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Causes of piglet crushing in free range farrowing pens

It has been investigated where, when, how and why the piglets are crushed to death in the farrowing pen. This study showed that most of the piglets (45%) are crushed in the middle of the pen. Piglet crushing was mainly caused by lying down of the sows (58%). Most of this piglets (78%) have been crushed within the first day after birth. 45% of the crushing incidents occured during active phases of the piglets in the lying area of their mother. Due to this two guide rods were in-stalled in the pen: One iron bar in front of the nest box and a sloped board along the long side of the pen to encourage the sows to lie down in this area. The following results with those arrangements showed, that there had been no piglet crushings before the nest box anymore, but furthermore on the long side of the pen. The optimized temperature-management in the piglet nest ist of central importance for this investigation.

Keywords
Free range pen, piglet crushes, video observations

Abstract

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As from January 1, 2013 all dry sows from four weeks post-insemination to one week before farrowing date must be housed in groups with free movement. Animal welfare discussions analogue to this development will also deal intensively with possibilities of free movement for sows in farrowing areas. Practical experience shows that, especially in the husbandry of unrestrained nursing sows, piglet crushing losses can increase. To investigate the question as to how the requirements of the sows, as well as those of the piglets, can be catered for in free movement pens, different parameters were examined. Investigation basis involved six farrowing cycles with a total 37 sows. The aim was the analysing of causes and marginal conditions of piglet crushing deaths through behaviour observations and barn temperature measurements as well as applying the results in establishing recommendations for optimising constructional aspects.

Animals, material and methods

Within the study, causes of piglet crushing in free movement pens were analysed at the Alternative Husbandry Department of the Boxberg Education and Competence Centre (State Institute for Pig Breeding, LSZ). The behaviour of sow and piglets was analysed via video observations (continuous filming from 24 hours before farrowing to 10 days after) with focus on number of crushed piglets. First, 19 sows were observed in four farrowing cycles (zero variant); the effect of optimised pen design measures (altered variant) was investigated with a total of nine sows in the subsequent two farrowing cycles in a parallel comparison with the zero variant with 10 sows. The sows were distributed arbitrarily in the observation pens. Gilts as well as older sows were integrated in the trial with the age structure thus balanced. Genetics were based

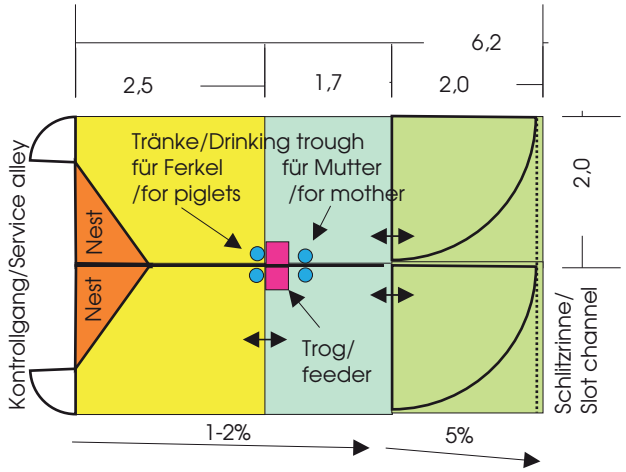
on the Baden-Württemberg hybrid breeding programme and investigations took place from March to August 2008 whereby different seasonal influences were taken into account.

Evaluation was divided into two study blocks. Analysis of the „piglet crushing“ incidents was carried out with the help of an event sampling procedure. Behaviour of sows during the 24 hours before farrowing begin in relation to the resultant crushing incidents was assessed through definition of indicator behavioural characteristics and their continual recording. The video analysis was supported with Mangold „Interact“ evaluation software for the event sampling procedure as well as for the continuous transcription. To ensure a high precision of data evaluation a single person processed the video films. Site of crushing (where?) described the point in the pen where crushing took place. Explanation as to the parameter “how?” was through the behaviour of the sow leading to crushing of the piglet, Through time of crushing (When?) the time of greatest danger potential for the piglets was determined. Further, behaviour of piglets before the incident “crushing” was investigated (Why?). In two pens in each farrowing cycle barn climate loggers (Test AG, testostor, 171) were installed at animal height in the laying and activity area of the sow and in the piglet nest. Damage to the instruments by sows and piglets was avoided by using a protection basket. A data logger was also situated on the building exteriors for continual recording of reference factors temperature and relative air moisture.

