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Housing System for Lactating Sows with Separate House Climatic Areas

Animal friendly housing systems for lactating sows with an opportunity to move around in exercise pens normally generate much higher costs than conventional systems. To circumvent these high costs for animal-friendly housing, a novel housing system with separate climatic areas was developed. This housing system is illustrated in the following and biological performances are presented.

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Keywords

Piglet production, sow housing, farrowing pen, exercise pen, housing system, separate climatic areas

Literature

Literature references can be called up under LT 05518 via internet http://www.landwirtschaftsverlag.com/landtech/local/literatur.htm.

In recent years increasingly housing systems had been developed, which should provide more animal welfare and comfort for the animals, due to cumulative accentuations of the minimum requirements on the national and the European level concerning the housing of productive livestock. For the housing of lactating sows this meansthat one tries to avoid the fixation of the sows during farrowing and lactation, being not animal friendly, in order to provide more mobility for the sows. By a suitably structured pen to separate functional areas and by using litter, animal welfare is further ameliorated [1, 2]. Indeed these housing systems mostly induce much higher costs, because this is connected to higher space demands per animal and an increased labour time requirement [3]. Therefore, a structured pen occupies with 7.5 m^2 nearly the double space than a crate stall pen. If an additional exercise area shall be offered, even 10 to 15 m^2 per pen has to be assumed [4].

To reduce the high costs being the result of these spacious housing systems, a new approach was followed in a diploma thesis at Hohenheim University. Therefore, the idea of separate climatic areas, well known from the housing of piglets, fatteners and sows, was transferred to a farrowing pen. The fundamental advantage of housing systems with separate climatic areas is that although the space being offered is much higher, the costs per sow place are not increased. The aim of the thesis was to develop a farrowing pen, which should comply with the natural needs of sows and piglets at the best, and simultaneously guarantee a high degree of functionality, working comfort and good animal performances. Beside sow mobility, separate functional areas, and litter material, also an effective piglet protection against crushing, a simple option to fix the sow if necessary and a labour efficient technology for manure removal with liquid manure belong to it.

Pen Structure

Altogether three different housing variants were developed and tested. To cope with the demands of sow and piglets, every single pen of the three was divided in three separate climatic areas, where the optimal temperature conditions for sow and piglets can be provided. Therefore, the climatic areas for sow and piglets were designed as boxes. It is up to the sow, similar to the housing in boxes of fatteners and sows in gestation, to choose the area where she wants to stay. Also for the period of birth, the sow is not fixed. *Figure 1* shows the functional scheme of the different pen variants.

Stable construction

The experimental stable was designed as an outdoor climate house with a wooden construction on individual footing and an insulated pent roof. The ventilation of the stable is done by a combination of eaves-ridge -

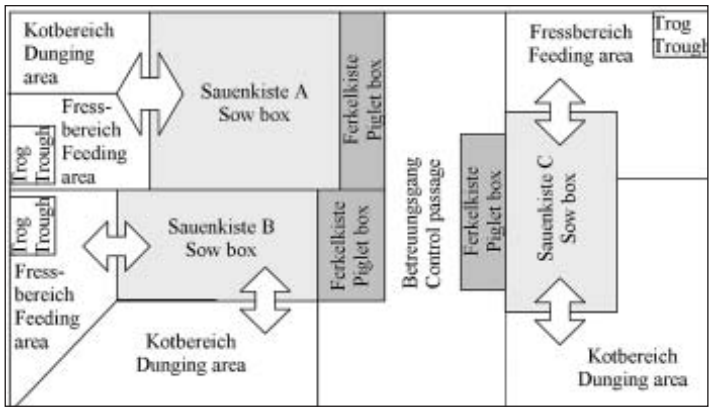

Fig. 1: Functional scheme of the experimental farrowing unit with the different pen variants

ventilation and cross - ventilation. The lower part of the outside walls of the sow house are closed up to a height of 120 cm, the upper part (120 cm to 200 cm height) consists of wind protecting curtains up to the eaves.

Piglet box
The sidewalls and the cover consist of polyurethane sandwich plates with a 40 mm PU foam layer. The box offers an effective lying area of 0.56 m^2 with an opening in the direction of the lying area of the sow. The opening is closed by strip curtains, being fixed to the cover of the box. The floor of the box is covered with a rubber mat. The temperature in the piglet box varies between 32 to 42 °C, and it is controlled by an electric blower-heater. Every piglet box can be opened and inspected from the service passage. In case of a necessary treatment, the piglet box can be separated by a slide.

Sow box
The lying area of the sow simultaneously serves as suckling area. It consists of an insulated box with closed floor. Its sidewalls consist of iron sandwich plates being reinforced by plywood plates. Every box has a cover, which is easily opened by a rope mechanism to facilitate the control of the animals. The closed concrete floor of the sow box is also covered by screwed in rubber mats. The temperature in the sow box is optimally at 18 °C.

