader: Germany, Sabine Dippel

1. Comparison of three systems regarding animal health, welfare and environmental impact
2. Detailed analysis of effect of farming type on health and welfare and productivity
3. Evaluation of improvement strategies
4. Dissemination:
   – Website, articles (farmer journals/scientific)
   – Handbooks and training material for advisors
   – National and international stakeholder meetings
Welfare

Clinical/Physical
e.g. Fraser & Broom, 1990

Feelings/Mental
e.g. Duncan, 1993

“Naturalness”
Normal behaviour Integrity
e.g. Rollin, 1993
How to measure?

WELFARE

Housing
- e.g. space, bedding

Breeding
- e.g. breeding goals

Nutrition
- e.g. system, ration

Stockmanship
- e.g. training

Behaviour
- e.g. social behaviour

Pathology/physiology
- e.g. lesions, BCS

Records
- e.g. treatments, mortality

Assess

IN PUTS

OUTCOME
First results-

Two Austrian farms

farrow to finish farms,
approx. 25 sows, F1 (LRxES), mainly home grown feeds

Indoor

Partly outdoor
First results - Animal welfare

### Thin sows

<table>
<thead>
<tr>
<th>20% best farms</th>
<th>20% worst farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 5.3 %</td>
<td>22.2 - 54.5 %</td>
</tr>
<tr>
<td>5.3 - 10.5 %</td>
<td></td>
</tr>
<tr>
<td>10.5 - 14.3 %</td>
<td></td>
</tr>
<tr>
<td>14.3 - 22.2 %</td>
<td></td>
</tr>
<tr>
<td>22.2 - 54.5 %</td>
<td>5.3 %</td>
</tr>
</tbody>
</table>

**Condition Score 1:**
The sow is visibly thin, with hip bones and backbone very prominent and no fat cover over hips and backbone.

**Condition Score 2:**
The hip bones and backbone are easily felt without any pressure on the palms.

**Condition Score 3:**
It takes firm pressure with the palms to feel the hip bones and backbone.

**Condition Score 4:**
It is impossible to feel the bones at all even with pressure on the palm of the hands.

**Condition Score 5:**
The sow is carrying so much fat that it is impossible to feel the hip bones and backbone even by pushing down with a single finger.
# First results - Animal welfare

## Skin lesions

<table>
<thead>
<tr>
<th>20% best farms</th>
<th>0.0 - 0.0 %</th>
<th>0.0 - 11.1 %</th>
<th>11.1 - 19.0 %</th>
<th>19.0 - 27.3 %</th>
<th>20% worst farms</th>
<th>27.3 - 51.4 %</th>
<th>Ihr Betrieb am 18.07.2012 (Mittelwert basiert auf: 19 Werte)</th>
<th>47.4 %</th>
</tr>
</thead>
</table>

Examples

![Image of pigs playing](image1.png)

![Image of pig with lesions](image2.png)
Environmental impact

- Global warming Potential
  e.g. Basset-Mens & van der Werf, 2005; Olea et al., 2009; Halberg et al, 2010, Rigolot et al, 2010

- Nutrient flow (N and P)
  e.g. Schröder et al., 2003

- Soil characteristics
  e.g. Gee and Bauer, 1986
How to measure?

Environmental impact

- Soil characteristics
- Vegetation cover
- Nutrient balances (N, P)
- Global warming potential

OUTCOME

INPUTS

Nutrition
Housing/Outdoors
Manure management

- e.g. system, ration
- e.g. space, bedding
- e.g. cleaning frequency

Assess

- e.g. training
- e.g. system, ration
Global warming potential Modell (Rigolot et al., 2010)

Bought in feed stuff:
Energy use, land use, transport

Home grown feed
Indirect emissions (energy, land use)

Sows Weaners Finishers

Farm fertiliser: Storage, spreading

Direct emissions (digestion, heat production: CH₄, CO₂)

housing: litter (CH₄, NH₃, N₂O), energy, pasture (N₂O, NH₃, NO₃)

