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Flooring in feeding pig housing

Statutory regulations and practical experience

Flooring design can have a large influence on animal welfare and health. Accordingly, certain requirements are legally enforced. Farming surveys and analyses of over 1.7 m slaughtered pigs indicate that slatted flooring has positive effects on animal health.
Requirements have been recommended at EU level that exceed the minimum requirements as defined presently in EU directives. These affect the widths of slat surface and slit – although only for concrete slats – and also the lying area design through reduction in perforated floor areas.
Author recommendations for flooring design will be proposed at the end of this paper.

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Anyone who owns an animal, looks after it, or causes it to be looked after, is responsible for providing the appropriate feeding and care measures and for housing it according to behavioural requirements [1]. Appropriate requirements for pigs are presented in the Statute for Protection of Housed Pigs (SHV) [2]. Here, e.g., area per pig is regulated according to liveweight and 100% perforated floors are proscribed for breeding pigs. Minimum slat surface widths and, widths for the slits between, are given.

Pig producers' experience?

Concrete slatted flooring was initially used only in the dunging area, i.e. part-slatted flooring. Subsequently, concrete slats were increasingly used for the whole pen floor, i.e., fully slatted flooring. At the same time, increasingly fewer straw-litter systems were used.

In practice, it is recognised that there were, and still are, often problems with dirty pigs on solid floors and this has been associated with animal health problems in reports. To investigate this possible relationship between floor design and animal health, Internet was used to start an initial survey with the main target of achieving a first overview of the situation on the basis of contacting as large a number of farms as possible [4]. Contact was also made to advisers of the Livestock Farming Support Association (VzF), the Bavarian State Advisory Service and to vets from the Integrated Herd Care for Pigs (ITB). These estimated the farms available in their respective regions using predetermined criteria. A few farmers also offered their estimations.

Only the effect on the animal, and not possible environmental consequences, was to be considered. Results were to be based on conditions over the year with, in each case, the number of farms or animal places affected by the evaluation in relationship with the different floorings entered into the table.

In the meantime, data from 1839 farms are available. Other systems such as natural climate houses were used on 39 farms or 2.1% of all the units concerned. Litter systems (deep litter, Danish and part-slatted with litter) were used on a total 234 farms or 13% of the units. Part slatted flooring was used on 282 farms (15%). The largest proportion (1284 farms or around 70%) had fully slatted flooring systems.

According to the survey the laying area was only minimally, or not at all, dirtied on 62% of the farms. Around 23% of all laying areas were reported as having medium dirtying. In less than 15% of the total, the laying area was badly to very badly dirtied. The cleanest laying areas by a large measure were those fully slatted. The dirtiest featured part-slatting with and without litter, Danish and other floor systems, i.e. the systems with the more or less largest proportions of solid flooring. Deep litter in this case comes somewhere in the middle.

In nearly 59% of all farms the lung and liver health could be evaluated as good to very good. According to this survey, around 33% indicated an average health status. In about 8% of all cases the lung and liver health was judged as poor. Farms where the animals showed a very good lung and liver health were found only under the categories other flooring, fully slatted and partly slatted with litter. The highest proportion of farms with poorer lung and liver health used part-slatting with litter, part slatting without litter, deep litter and other flooring. The lowest proportion used fully slatted flooring and Danish flooring. There tends to be a close relationship here with the degree of dirtiness, in that these floors are often associated with high, lung-damaging, ammonia concentrations [5].

In 62% of all farms joint and hoof health was evaluated as good to very good; around 32% indicated average health status in this respect .On some 6% of all farms the joint and hoof health was assessed as poor. The deep litter systems returned the largest proportion of good to very good joint and hoof health whereby no farms with poor health in these aspects were identified. Between the other flooring variants, seen in general, there was no tremendous difference in joint and hoof health.

These first results back-up the premise of a relationship between type of flooring and animal health, a health: housing association which was subsequently investigated through the analysis of available slaughter

data from Norddeutsche Fleischzentral (NFZ). This was possible because the NFZ investigate and evaluate in detail animal health with vets on its slaughter line as part of quality controls. In this way [6] could *(fig. 1)* show, on the basis of 1 725 000 slaughtered pigs that with part-slatted systems the proportion of diseased livers, (14.1%), was clearly higher than that from fully slatted flooring systems (12.1%). Leg damage at around 5 to 6% lay at a greatly lower level whereby the part-slatted floors performed tendencially better here.

