Organic pig production

Module M4801-480: Organic Livestock Farming and Products

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Introduction

- Increasing demand for organic food items through concern of food quality and safety, environment, and animal welfare
- Growing demand of organic pork in Europe, although still a niche product
- Variation in the different member countries of the EU
- Insufficient market transparency and structure
- Consumers’ willingness to pay relatively high premiums for organic pork
- Current production of organic pork cannot meet the demand
- Conversion of conventional into organic pig production
Organic pig production in core European producing countries

Source: Compiled after Edwards, 2011
• Aim of organic pig production: Production system with high animal welfare standard
• Little change of behavioural repertoire due to domestication
• Higher welfare ➔ pigs can express their natural behaviour
• What are the instinctive behaviours of pigs?
Natural behaviour of pigs

- Social behaviour
- Locomotion behaviour
- Exploration behaviour
- Feeding behaviour
- Comfort
- Resting and sleeping behaviour
- Defecation behaviour
- Nesting and farrowing behaviour
- Exploration behaviour
Social behaviour

- Very distinctive and differentiated
- Herd animal: All behaviour pattern performed in group
- Naturally living in small groups (20-30 animals)
- Pigs are social animals and form hierarchies
- 10% of the active time per day used to form social structure
- Problem to integrate new pigs to existing groups
Locomotion behaviour

- Structured day in terms of time and place
- In nature: change of the behavioural activity ➔ change of location
- Wild boar: up to 4-6 km per day
- Piglets during the 2\textsuperscript{nd} – 6\textsuperscript{th} week: playing with a lot of running ➔ need a lot of space
Exploration behaviour

• Exploration by eye, ear, mouth, tactile and olfactory sense (e.g. truffle pig)
• Extremely sensitive rooting disc
• Main time of activity during the day
• Combined with foraging and rooting
• Welfare consequences of rooting deprivation
• Nothing to explore in a pigpen ➔ redirection behaviour towards pen fixtures or penmates
• Rooting areas to be provided
Natural behaviour of pigs

Feeding behaviour

• Pigs are omnivores ➔ wide natural spectrum of feed
• Social behaviour: one finds food ➔ all start to eat
• System must ensure possibility of synchronic feeding
• Need to forage even when fed on a well-balanced diet
• Otherwise frustration ➔ poor welfare seen e.g. in sham chewing, bar biting
Defecation behaviour

- Strong aversion to own or conspecifics’ excrements
- Strict separation of defecation and laying area
- Preferred defecation areas close to watering place
- Problem of punctual soil and water pollution
Nesting and farrowing behaviour

- Behavioural need of maternal behaviour in domestic pigs ➔ provision of shelter for piglets
- Considerably effected by the husbandry system and by environmental circumstances
- Restriction under conventional husbandry conditions
- Opportunity for behaviour expression ➔ better health and welfare

Natural behaviour of pigs

http://www.vgt.ch/news2006/060110_einstreu_in_abferkelbuchten.htm

http://www.vgt.ch/news2006/060110_einstreu_in_aberkelbuchten.htm
Nesting and farrowing behaviour

- Physiological stress in sows
  ➔ Delayed births and increased rate of stillbirth
  ➔ Negative effect on the piglets: reduced survival rate / savaging of piglets

- Loose farrowing system or at least suitable material required
Sleeping and resting behaviour

• Peaks of activity at the morning and afternoon
• Resting in groups, rarely alone
• Housing systems with protected laying area
• Quality of floor important: soft and dry laying areas
• Relaxed resting and sleeping: lateral position
Natural behaviour of pigs

Comfort behaviour

• Limited thermoregulation
• Piglets and young fatteners → cold stress
• Fatteners and lactating sows → heat stress
• Wallow, bathing or shower
  – Hygiene: to clean hair and skin, get rid of external parasites
  – Regulation of body temperature
  – Protection from sunburn
## Breeding and genetic resources

**EC-regulation 889/2008 supplementing the EC-regulation 834/2007**

<table>
<thead>
<tr>
<th>Article</th>
<th>Issue</th>
<th>Contents concerning pig keeping</th>
</tr>
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</table>
| 8 & 9   | Origin of the animals | • Choice of breeds and strains according to their resistance and vitality (e.g. no pig breeds prone to PSE syndrome)  
• Preference to indigenous breeds  
• Piglets must come from organic piglet producers  
• Lack of animals of organic origin ➔ non-organic piglets < 35kg, 20% of adult breeding sows |

*Source: Compiled after Commission Regulation (EC) No 889/2008*
Breeding and genetic resources

