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SENSOR BASED MONITORING OF PREFERENCE OF FATTENING PIGS: SLATTED FLOOR VERSUS SOLID FLOOR

Mihaiela Alexandrina Rus[*], *Otto Kaufmann, Manfred Krocker*

Humboldt-Universität zu Berlin, Faculty of Agriculture and Horticulture
Department of Animal Science
Philippstr. 13, D - 10115 Berlin
mihaiela.alexandrina.rus@agrar.hu-berlin.de

Abstract

In the research and in the practice sensor-based systems are increasingly used to assess the responds of animals. Sensor based identification were used to monitor the behaviour of 21 pigs by several offerings in the keeping environment during the whole fattening period. The aim of this project was to analyse and evaluate the preference of fattening pigs concerning differently floors in the resting area. The basic approach assumes that the preference can be calculated as a function of time via the frequency of visits and duration of stay in accessible areas. In this experiment a slatted floor was compared with a solid floor. The pigs preferred the solid floor over the whole fattening period. It appeared, an increasing pollution of the solid floor as well as the use of a nuzzle mate in the area with slatted floor didn't led to a shift of preference of the pigs.

Keywords: pigs, preference behaviour, sensor based monitoring, flooring systems

Introduction

Within the limitations of the research project, the experiment was aimed at contributing to a more objective evaluation of husbandry systems in pig production. Preference should be identified by letting the animals to choose between two housing systems with different flooring.

"Asking" the animals themselves is the best way to get more information about the environmental requirements of the pigs and their preferences. The animals show their preference for different environmental qualities very well if they can choose.

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Material and method

The investigations were carried out in a plant, that consists of two climate controlled resting areas (A and B) and a feeding area C (open space) (*Figure 1*). A and B are resting areas. These can be designed as huts equipped with different floors. Each resting area contains an open space beside the lying area. It was located between passage gates and lying area. The feeding area C, was located in a open space outside the resting area and therefore had outdoor climatic conditions. The feeding area was provided with two automatic feeders (F1 and F2) and two drinkers (W5 and W6) which were equipped with animal identification facilities. The automatic feeders measured feeding time, feed intake and its duration of each animal. At the drinkers, the duration of stay of pigs were also recorded. Each identifications of pigs by entering or leaving the resting areas or by using the feeders and drinkers was transmitted by the data line to a PC and was stored. The individual electronic identification of the pigs was provided by ear tag responder. Moreover this electronic identification at passage gates was enables to record the visit duration in the resting area.

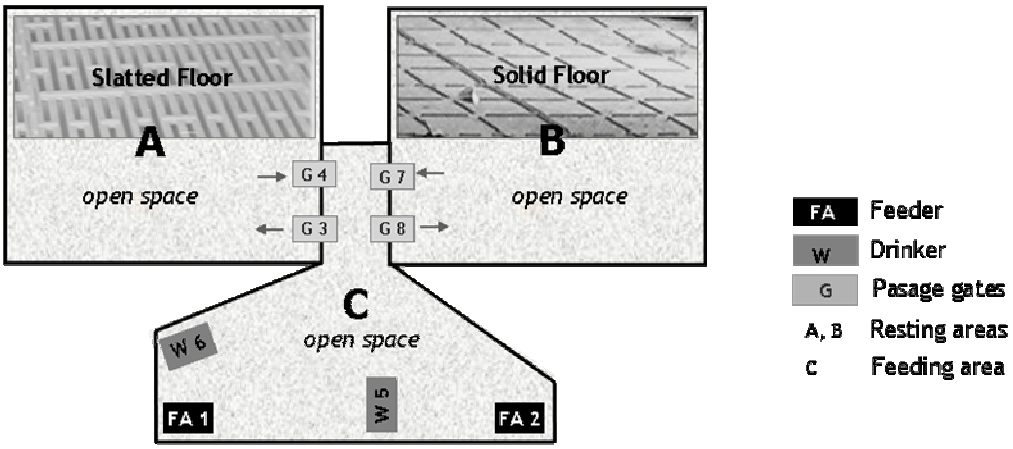

***Figure 1*. Experimental Design**

The animals are given alternatives between different housing areas with different floors. In this experiment a slatted floor (area A) was compared with a solid floor (area B). The whole fattening period was divided in eight periods of different length from one to four weeks. During these periods animals had to choose between two housing systems. Periods I, III and VII were characterised by having access to only one of two lying area. In these periods only the entrance to the lying area was closed. The open space was continually open for the animals.

Table 1. provides informations about chronology within the Experiment and the different characteristics of the offered areas.

***Table 1*. Chronology within the Experiment**

Period	Fattening week	Offering
I	1st to 2nd	only **A**
II	3rd to 4th	**A + B_1**
III	5th to 6th	only **A_1**
IV	7th	**A_1 + B_1**
V	8th	**A_1 + B_2**
VI	9th to 10th	**A_1 + B_3**
VII	11th	only **A_1**
VIII	12th to 15th	**A_1 + B_3**
A = Slatted floor; A_1 = Slatted floor with a nuzzle mat B_1 = Solid floor with straw litter; B_2 = Solid floor without straw litter ; B_3 = Solid floor without straw litter; not cleaned		

At the beginning the solid floor area was littered. From the 5th fattening week on the area with the slatted floor was supplemented with a nuzzle mat. The nuzzle mat offers the possibility to empathies the behaviour pattern of natural rooting combined with their needs for changeable, biting and chewing materials at the same time. From the 8th fattening week no straw litter was used in the solid floor area and one week later (10th week) the area with solid floor was not cleaned anymore.