The sow box owns an opening being 20 cm in height, where the piglets pass to enter the sow box or to get back into the pigletís nest. Box A has along its whole width an additional opening for the sow to enter the area with outdoor climate. The boxes B and C are characterised by two openings. In box B one opening is located at the front side, the other is alongside. In box C both openings are in the front side. The openings are equipped with transparent strip curtains.

To prevent crush losses, box B (200 cm • 110 cm) and C (200 cm•100 cm) are furnished with special lay-down aids (*Fig. 2*). These aids shall modify the sow's lay-down process in order to abolish the danger for the piglets to be crushed. They are fixed 20 cm above floor parallel to the box wall (at least 10 cm distance to the wall) and provide protected spaces for the piglets. By adjusting the aids, the breadth of the lying area can be adjusted to the size of the sow between 65 and 80 cm. In box A the lay-down aid was not installed and the dimensions of the box (200 cm • 150 cm) were chosen so that the sow could turn around well. This generous space should enable the sow to live out her own behavioural patterns, thus securing the piglets somehow "ethologically" against being crushed.

As nest-building and occupational substrate, the sow boxes are littered daily with about 70 g of a chopped / milled straw mix; during the nest-building phase, the amount is increased to 200 g per day.

The entrance doors of the pens close, if opened, the entrances of the boxes, thus fixing the sow temporarily in the box. Because the sows in the boxes B and C are not able to turn around because of the lay-down aids, they can be fixed in these two boxes similarly to farrowing crates.

Outdoor climate area
The perforated and completely roofed outdoor climate area comprises the functional areas ìexcretingî and ìfeedingî as well as the service passage. The functional areas are segregated as good as possible. The perforated outdoor climate area is smallest in pen A with 2.1 m^2, the pens B and C offer with 4.6 m^2 resp. 6 m^2 significantly more space.

Animals, material and methods

The experiments started in May 2004 and ended in the beginning of October 2004. Twelve different sows of "German Landrace" were used and each of the three experimental pens was stalled up twice with old sows and twice gilts. The average lactation lasted 24.3 days.

The pens were tested for functionality and whether their functional areas were respected. Therefore, the investigated parameters were restricted to the most important ones for the practise, concerning performance and to some ethological parameters, which are relevant for the functionality of the system.

Results and discussion

The farrowing performances were in pen A with 11.5 live born piglets the highest and in pen C with in average 8.8 piglets lowest (*Table 1*). Pen B ranged with 10.8 piglets per farrowing between them. Definitely, the small number of live born piglets in pen C is not due to the housing variant, but is explained by the small number of repetitions, because both gilts in pen C gave only birth to 6 piglets per litter. [5] and [6] also confirm this hypothesis; they were not able to assess any influence of the housing system on the number of live born piglets.

It is for sure, that the number of stillborn piglets is influenced by the housing system [7]. The rate of stillborn piglets was highest in the pens A and B with 2.2 % resp. 2.3 %, but compared to other investigations they ranged on a very low level. In pen C there were no stillbirths.

The losses of suckling pigs and the losses from crushing were strongly depending on the housing variant. Thus the losses of suckling pigs in pen A and C were with 17 % resp. 18.4 % more than threefold higher than those in pen B with only 4.9 %. In pen C occurred a coli-infection, which led to the death of six piglets from one farrowing. Without this incidence, piglet mortality would have been comparable to that in pen B. In pen A more than 50 % of the perished suckling pigs died from crushing, in average 8.8 % of the piglets in that pen were crushed. In the pens B and C, being furnished with lying aids, no piglet was crushed, which leads to the conclusion that the lay-down aid proved its high functionality.

Table 1: Synopsis of animal performance in the particular keeping variants

Pen	A	B	C
LLive born piglets/litter	11,5	10,8	8,8
Stillborn piglets in %	2,2	2,3	0
Losses of suckling pigs in %	17	4,9	18,4
Crushing losses in %	8,8	0	0
Daily weight gain in g/d	198	223	248
Feed intake of sow in kg/d	6,5	6,9	7,7

The daily weight gain of the suckling pigs was by far the best in pen C. This seems to result also from the higher inside temperatures in box A (+ 1 to 3 °K) compared to box B and C. Increased ambient temperatures lead through the reduced milk yield of the sow to minor weaning weights [8, 9]. The level of weight gains in pen B and C was with 223 g/d resp. 248 g/d in comparison to other trials high until very high; in pen A it was much lower.

The daily feed intake of the sows was in pen A 6.5 kg/d, in pen B 6.9 kg/d and in pen C 7.7 kg/d. As a reason for the very high feed intake the climatic changes between box and outdoor climate is supposedly the reason, beside the free movement.

Conclusion

In spite of the small number of repetitions, the sum of the proved parameters shows nevertheless a clear trend. Pen A was in nearly all criteria inferior to the other two pens. The pens B and C outmached in many criteria and generated in comparison to pens with sow movement in other trials good to very good results. Apart from this, it showed that piglet production is on principle also possible in outdoor climate stables with boxes. Further investigations are necessary for a standardised comparison with other housing systems.