This indicated that, at least with full and part slatted floors, the results from the evaluation and those of the NFZ quality controls were around the same. Through the NFZ grading payments better animal health means a higher return for the farmer. Thus the top 25% of farms under the criterion worm livers received around 8 DM/pig, and under the criterion leg damage, around 2 DM/pig higher return, than the less good farms.

Currently, data on housing and animal health is being analysed in detail in cooperation with the VzF with the aim of assessing even more details, e.g., a on other housing systems, so that analyses of causative relationships can be gone into more deeply.

What's being discussed at EU level?

The 1991 European Pig Farming Directive (91/630/EWG) [7] is binding for the EU. Every member country had to amalgamate this directive into national law by 1994. In that this directive involves minimum demands, individual countries can, during incorporation of the law, add additional requirements. A reduction in the requirements is, however, not possible.

At EU level the introduction of solid flooring with preferably littered laying areas is actually encouraged – with the target of improved animal health! Individual countries (Britain, Sweden, Denmark and the Netherlands) have already introduced appropriate national laws to this effect.

Currently the above mentioned directive is being revised. With regard to flooring, the following suggestions for piglets and feeders are being discussed: where concrete slats are used the tread surface should have a minimum width of 75 mm whereby the slit should not be wider than 25 mm. Flooring of other materials is not regulated for. From the aspects of consumer protection and animal welfare constructional differences are envisaged between laying and dunging areas, one solution being that the proportion of slits to floor area in the laying area should not exceed 10% of the entire floor space [8].

Also being evaluated on an EU level are production methods according to their prefe-

rability, especially from the environmental aspect. From this has been produced the so-called „Best Available Technology". In feeding pig production, e.g., this gives fully slatted floors and group housing systems the best evaluation [9].

Recommendations on flooring

Based on scientific knowledge and practical experience the following recommendations for flooring design should be discussed:

The floor in the total area used by the pigs should be non-slip and give sure-footing. Injury risks, especially for the hoofs, must be avoided as far as possible. In the laying area, the floor should be designed to fulfil all requirements for laying animals, especially so that disadvantages are avoided that would affect the health of the pigs through dirtiness, poor insulation or excess heat. It should also be possible for all pigs in a pen to lie down simultaneously in the above area. The flooring should also be positively evaluated from an environmental point of view.

The following criteria could enable a practical compromise: Every pig should have a usable floor area of at least 0.5 m^2 where its liveweight is from 30 to 50 kg and 0.8 m^2 for from 50 to 120 kg. With every extra animal over 20 in a group, the above values could be reduced by 20%. For groups of over 40 animals the floor space for each extra pig could be reduced by 30%. In no case should the space per pig be less than 0.4 m^2 (30 to 50 kg lw) and 0.7 m^2 (50 to 120 kg lw). At least 30% of the required unlimited usable floor area should be included in the laying area. With pigs of over 30 kg lw the proportion of slat slit area in the total flooring of the laying area should not exceed 10%. In the other areas, the proportion of slat slit should not exceed 40% of the total floor area.

The flooring should have slits to allow excess liquid run-off. For animals between 30 and 120 kg lw these slits should not exceed 17 mm width. This width should not be exceeded by more than 15% through manufacturing/constructional imprecision. The area between the slits must be at least the breadth of the individual slits.

A flooring with holes, slits or other forms of opening should be designed so that no danger of hoof or leg joint injury is present. For the same reason the edges of the openings should have no ridges.

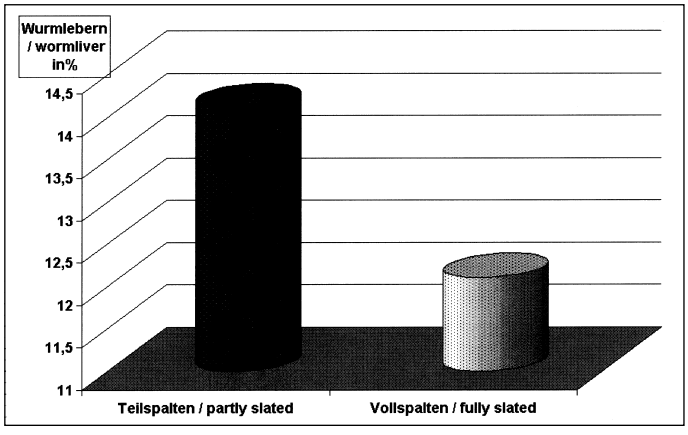

Fig. 1: Liver worm damage in pigs from housing with partly and fully slatted flooring (source: NFZ 2000)