- Mainly same genotypes as found in conventional production
- Consideration of breeding aspect in the organic pig production for long time quite low
- No own profile of quality ➔ no clear distinction in the taste from conventionally produced pork
- Consumer demands of lean meat ➔ fast growing animals
  - Selection according to carcass quality but not meat quality
- Importance to consider adaptability traits in pig breeding for organic production systems
Breeding and genetic resources

Selection criteria for appropriate outdoor sows

- Hardiness
- Prolificacy
- Good maternal behaviour
- Ease of handlings

Selection criteria for appropriate outdoor boars

- Hardiness
- Right temperament for group management
Use of traditional breeds

- In-situ conservation of endangered pig breeds
- Adapted to the local environment
  - Feed intake
  - Environment conditions
  - Comparatively higher disease tolerance
- Suitable behaviour patterns
- Potential for regional marketing programs of pork brands
- Lower percentage of lean meat but higher meat quality
- Lower feed efficiency
- Fatteners are often cross-bred animals
  - High performing breeds x local breeds
Pig breeds

International transboundary breeds

- **Large White / Yorkshire**
- **Hampshire**
- **Pietrain**
- **Landrace**

Duroc

Hampshire

Large White / Yorkshire

Pietrain

Landrace
Selection of local breeds (Germany)

- **Angler Saddleback**
  - [Image](www.angler-sattelschweine.de/galerie_heute.html)

- **Bentheim Black Pied**
  - [Image](www.g-e-h.de)

- **Düppeler Weideschwein**
  - [Image](www.egge-weser-digital.de/hum.miafe/20005019.html)
Pig breeds

Selection of local breeds (Europe)

Mangalitza (Hungary)

Cinta Senese (Italy)

Iberian pig (Spain)
## Housing systems

### EC-regulation 889/2008 supplementing the EC-regulation 834/2007

<table>
<thead>
<tr>
<th>Article</th>
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<th>Contents concerning pig keeping</th>
</tr>
</thead>
</table>
| 11      | Housing | • Permanent access to open air areas, preferably pasture  
|         |         | • Sows shall be kept in groups, except in the last stages of pregnancy and during the suckling period  
|         |         | • Piglets may not be kept on flat decks or in piglet cages  
|         |         | • Final fattening phase may take place indoors  
|         |         | • Exercise areas must permit dunging and rooting by the animals                                  |

Source: Compiled after Commission Regulation (EC) No 889/2008  
23
Housing systems

- **Organic standards**
  - EU-Regulation
  - Regulations of farmers association

- **Farming traditions**

- **Consumer expectations**
  - Animal welfare

- **Animals**
  - Expression of natural behaviour
  - Health

- **Soil and land**
  - Available land surface
  - Soil properties

- **Farmers**
  - Economy
  - Work schedule
  - Investment costs

- **Environment**
  - Risk of nutrient leaching

- **Climate**
  - Precipitations
  - Snow
  - (Cold) winter temperatures
  - Hot temperatures in summer

*Source: FIBL 2011, modified*
Housing systems

- Diversity of required management related to the different housing systems
- Concrete and slatted floors or deep litter
- Organic standards require access to outdoor run
  - Range: From open to fully covered by a roof
- Basically three forms of housing systems:
  - Indoor, outdoor, mixed
Housing systems

Indoor Housing

- Housed inside with access to concrete outside run
- Heated buildings or uninsulated barns with open fronts
- Challenges:
  - Provision of suitable space for pigs to express their natural behaviour
  - Separation of areas to express different behaviour patterns essential to avoid problems, economic losses and extra work
Housing systems

Indoor Housing

- Pregnant sows
- Mating
- Farrowing
- Lactating sows & piglets
- Weaning
- Weaner pigs
- Fattening pigs

Source: FIBL 2011, modified
Housing systems

Housing of empty and pregnant sows

Deep litter with elevated feeding area

Housing systems

Housing of empty and pregnant sows

Multi area housing with laying units

Housing systems

Housing of sows with piglets

Heku box

Housing systems

Housing of sows with piglets

BAT box for groups of sows

www.ign-nutzterhaltung.ch/Schweinehaltung/systeme/systeme_20.php
Housing systems

Housing of weaned piglets

3-area housing system

Housing of fattening pigs

Danish system

http://www.ign-nutzierhaltung.ch/Schweinehaltung/systeme/systeme_32.php

Outdoor Housing

- Pigs are kept outside for the whole year
- Huts or natural shelter
- Little or no building costs
- Meets the consumers expectations
- Challenges:
  - Organisation of pasture rotation to maintain the vegetation cover
  - Avoid environmental damage
  - Ensure bio-security
  - Identify and treat health problems
  - Sun protection
  - Organisation of the work
Housing systems