Pen

Both farrowing barns had 12 pens with separate climate areas. The parts of the pens are illustrated in **figure 1**, although the green outrun area with around 4 m^2 area was not accessible to the animals. The insulated laying area (yellow) with nest (orange) served as resting place, for farrowing and subsequent nursing by the sow. In the activity area (blue) the sow carried out the behavioural characteristics of eating, excreting and urinating. Total ground area of each pen was around 10.0 m^2. The lying area was separated from the activity area by a solid swing gate. An opening in this gate allowed the sow to move between the pen areas and this featured a metal roller attached to the 3 cm high lip of the opening to avoid damage to sows' teats when passing through. The opening also featured a plastic strip curtain to reduce draughts. A piglet escape gate was also integrated in this gate. From the tenth day of life this was opened and the piglets could follow the sow into the activity area. As pen design optimisation in the second part of the investigation, a protection rail was fitted in front of the nest area (**figure 2**) as well as a sloping board to slow the laying down procedure of the sow (**figure 3**).

Fig. 1



Sketch of functional areas of the free range farrowing pen without protection against piglet crushing

Fig. 2

Guide rod in front of the piglet nest

Results and discussion

The evaluation of the first four farrowing cycle results showed that most piglets (43%) were crushed in the middle of the pen (**figure 4**). The crushing was caused mainly (58%) through the laying action of the sow. It was further established that within one day of farrowing begin 78% of the crushing incidents had already occurred. Up to day three following farrowing, nearly all crushing cases (97%) were recorded. 45% of the crushing cases occurred while the piglets were active in the sow laying area. The results were analogue to those from comparable trials [1; 2].

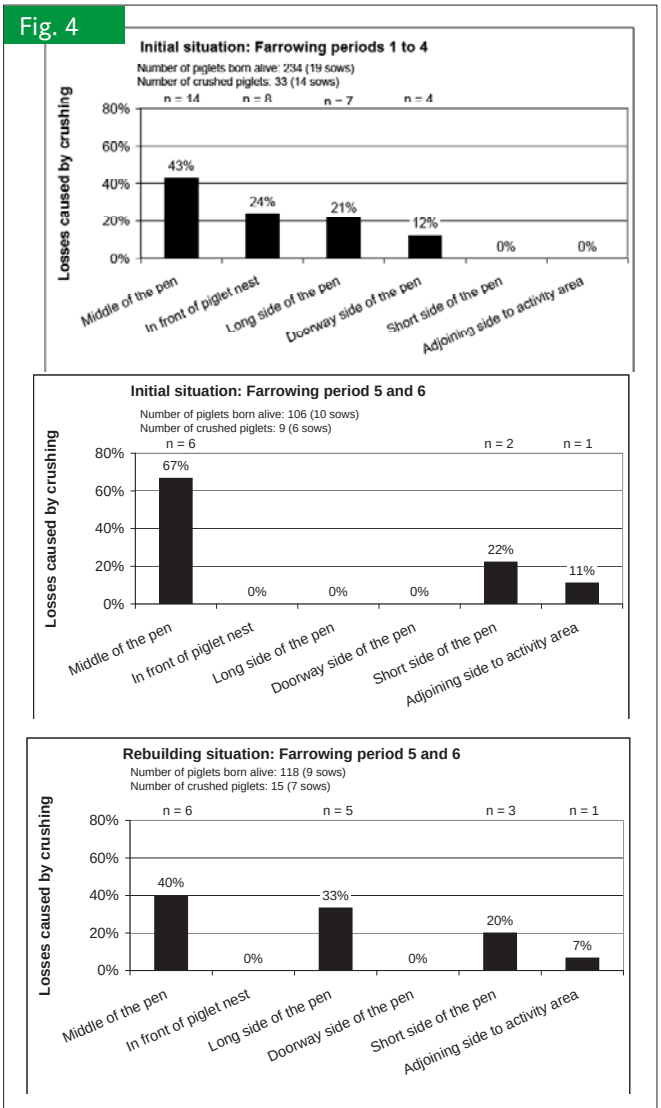
Because of the results from the first four farrowing cycles a protection rail was fitted across the front of the piglet nest (**figure 2**) and a sloping board (**figure 3**) installed for the sows on the long side of the pen. The protection rail was positioned to keep the piglets near their nest because when temperatures were too high in the nest and there was no rail the piglets tended to lie on the outside borders near the sow laying area and therefore were liable to potential crushing danger Particularly in the colder months the sow increasingly lay in this nest edge position to get the benefit of warmth from the nest, whereby

