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Sensor Based Monitoring of Fattening Pig Preference Behaviour

Which Flooring Systems and Activities are Preferred?

The aim of this project was to analyze and evaluate fattening pig preferences concerning differently designed flooring systems and materials for activities. A sensor based system was used to monitor the behaviour of 22 pigs by continously offering several choices in their keeping environment throughout the whole fattening period. The research approach assumes that the preferred keeping areas can be presented as a function of time, based on the frequency of visits and the duration of stay.

Asking the animals themselves is the best way to get more information about the environmental requirements of pigs and their preferences. The animals show their preference for special environmental qualities very well if they can choose. Long-term choice experiments in which the animals can revise her decision are to be preferred to a T-labyrinth model with unique decisive situation [1].The behaviour for the following analysis was recorded in most cases by direct observations or by video recordings for a restricted period. It is possible to record objectively and during a long term the choice behaviour of pigs by using a sensor-based experimental design as opposed to the visual observations.

Material and methods

For the whole fattening period of 22 growing pigs (28 – 110 kg of liveweight) maximum four separated areas (area A to D) with different settings are available within each experiment. Besides, the single areas can be changed by their settings in equipment and structure for different investigations (*Table 1*). So far following research projects were studied:

1. Analysis of the preference behaviour of pigs for the following materials for activities: sand, straw and a specially developed nuzzle mat (experiment 1 and 2).
2. Comparative analysis and assessment of the preference behaviour of fattened pigs for common flooring systems: totally slatted, partly slatted and paved floor (experiment 3 and 4).

The sensor-based recording of the animal behaviour is conducted by six passage gates, which only could be passed in one direction, two automatic feeders and two drinkers. All elements are provided with an animal identification system. The individual electronic identification of the pigs is provided by earresponder. By the passage gates four areas can be separated from each other. The areas can be reached only through one passage gate and be left through a second one. Each contact with an animal identification by changing the areas or also feeders is transmitted about a data line to a PC and is stored.

Thus an exact recording of the place, duration of stay and frequency of single pigs in their environment for the whole testing period is guaranteed.

Data preparation and data analysis

For a precise preparation and evaluation of stored experimental data, raw data must be edited and formatted in several steps. An individual correction of more than 6000 data sets per animal and experiment is not realistic. Therefore the attention is to a standardised and automated approach. Hence, the recorded data are formatted at first and then filtered for data mistakes and illogical connections.

Table 1: Settings of the areas in the experiments 1 to 4

Experiment	Area A	Area B	Area C	Area D
1	ingestion feeder, drinker	activity straw feeder	resting paved floor	activity sand-run
2	ingestion feeder, drinker	activity straw feeder	resting paved floor	activity "nuzzle mat"
3	ingestion feeder, drinker	resting partly slatted floor	resting totally slatted floor	-
4	ingestion feeder, drinker	resting totally slatted floor	resting plan- paved floor	-

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Keywords

Pigs, preference behaviour, sensor-based analysis, flooring systems, material for activities

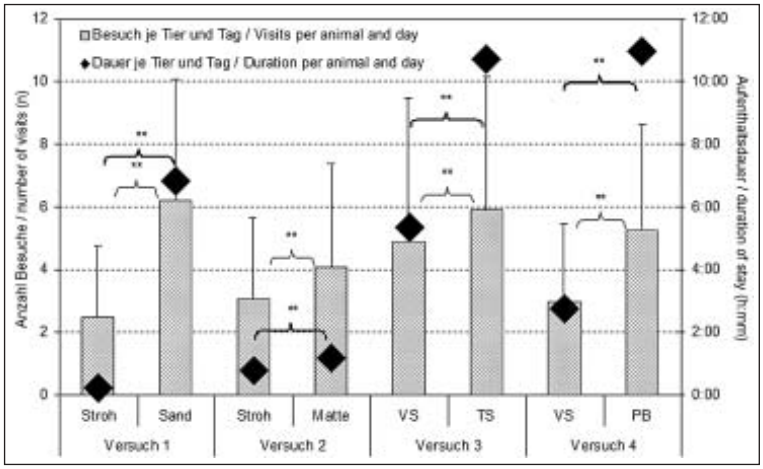

Fig. 1: Mean number of visits and duration of staying per animal and day between the alternatives in the 4 experiments (SD, Wilcoxon-test)

These can arise if animals are not forced to pass the passively working gates after entrance or however, that an animal passes relatively slow a gate and thus are registered several times. Less than 1 % were incomplete passages. The reliability of the sensor system is to be estimated as high. Finally, the data are imported in a data bank in which by linking with other criteria (e.g. liveweight measured weekly) standardised complex evaluation structures are generated.