For a precise preparation and evaluation of stored data, raw data must be edited and formatted in several steps. Finally, the data were imported into a data bank in which, by linking with other criteria (e.g. living weight measured weekly) are generated standardised complex evaluation structures. The statistical data-analysis was calculated by using SPSS 15.0 for Windows.

The following results rely to the average observation of the whole group (average values of the whole group). The following results about preferences of pigs referred to periods II, IV – VI when both lying areas were open.

Results

On February 13th 2006, 20 animals with an average live weight of 27 (± 2 S.D.) kg were stalled. After a fattening period of 15 weeks the average live weight was 100 (± 11 S.D.) kg. The average daily gain was 731 ± 92 g. The feed conversion over the whole duration of the experiment was 2.95 ± 0.50 kg per kg gain.

Over the whole fattening period the following situation can be stated: with the progressing of the fattening period the animals showed a clear preference for area B (non-slatted floor), whereas the time they spent in area A declined. The differences are significant. Moreover was evident that with increasing age pigs stayed longer in feeding area C ($p<0.05$). The following table (*Table 2*) provides informations about the average of the duration of stay per area and period. In all investigated periods the animal spent 77 – 83 % of daily time in the resting area and 21 – 29 % in the feeding area.

***Table 2*. Average duration of stay (h:mm) per animal and day in the area A – C in the analysed periods**

Period (Offering)		**Resting Area A** (slatted floor)	**Resting Area B** (solid floor)	**Feeding Area C** (open space)
II	($A + B_1$)	5:12 ± 6:35 $^{(a)\ A}$	13:41 ± 7:59 $^{(a)\ B}$	3:58 ± 3:42 $^{(a)\ A}$
IV	($A_1 + B_1$)	1:49 ± 2:41 $^{(b)\ A}$	14:49 ± 6:29 $^{(a)\ B}$	4:45 ± 3:28 $^{(b)\ C}$
V	($A_1 + B_2$)	0:31 ± 0:45 $^{(c)\ A}$	16:35 ± 4:58 $^{(b)\ B}$	3:56 ± 2:26 $^{(ab)\ C}$
VI	($A_1 + B_3$)	0:48 ± 0:55 $^{(d)\ A}$	16:31 ± 5:15 $^{(bc)\ B}$	5:03 ± 3:32 $^{(c)\ C}$
$^{(a-d)}$ Means within a column with different subscript letters are different ($p<0.05$) $^{A-C}$ Means within a row with different subscript letters are different ($p<0.01$)				

In the period II, with a duration of stay of 13:41 ± 7:59 h /animal /day, the pigs showed a clear preference for the area with solid floor and straw litter. Duration of stay in slatted floor area was 5:12 ± 6:35 h /animal /day. This result was used to arrange the following experimental design.

In period IV, the area with the slatted floor was supplemented with a nuzzle mat. In spite of this, the animals preferred again the solid floor with straw litter (14:49 ± 6:29 h in area with solid floor and in slatted floor area 1:49 ± 2:41 h duration of stay /animal /day).

In the period V no straw litter was used in the solid floor area. Nevertheless, duration of stay in this area increased to 16:35 h ± 4:58 /animal /day. Additionally one week later (period VI) the solid floor area was not cleaned anymore. This led to a fast and strong dirtying of the lying-surface. The animals showed again a clear preference for the dirty, solid floor (16:31 ± 5:15 h /animal /day) in comparison to slatted floor with additional offer (only 0:48 h ± 0:55/animal /day).

The duration of stay in the area C (*Figure 2*) contained as well time for feeding and drinking, as remaining time. The average feeding and drinking time was between 0:52 ± 0:17 and 0:47 ± 0:17 h /animal /day, whereupon the shortest feeding time is attributed to the older animals. A significant difference ($p<0.01$) could only be observed between the period II and VI. In the course of fattening period it gets evident that the animals stay significant longer in the feeding area (time without feeding and drinking: 3:06 ± 3:40 h in period II and 4:15 ± 3:28 h per animal and day).

