Multi-centre approach to improve outdoor runs for organic pigs: Preliminary results of on-farm experiments

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Abstract

Within the CORE Organic Cofund project POWER, European stakeholders and scientists identified elements to improve animal welfare and reduce environmental impact in concrete outdoor runs for organic growing-finishing pigs. The selected innovations included 1) roughage, 2) showers, and 3) rooting areas. We evaluated the effectiveness of these innovations on nine commercial organic pig farms in three European countries (Austria, Switzerland and Denmark). This multi-centre study requires a common approach to ensure the best possible standardisation regarding experimental set-up and data collection whilst acknowledging differences between countries and farms. Assessment protocols including animal-based (clinical and behavioural) indicators were jointly developed. To ensure comparable results, training and inter-observer reliability testing took place in on-farm sessions and via online training and showed acceptable to good agreement. Preliminary descriptive results of the three experiments are presented for clinical indicators, pig faecal soiling and use of the outdoor run. Most clinical indicators showed a low prevalence across all farms and experiments. For pig soiling, a potential effect was only observed in pigs with access to showers; they were slightly cleaner. The use of outdoor runs was generally high and seemed to be influenced by the improvement measures. We conclude that multi-centre on-farm studies are suitable for ensuring external validity as an important step in implementing improvement measures. However, the high effort for training and potential trade-offs between the highest possible standardisation and the need to adapt to farm-specific conditions must be acknowledged when planning such projects.

Introduction

Within the CORE Organic Cofund project POWER, stakeholders and scientists identified measures such as providing roughage in racks or rooting areas and possibilities for thermoregulation through showers as the most important elements to improve the concrete outdoor runs in organic growing-finishing pigs (Wimmler et al. 2021). Whereas these innovations have already been studied in controlled experiments (Olsen et al. 2001; Høøk Presto et al. 2009; Olsson et al. 2016), on-farm studies across different husbandry conditions are lacking. Apart from specific research questions related to the respective improvement measure, the common aim across all experiments was to investigate the effectiveness of measures to improve the use of the outdoor run, support animal wellbeing and reduce faecal soiling as well as associated ammonia emissions.

Materials and methods

We evaluated each of the three measures adapted to the on-farm conditions in at least two countries on two to three organic farms per experiment (Table 1). Farm recruitment inclusion

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criteria (e.g. breed; at least four comparable pens) were defined to enhance comparability and representativeness. Assessment protocols were jointly developed based on existing protocols for on-farm use (Leeb et al. 2015) and included animal-based indicators (behaviour, clinical parameters and soiling of pigs). We carried out an on-farm training session for clinical parameters on two Austrian farms in March 2018 with part of the assessors. Due to the low prevalence of the indicators, we performed additional online training. All assessors accomplished inter-observer reliability (IOR) testing using a set of approx. 30 photos per indicator. Training and IOR testing of behavioural parameters took place via video recordings from different farms. After a first round, the definitions were discussed and adjusted appropriately, followed by a second round for final IOR testing. Data collection was conducted in 2019/2020 by between one and three persons per country. Farms were visited repeatedly in an interval of 10-14 days, depending on the experiment (Roughage: 3-6, Showers: 2-3, Rooting: 6-7 visits per group). Behaviour was assessed from outside the pen before other assessments, allowing the pigs to become accustomed to the observer for at least two minutes. Clinical parameters were assessed in the afternoon on a group level by counting the number of affected pigs. We used binary scores for parameters with low prevalence (e.g. lameness), i.e. the whole pen was scored as affected if at least one pig displayed the indicator. Data were processed in Microsoft Excel 2019.