crushing danger was additionally increased.

The aid in laying down via the sloping board on the long side of the pen was introduced in an attempt to entice the sow to this area away from the pen centre where laying down was a rapid uncoordinated procedure. The more comfortable and slower sliding down against the sloping board was meant to offer a more attractive procedure for the sow [3]. During installation of this board, attention had to be paid that there were no sharp edges or squared nuts or bolt heads so that injuries could be avoided. Furthermore, the supporting frame had to be strongly built so that there was no danger of the board being broken on sudden application of the sow's weight.

Figure 4 shows the results for the factor 'crushing locality' in chronological order. The "zero variant (Nullvariante) cycles 1 – 4" describe the starting situation, results that led to introduction of the design optimisation. The data " zero variant cycles 5 and 6" as well as "alteration variant (Umbauvariante) cycles 5 and 6" were recorded parallel, or at the same time, and thus represent a comparative investigation. Noticeable is that in the pen area "front of

Fig. 4



Development of the criterion "location of crushing events inside the pen" in chronological order

Fig. 3

Sloped board along the long side of the pen to slow down the laying down act of the sow

piglet nest" (vor Ferkelnest) an average 24% of all crushing cases took place in "starting variant". In the subsequent comparative investigations with "altered variant" and "zero variant" no piglets were crushed at this location. The fact that there were no deaths with the "zero variant" can in part be explained through the summer situation which meant that the sow sought less often, or not at all, these danger zones on front of the piglet nest for laying down because temperature conditions were suitable for her throughout the pen.

The second construction alteration featuring the sloping board on the pen long side gave different results. In the starting variant an average 21% of all crushed piglets were killed in this location. In the subsequent comparative investigations no piglets were killed in the zero variant although deaths occurred in the supposedly optimised (altered) variant. In the pens with the laying board an average 33% of all crushed piglets were killed in this location although, in this case, the piglets were not crushed at the pen wall. The piglets rested under the sloping board but not with the entire body protected and were in this way crushed against the laying board by the descending sow.

Thus it can be interpreted that through its function as a protective cover, as well as possibly better fresh air and climate conditions there, the board proved attractive to the piglets. On the other hand, the video films clearly showed that the board was used as a protection against crushing in the form of an escape niche, as described in the literature [4]. Thus piglets can save themselves under the sloping board when the sow starts to lie down.

Regarding the barn temperature recordings it was established that an optimum temperature in the piglet nest is of central importance for reducing losses in the free movement pens.

Figure 5 demonstrates this well with figures for a sub-optimal temperature in the cooler season of the year. In the first days after farrowing (birth indicated with red line) the temperature in the piglet nest lay clearly under the target of 32°C, Piglets therefore often sought the warmth of the sow in the laying area of the pen. Here then occurred, naturally additionally caused by other fac-

tors, the increased crushing incidence as indicated by the arrow markings.

Conclusions

The two constructional alterations in the free movement pens, i.e. the laying board and the protective rail for the piglet nest, can be evaluated in different ways. The laying board on the long side of the pen failed to deliver the hoped-for behavioural steering effect in sow laying down behaviour which was aimed at reducing losses in the pen middle. Additionally, the board was in fact responsible for an increase in losses on the long side of the pen through its alternative use by the piglets as "second" nest. In the pens with protective rail in front of the piglet nest no more crushing was recorded in that particular area. However, neither were any losses recorded for this area in the simultaneous trials carried out in the "zero variant". Further trial cycles are required to support these results. Towards the aim of reducing crushing deaths as much as possible the piglet nest should always be the most attractive place in the pen for the young animals because then potential danger moments will be fundamentally eliminated.