NH₃, NO₃, (N₂O)

Assess
First results - CO₂-eq Emissions of Austrian organic pig farms in kg CO₂-eq/1000kg finishing pig (live weight at slaughter)

Examples

Brandhofer 2013
First results- 
N and P 
balances of Austrian organic pig farms

<table>
<thead>
<tr>
<th>Betrieb</th>
<th>N-Bilanz (kg N/ha/a)</th>
<th>P-Bilanz (kg P/ha/a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT001</td>
<td>17</td>
<td>-6</td>
</tr>
<tr>
<td>AT002</td>
<td>-30</td>
<td>-6</td>
</tr>
<tr>
<td>AT004+AT006</td>
<td>-10</td>
<td>-3</td>
</tr>
<tr>
<td>AT007</td>
<td>7</td>
<td>-4*</td>
</tr>
<tr>
<td>AT008</td>
<td>-10</td>
<td>-7*</td>
</tr>
<tr>
<td>AT009</td>
<td>3</td>
<td>1*</td>
</tr>
<tr>
<td>AT011+AT015</td>
<td>15</td>
<td>-3</td>
</tr>
<tr>
<td>AT013</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>AT016</td>
<td>5</td>
<td>-2*</td>
</tr>
<tr>
<td>AT003</td>
<td>-12</td>
<td>3</td>
</tr>
<tr>
<td>AT005+AT012</td>
<td>-11</td>
<td>2*</td>
</tr>
<tr>
<td>AT014</td>
<td>42</td>
<td>28*</td>
</tr>
</tbody>
</table>

Durchschnitt indoor 1,0 -2,9
Durchschnitt partly outdoor 6,3 11,0

Brandhofer, 2013
How to relate?

1. Individual parameters?
   – Mange eradication:
     • prevalence of ectoparasites vs. Treatment incidence
   – Outdoor areas:
     • rooting behaviour vs. vegetation cover
How to relate?

2. Combination of few, selected parameters „Cluster“?
   – E.g. **Physical welfare**: treatment incidences plus lesions, lameness
   – E.g. **Direct animal impact on environment**: Medicinal input, Vegetation cover,
3. Compare e.g. WQ® Score of farm with e.g. CO₂-eq Emissions?
How do they relate?

<table>
<thead>
<tr>
<th>Relation</th>
<th>Environment</th>
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<tbody>
<tr>
<td></td>
<td>+</td>
<td>0</td>
<td>-</td>
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<tr>
<td>Animal health, welfare &amp; nutrition</td>
<td>Mange eradication Optimised ration Regular removal of manure in outside run Health management</td>
<td>Adequate amount of bedding</td>
<td>Access to forest Access to natural water sources</td>
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<tr>
<td>Animal health, welfare &amp; nutrition</td>
<td>Origin of food stuff Manure storage Food conversion rate</td>
<td></td>
<td>Protein surplus in Ration Feed losses High spacial variability in N and P load</td>
</tr>
<tr>
<td>Animal health, welfare &amp; nutrition</td>
<td>Nose rings of sows</td>
<td>Respiratory problems</td>
<td>High density of pigs outdoors Rotation interval inadequate</td>
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First results - Ectoparasites

**Treatment incidence Parasites sows**

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<td>0.0 - 0.0 %</td>
<td>100.0 - 187.5 %</td>
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**Treatment incidence Parasites weaners**

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<th>33% best farms</th>
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<td>0.0 - 0.0 %</td>
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### First results - Ectoparasites - Mange eradication

#### Treatment incidence Parasites sows

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Conclusions

• Selected aspects of animal welfare and environmental impact can be assessed on farm

• Still to be discussed how to relate them to each other
  – Concrete hypothesis
  – Specific – measureable - outcomes

• High influence of management - variation within systems larger than across systems

• Allowing to identify solutions
Thank you!
Questions?

Further information: http://www.coreorganic2.org/propig
References