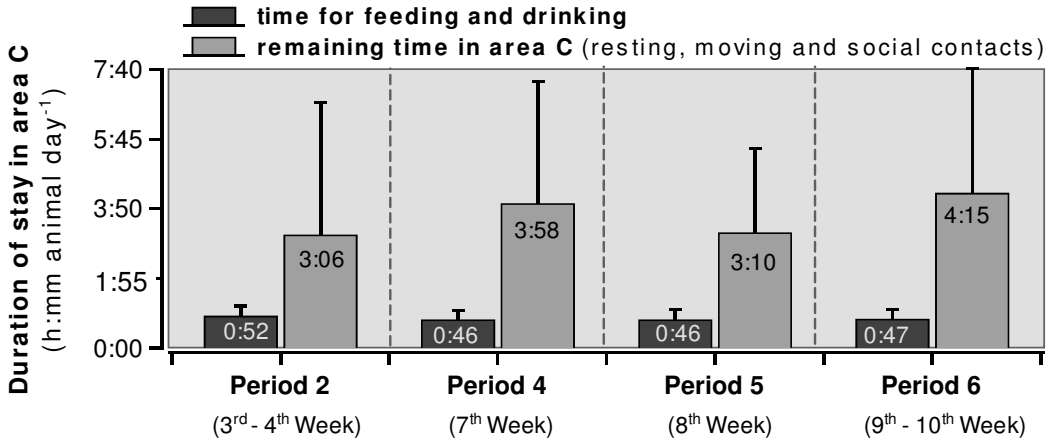

***Figure 2*. Segmentation of the duration of stay (h:mm) in the feeding area C (average per animal and day)**

The following *Figure 3* provides information about the dynamic of the frequency of the visits per area and period. The frequency of visit of the resting areas, in all periods showed again a clear preference for the area B (solid floor).

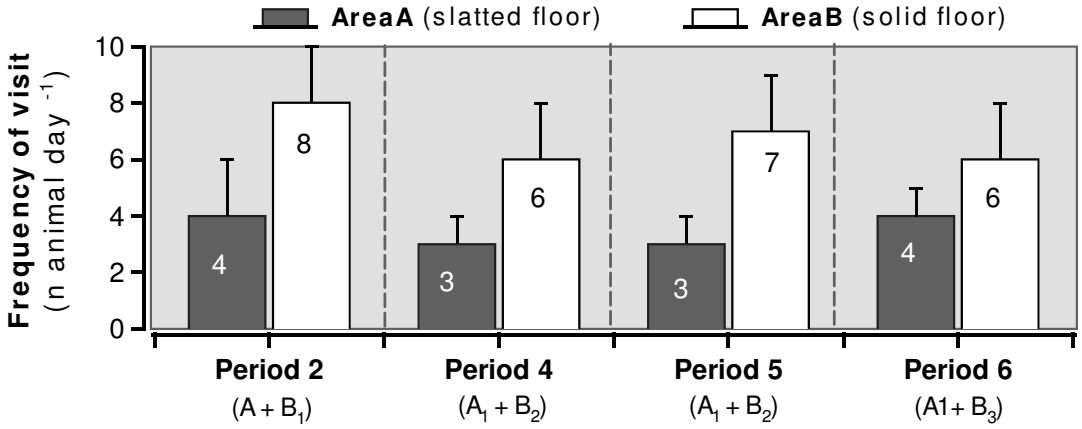

***Figure 3*. Average frequency of visit per animal and day for the alternatives resting area (A and B) in the analysed periods**

Regarding the number of animals which visited the offered resting areas (A and B), the animals showed again a clear preference for the area B (solid floor). All pigs visited minimum once a day the feeding area C. The solid floor area (area B) was visited by the whole group, as well. For the area A (slatted floor) it can be stated, that 10-25% of the animals have never entered this area.

Discussion

Due to *Sambraus* (1991) a closed floor was preferred to a slatted one; litter seems to be more appropriate than an uncovered floor. This experiment showed a higher preference for the solid floor than for the slatted floor. At the beginning of the experiment this area was littered. To identify the affinity of the pigs for this specific lying area (solid floor) a set of measures has been carried out: lying area A was supplemented with a nuzzle mat; the straw litter on the lying area B was renounced and one week later this lying area was not cleaned any more. Despite all the measures the animals showed a clear preference for the solid floor in comparison to totally slatted floor with additional environmental enrichment.

The use of a nuzzle mat in the area with slatted floor did not lead to a clear revaluation of this area. The attractivity of the slatted floor could not be increased within this experiment. It was interesting that even a bad quality of the solid floor has a higher attractivity than the slatted floor.

The results showed that a single day is divided into relatively small and definite time-units of feeding, activity and resting. Die animals spent on average 77 - 83 % of the day in both resting areas and confirm the results described in literature. Due to *Marx* (1991), *Sambraus* (1991), pigs spent 70 - 80 % of the time lying. According to housing system, this value can vary. Therefore this was the most common behaviour which was attributed to the poor animations in today's stalls and the resulting boredom (*Braun*, 1997).

85 % of 8-11 h lasting activity-time per day wild boar spent with foraging and feeding (*Briedermann,* 1990). There was a close connection between feeding and locomotion/ exploration. In opposite, animals grown in an intensive husbandry showed shorter feeding phases. *Zaludik* (2002) had observed duration of feeding between 4-8.9 % of daily time. According to feeding system, feeding time varied. In this experiment pigs spent approximately 3 % of the daily time with feeding and drinking. The feeding and drinking time lies between 52 and 47 minutes per day, whereupon the shortest feeding time was attributed to the older animals. Obviously the animals spent only little time with feeding and drinking. Moreover the time spent on ingestion was not influenced by increasing quantities of food and water needed by older animals.

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