Table 1: Description of on-farm experiments

Experiment	Description
Roughage (A)	Daily provision of (clover-) grass silage or hay in a rack in the outdoor run. Control pens with roughage provided indoors. Three farms, two in AT and one in DK**, Sept. 2019-June 2020
Roughage (B)*	Changing the type of roughage (clover-grass silage and barley-pea whole seed) every second week. Two farms in DK, Sept. 2019-April 2020
Showers (A)	Showers installed in the outdoor run, running for 30 min, 5-6 times per day. Control pens without showers. Three farms, one in AT and two in CH, Aug.-Sept. 2019
Showers (B)*	Comparing different duration of shower activation: 10 minutes per hour, 30 minutes per hour or continuous shower. Three farms, two in AT and one in CH, June-Sept. 2020
Rooting area (A)	Daily mixing of corn pellets in the compost rooting area in the outdoor run. Control pens with only compost in the rooting area. One farm in CH, Oct. 2019-Mai 2020
Rooting area (B)*	Comparing two types of rooting material (wood chips vs. soil/turf). One farm in DK, Oct. 2020-Feb. 2021

Bold = experiments presented in this paper. *Data not presented. **Experiments on roughage in one farm in Italy were cancelled due to the COVID-19 pandemic.

Preliminary results

A summary of results for selected parameters across experiments and farms is presented in Table 2. Clinical parameters and soiling of pigs relate to the proportion of pigs in the group per assessment day, use of the outdoor run to the proportion of pigs in the group per observation round. All results are presented as medians and ranges.

Table 2: Preliminary results for selected parameters across three experiments in Austria (AT), Denmark (DK) and Switzerland (CH). Results provided as median (min. – max.) percentage of affected pigs from total pigs in a group.

Experiment	ROUGHAGE					
Farm	AT02		AT03		DK01	
Treatment (n pens)	**IN** (n=6)	**OUT** (n=6)	**IN** (n=3)	**OUT** (n=3)	**IN** (n=4)	**OUT** (n=4)
Ocular discharge (%)	53 *(11-89)*	56 *(10-100)*	14 *(0-36)*	17 *(0-45)*	18 *(0-56)*	26 *(0-75)*
Scratches (%)	0 *(0-22)*	0 *(0-20)*	0 *(0-9)*	0 *(0-9)*	0 *(0-29)*	0 *(0-31)*
Total soiled pigs (%)	25 *(0-70)*	28 *(0-90)*	30 *(0-70)*	18 *(0-46)*	0 *(0-6)*	0 *(0-31)*
Use of outdoor run (% pigs outdoors)	55 *(0-100)*	58 *(0-100)*	45 *(9-80)*	54 *(8-91)*	0 *(0-100)*	6 *(0-100)*

Experiment	SHOWERS					
Farm	AT01		CH01		CH02	
Treatment (n pens)	**NO** (n=3)	**shower** (n=3)	**NO** (n=2)	**shower** (n=3)	**NO** (n=2)	**shower** (n=2)
Ocular discharge (%)	18 *(9-42)*	12 *(5-33)*	0 *(0)*	0 *(0-14)*	3 *(0-9)*	0 *(0-11)*
Scratches (%)	0 *(0)*	0 *(0-7)*	0 *(0)*	0 *(0)*	0 *(0)*	0 *(0-3)*
Total soiled pigs (%)	28 *(0-100)*	14 *(0-75)*	21 *(10-65)*	3 *(0-35)*	8 *(0-19)*	6 *(0-71)*
Use of outdoor run (% pigs outdoors)	69 *(28-100)*	58 *(4-100)*	75 *(45-100)*	57 *(0-80)*	40 *(15-82)*	35 *(0-86)*

Experiment	ROOTING AREA	
Farm	CH01	
Treatment (n pens)	**Compost only** (n=6)	**With corn pellets** (n=7)
Ocular discharge (%)	7 *(0-24)*	6 *(0-45)*
Scratches (%)	0 *(0-12)*	0 *(0-12)*
Total soiled pigs (%)	0 *(0-26)*	0 *(0-18)*
Use of outdoor run (% pigs outdoors)	35 *(0-100)*	48 *(0-95)*

Inter-observer reliability

The IOR for most clinical indicators was substantial (PABAK >0.6) to almost perfect (>0.8). Most difficulties were found for the soiling of pigs (PABAK=0.7) and ocular discharge (PABAK=0.8). The IOR for behaviours was more challenging and resulted in good (ICC >0.9) to satisfactory (ICC >0.7) agreement for general activity (standing/sitting, lying, lying-active) and did not differ considerably between the first and second round. Other behaviours such as exploration, play, agonistic behaviour, and tail biting showed relatively poor agreement (ICC <0.7); however, it improved considerably in the second round.