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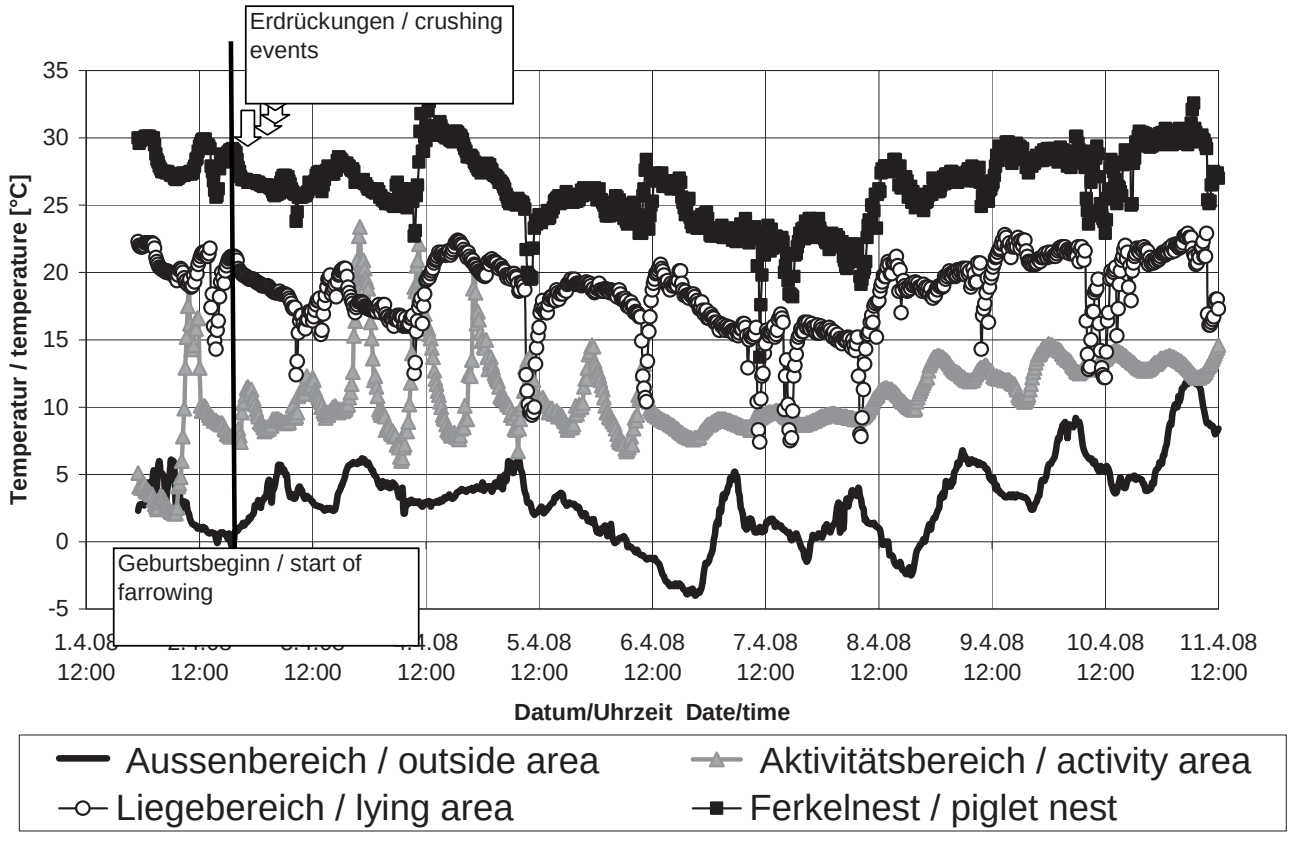
Fig. 5



Suboptimal course of the piglet nest temperature during the 2nd farrowing period (spring time)