Outdoor Housing

- Pregnant sows
- Mating
- Farrowing
- Lactating sows & piglets
- Weaning
- Fattening pigs
- Weaner pigs

Source: FIBL 2011, modified
Housing systems

Pigs on pasture

www.picdeutschland.de

www.tierschutz-landwirtschaft.de/html/schweine.html

ebeyfarm.blogspot.com/2008/12/giant-milk-score.html
Mixed Housing

- Different combinations of outdoor and indoor housing systems
- Combination of advantages of both systems
- Practicability depends on climatic conditions, historic and farm specific development
- Enables sows to be kept on pasture during different stages of their life (e.g. during pregnancy or during group suckling)
- Weaners and fatteners
  - Normally: Large groups, in a barn, concrete outdoor runs
  - During summer: Access to a pasture for weaners and fatteners
Housing systems

Measurements against temperature stress

- Climate is a challenging issue in organic sow husbandry related to health and welfare
- Depending on the geographical location, both heat and cold stress possible during different seasons
- Heat stress: rather a problem for lactating sows (high feed intake, metabolic activity for milk production)
- Cold stress: piglets, young fatteners and eventually dry sows (restricted feed level)
- How to prevent heat and cold stress?
Housing systems

Measurements against temperature stress

- Provide shade, wallows or water sprinkling systems to alleviate heat stress
- Provide huts and plentiful dry straw bedding to alleviate cold stress
- For piglets: provide supplementary heat by use of a heat lamp or floor heating (unlikely in outdoor systems)
- Good layer of dry bedding everywhere where piglets might lie down
- Creep area: warm and draught free
Housing systems

Maximum number of animals per ha

<table>
<thead>
<tr>
<th>Pig class</th>
<th>Equivalent to 170 kg N / ha / year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piglets</td>
<td>74</td>
</tr>
<tr>
<td>Breeding sows</td>
<td>6.5</td>
</tr>
<tr>
<td>Pigs for fattening</td>
<td>14</td>
</tr>
<tr>
<td>Other pigs</td>
<td>14</td>
</tr>
</tbody>
</table>

Source: Compiled after Commission Regulation (EC) No 889/2008
### Feeding systems

**EC-regulation 889/2008 supplementing the EC-regulation 834/2007**

<table>
<thead>
<tr>
<th>Article</th>
<th>Issue</th>
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</tr>
</thead>
</table>
| 20 & 43 | Feed  | • Organically produced feed produced as far as possible on the farm unit  
|         |       | • Roughage must be added to the daily ration of pigs  
|         |       | • Feeding of piglets must be based on natural milk, at least for a period of 40 days  
|         |       | • Since 1. January 2012: 100% organically produced feed*  |

*5% conventionally produced feed allowed until 31/12/ 2011

*Source: Compiled after Commission Regulation (EC) No 889/2008*
Feeding systems

Objectives of modern pig feeding

• High level of animal health
• High growth performance
• Productivity of pig husbandry
• Harmlessness
• Use of farm grown (feed) resources

• Protection of the environment
  ➔ significantly influenced by the feeding system

Source: Modified from Rodehutscord, 2012
Feeding systems

- Integration of greater numbers of pigs into the organic farming systems more difficult than in the case of ruminants
- Nutrition based on home-grown feeds, produced and handled organically more difficult
- Forbidden are:
  - GM grain
  - Antibiotics or drugs for disease prevention and growth promotion
  - Chemically extracted feeds
  - Synthetic vitamins
  - Artificial amino acid
Feeding systems

- Use of breeds with high genetic potential for primary performance traits in organic pig production
- Pigs of high genetic potential show a quick growth in relation to their body weight
- Genetic progress in these traits not accompanied by a similar increase in feed intake capacity
- Gap between increased nutrient requirement and limited feed intake capacity
- Relatively little use of fibrous, bulky feed
- Diets with high nutrient and energy densities are provided
- Challenge to formulate these high-density diets in organic pig production
Limitation of amino acids

- "Liebig's barrel"
- Restricted protein synthesis in case of the constraint of one essential AA

⇒ Generally: Lysine first limiting amino acid

- Shortage or imbalance of AA
⇒ Adverse effects on the performance

Source: Modified from Rodehutscord, 2012
Feeding systems

100% feed of organic origin

- restricted use of e.g. potato protein (since January 2012), beer yeast and maize gluten (mainly convent. produced)