Aim of this evaluation is the evaluation of possible preferences for different segments of the housing systems. The preference of the pigs is caused particularly by frequency and utilisation time of the single areas chronologically.

Preference behaviour of the pigs

In experiment 1 the pigs use the sand-run on average per day as well as in frequency (n = 6.2) as in duration of stay (6:48 h) more than the straw area (n = 2.4; 0:12 h) (*Fig. 1*). Both parameters differ significantly.

The sand-run is not only used as a location for rooting behaviour. Mingled behaviour patterns (resting and comfort behaviour) can be studied. The pigs visit this area up to a maximum of 25 visits and nearly 24 hours per animal and day, interrupted by short feeding and drinking periods.

Such a high level could not be observed in experiment 2 (alternatives straw and the special nuzzle mat). Nevertheless, the nuzzle mat offers the possibility to empathise the behaviour pattern of natural rooting, combined with their needs for changeable, biting and chewing materials at the same time. So that significantly higher acceptance of the nuzzle mat compared with straw within both parameters (visit frequency per animal and day (straw: n = 3, nuzzle mat: n = 4) and average duration of stay per animal and day (straw: 0:47 h, nuzzle mat: 1:11 h) is explained.

The third experiment shows the preference of the pigs for partly slatted floor (TS), as opposed to the totally slatted floor (VS). As well as the average visit frequency per animal and day (VS: n = 5, TS: n = 6), as the average duration of stay (VS: 5:10 h, TS: 10:43 h) differ significantly.

Animal husbandry on totally slatted floor is compared (VS) to a paved flooring system (PB) within experiment 4. 10:57 h (n = 5) is the average duration of stay as shows the preference for the paved floor. In the area VS, animals stayed on average 2:46 h (n = 3). Both parameters are significant.

The daily gain and feed conversion of the fattened pigs in the experiments is high (*Table 2*). The daily gain are clearly higher than the average of the producer ring evaluations (Ø 715 g) [2]. Feed conversion is very good.

With increasing liveweight, decreasing activity and decreasing numbers visits to the offers for activities can be observed (*Table 3*). Indeed, this decrease differs between the offers.

Thus the lower correlation coefficient between live weight and number of visits in the sand-run points out to the fact that the pigs with increasing age barely change the preference towards the sand-run. In contrast to that, the offer of straw is preferred less with increasing lifeweight. The strongest decrease in preference with increasing age can be examined for the nuzzle mat.

Comparing pig husbandry on partly or totally slatted floor showed that younger pigs preferred partly slatted floor, while the preference of older animals was not as distinctive [3]. In experiment 4 a clear and continuous preference for paved floor during the whole fattening period could be ascertained.

Table 2: Mean daily gain (g) and feed conversion (kg/kg) of fattening pigs in the experiments

Experiment	daily gain (g)	feed conversion (kg:kg)
1	925	2.67
2	853	2.78
3	817	3.15
4	731	2.95

Table 3: Correlation between live weight (kg) and the number of visits in areas with offers for activities (experiment 1 and 2)

Experiment	Number of visits	live weight (kg)
1:	straw r	-.390**
1:	sand r	-.227**
2:	straw r	-.378**
2:	mat r	-.473**

** p ≤ 0,01; Spearman-Correlation, 2-sided

Summary

The sensor-based recordation of behaviour of fattened pigs towards different offerings displays the possibility to analyse objectively the behaviour during a long term period.

It could be studied that there is an order of preference concerning the following offers for activities: sand > nuzzle mat > straw.

Furthermore the pigs showed a preference for the paved floor compared to the totally slatted floor as well as for the partly slatted floor compared to the totally slatted floor.

Literature

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