On-farm experiments

Many clinical parameters showed a very low prevalence (e.g., signs of diarrhoea, ear lesions, lameness). The most prevalent clinical indicator was ocular discharge with high variation within and between farms. Scratches on the body due to agonistic interactions occurred only sporadically and on a very low level. Most of the pigs had intact tails. However, out of the 62 groups assessed, five groups (on three farms) showed more than 75% of the pigs with short tails. Tail lesions occurred in only six groups (out of 62), and only two of them were affected severely (more than 10% of the pigs). None of the clinical welfare parameters differed between control and treatment groups, so no effect from the improvement measures was found. Also, the soiling of pigs varied considerably within and between farms without indicating considerable differences between treatments, except for the shower experiment. Pigs with showers were less dirty on two of the three farms. The median proportion of pigs in the outdoor run was around 50% (35-75%) for most farms, except DK01, which showed meagre proportions. Also, a high variation within farms and groups exists for this parameter. A rack with roughage in the outdoor run and mixing corn pellet into the compost of the rooting area seemed to attract more pigs to the outdoor run. Interestingly, in the shower experiment, even fewer pigs were in the outdoor runs with showers.

Discussion

Generally, the chosen approach of a multi-centre study across nine farms in three countries was practicable but required flexibility to adapt experimental designs to the on-farm conditions. Close collaboration with farmers and regular interaction between researchers helps to overcome these challenges. The results show large variations across farms, emphasising the need for multi-centre studies to develop and implement improvement measures. Observer training is essential to ensure the reliability of results in this kind of study. However, the more participants and the more countries involved, the more challenging it is. As data collection included live observation, training on-farm was needed, although demanding. Online training was a feasible complementation and proved good IOR for clinical parameters. For practical reasons, agreement on behavioural parameters was only tested via video recordings, which may not always represent direct on-farm observation. However, improvement of IOR in the second round shows the potential to enhance observers' common understanding and performance.

Preliminary results show a very low prevalence for clinical indicators such as signs of diarrhoea and lameness, which typically affected individual pens without a plausible link to the improvement measures. Therefore, clinical indicators can be seen as parameters “to control for” when analysing and interpreting outcomes. Tail length is difficult to interpret as it may be a result of previous tail biting. Therefore, development during the experiment and prevalence of tail lesions should be considered. Yet, indicators such as tail lesions or scratches, which might have been affected by treatments, also occurred infrequently without obvious differences across treatments. Hence, we do not expect an increased risk for tail-biting or resource competition through the implemented measures. The level of ocular discharge seems to be farm-specific with a considerable variation and gives reason for further in-depth analysis of its development over time. Results for soiling of pigs indicate some differences in cleanliness for pigs with access to showers. Evaluation of pen soiling will further shed light on the potential effect of the measures to improve hygiene and reduce ammonia emissions. While Olsen et al. (2001) found on average 15% of pigs outdoors during the day, the proportion was higher for most farms in our studies and may depend on the design and available resources of the outdoor run. The measures seem to affect the number of pigs in the outdoor run: While roughage provided outdoors and rooting areas with corn pellets increased outdoor run use, showers reduced the number of pigs outdoors. Upcoming evaluation of other parameters assessed, such as behaviour parameters and pen hygiene, may provide a more precise picture at the level of the individual experiments.

Our suggestions for research and support policies to develop further organic animal husbandry

With this approach, we illustrate possibilities for standardisation of on-farm experiments under varying practical conditions. However, flexibility to react to a farms' condition is required (e.g., varying group size and pen design across farms and countries). On-farm experiments may also provide the opportunity to adapt research questions according to practical relevance. However, for this approach, sufficient time, resources, and flexibility are needed in the initial phase of the project. While challenges for experimental design occur when covering many different situations in different countries, this approach may enhance the external validity of the outcomes and increase relevance and practicality for farming. Finally, reacting to and acting with practice may broaden the horizon for science.

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