- Alternative: Grain legumes (peas, fava beans, lupines)

- AA-composition not suitable to meet the demand of high performing pigs

- Recommendation of phase feeding according to the varying dietary requirements during the pig’s life cycle: starter, grower, finisher, gestation, lactation
# EC-regulation 889/2008 supplementing the EC-regulation 834/2007

## Article 23: Disease prevention & treatment
- Disease prevention based on selection of appropriate breeds, appropriate husbandry conditions, high quality fodder, avoiding overstocking
- The use of chemically synthesized allopathic veterinary medical products or antibiotics for preventive treatments is prohibited
- Veterinary treatment, phytotherapeutic, homeopathic products
- If not effective ➔ use of chemically-synthesized allopathic veterinary medical products

## Article 18: Management of animals
- Tail-docking and cutting of teeth shall not be carried out routinely
- Physical castration is allowed in order to maintain the quality of products and traditional production practices
- Any suffering to the animals shall be reduced to a minimum by applying adequate anaesthesia and/or analgesia

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*Source: Compiled after Commission Regulation (EC) No 889/2008*
Health and welfare

• Disease prevention by selection of appropriate breeds and husbandry practices
• Appropriate density of livestock ➔ avoiding overstocking
• Use of chemically synthesized allopathic veterinary medicinal products & antibiotics for preventive treatments prohibited
• Health and welfare problems in organic pig production may differ from problems in conventional pig herds
• Common problems: endo-parasites, respiratory diseases, lameness, skin lesions
• Piglet mortality: big issue of concern
Health and welfare

Physical alteration

- Tail-docking, not to be carried out routinely
- Cutting of teeth, not to be carried out routinely
- Castration of the piglets allowed without the application of anaesthesia and/or analgesia during a transition period expiring on 31 December 2011

Isoflurane inhalation anaesthesia
Health and welfare

Physical alteration

- Nose-ringing of pigs kept on pasture
- Prevention from rooting to protect the vegetation cover
- ➔ Drawback in animal welfare
- Under discussion

www.tierschutz-landwirtschaft.de/html/nasenringe_-klammern.html
Production cycle in pig production

Mating/Insemination (Boar or AI)
- 114 days

Farrowing
- Conv. 21-28 days
- Organic ≥ 40 days

Weaning
- 1 week

Sow in heat

Piglets born
- Conv. 21-28 days
- Organic ≥ 40 days

Weaning

Fattening
- Conv. ~ 120 days
- Organic ~ 150 days

Slaughtering
- Conv. ~ 145 days
- Organic ~ 190 days

Piglet production
- Sum Conv. ~ 150 days
- Sum Organic ~ 165 days

Source: Kaufmann, 2009 modified
## Biological parameters

### Average sow and litter performance of crossbred sows on organic and conventional herds during 2006 to 2007

<table>
<thead>
<tr>
<th>Performance trait</th>
<th>Organic</th>
<th>Conventional</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L₁Y</td>
<td>TF</td>
</tr>
<tr>
<td>No. herds</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>No. sows per farm</td>
<td>122</td>
<td>130</td>
</tr>
<tr>
<td>Litters /sow / year</td>
<td>2.1</td>
<td>2.0</td>
</tr>
<tr>
<td>Weaned piglets / sow / year</td>
<td>21.5</td>
<td>20.5</td>
</tr>
<tr>
<td>Sow cullings / year (%)</td>
<td>37.5</td>
<td>33.4</td>
</tr>
<tr>
<td>Farrowing rate (%)</td>
<td>80.2</td>
<td>80.7</td>
</tr>
<tr>
<td>Lactation length (days)</td>
<td>41.9</td>
<td>40.8</td>
</tr>
<tr>
<td>Live born piglets / litter</td>
<td>14.0</td>
<td>12.7</td>
</tr>
<tr>
<td>Mortality until weaning (%)</td>
<td>25.5</td>
<td>20.8</td>
</tr>
<tr>
<td>Weaned piglets / litter</td>
<td>10.3</td>
<td>10.1</td>
</tr>
</tbody>
</table>

L₁Y = Dutch Landrace x Yorkshire; TF = T-line x Finnish Landrace cross; Rot = rotational cross using L₁, F, T and Y lines.

(Source: Modified from Leenhouwers et al., 2010)
### Biological parameters

**Slaughter weight, carcass and meat quality of pig of different genotype and in different production systems**

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Production system</th>
<th>n&lt;sup&gt;1&lt;/sup&gt;</th>
<th>FCR (kg feed / kg gain)</th>
<th>n&lt;sup&gt;2&lt;/sup&gt;</th>
<th>DWG (g / Tag)</th>
<th>Lean meat (%)</th>
<th>n&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Intra-muscular fat (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid</td>
<td>Conv</td>
<td>35</td>
<td>2.51</td>
<td>87</td>
<td>893</td>
<td>59.5</td>
<td>42</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Org</td>
<td>16</td>
<td>3.04</td>
<td>58</td>
<td>734</td>
<td>58.6</td>
<td>28</td>
<td>2.3</td>
</tr>
<tr>
<td>SH</td>
<td>Conv</td>
<td>6</td>
<td>3.12</td>
<td>25</td>
<td>831</td>
<td>50.8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Org.</td>
<td>6</td>
<td>3.26</td>
<td>26</td>
<td>751</td>
<td>51.7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pi*AS</td>
<td>Conv</td>
<td>30</td>
<td>2.68</td>
<td>59</td>
<td>852</td>
<td>56.8</td>
<td>28</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>Org</td>
<td>9</td>
<td>3.28</td>
<td>33</td>
<td>771</td>
<td>56.0</td>
<td>16</td>
<td>3.2</td>
</tr>
<tr>
<td>Du*LR</td>
<td>Conv</td>
<td>32</td>
<td>2.53</td>
<td>62</td>
<td>961</td>
<td>58.2</td>
<td>30</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>Org</td>
<td>12</td>
<td>3.27</td>
<td>43</td>
<td>805</td>
<td>55.6</td>
<td>20</td>
<td>2.6</td>
</tr>
</tbody>
</table>

<sup>1</sup> number of tested groups, <sup>2</sup> number of tested animals

Conv: Conventional, Org: Organic

SH: Swabian-Hall Swine, Pi: Pietrain, Du: Duroc, LR: Landrace

(Source: modified from Weißmann et al., 2009)
## Economic efficiency

### Biological and economic parameter of organic and conventional piglet production for the financial year 2002/2003

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Organic*</th>
<th>Conventional**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of raised piglets / sow / yr</td>
<td>13.14</td>
<td>20.20</td>
</tr>
<tr>
<td>Replacement rate (%)</td>
<td>28.44</td>
<td>41.50</td>
</tr>
<tr>
<td>Weight at sale per piglet (kg)</td>
<td>28.02</td>
<td>29.10</td>
</tr>
<tr>
<td>Revenue per piglet (€)</td>
<td>84.36</td>
<td>52.90</td>
</tr>
<tr>
<td>Total return (€/sow)</td>
<td>1,250</td>
<td>1,150</td>
</tr>
<tr>
<td>Cost of replacement (€/sow)</td>
<td>60</td>
<td>113</td>
</tr>
<tr>
<td>Veterinary costs (€/sow)</td>
<td>51</td>
<td>89</td>
</tr>
<tr>
<td>Total feed costs (€/sow)</td>
<td>596</td>
<td>417</td>
</tr>
<tr>
<td>Other variable costs (€/sow)</td>
<td>10</td>
<td>98</td>
</tr>
<tr>
<td><strong>Return without direct costs (€/sow)</strong></td>
<td>489</td>
<td>411</td>
</tr>
<tr>
<td><strong>Labour demand per sow and year (h)</strong></td>
<td>34.82</td>
<td>12.17</td>
</tr>
</tbody>
</table>

*17 farms in 8 federal states in Germany, ≥ 10 sows, mainly LR and LR x LW sows **Farmers’ association Westfalen, 295 farms, Ø 146 sows, hybrid sows and boars

(Source: Bussemas, 2006 modified from BLE, 2004; Hinken, 2004)
Economic efficiency

Factors impacting the economic efficiency

- Feeding expenditures
- Longer productive lifetime of sows
- Labour demand
- Price premiums
- Restricted fattening
- Space demand
- Production cycle
- Lower veterinary expenditures
- Less expensive housing equipments
Conclusions

- Growing demand for organic pork
- Research needed to optimize management and husbandry system
- Appropriate breeding programs for suitable pig breeds for organic system needed
- Feeding remains the major challenge in organic pig production
- High health standard difficult to maintain
- Marketing potential to be exploited through better knowledge of market channels and production of meat quality fitting to consumers demands
References


References

• KTBL. 2006. Nationaler Bewertungsrahmen Tierhaltungsverfahren. KTBL Schrift 446. Darmstadt, Germany.
Thank you very much for your attention!