

Behaviour of weaned piglets in an experimental house with kennels and straw bedding in dunging-exercise area

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ABSTRACT

The main aim of the study is to test housing systems based on straw use for weaned piglets. The experimental pig house was obtained rebuilding a facility for loose dairy cows. It has 15 pens for weaned piglets, from 5-7 kg to 25-30 kg. Each pen consists of a dunging area with straw bedding, an exercise area with concrete sloped floor and a feeding-dunging area. The latter is realized in kennels, provided with a localized heating system (2 infrared lamps per pen) and with plastic transparent strips placed between the lying and the exercise area. A straw dispenser and two multi-space hopper feeders are placed inside each kennel. Therefore this housing system greatly differs from ones normally used in Italian intensive pig farms, generally based on totally metal or plastic slatted flooring. During the experimental trials the following parameters were analysed: A) productive performances; B) managerial parameters; C) behavioural parameters; D) environmental parameters.

INTRODUCTION

In this moment in which the alarm for the protection of the environmental balance and for protection of animal welfare are widespread it is extremely necessary to remind the importance of using the straw in pig farms.

The availability of straw represents an important condition for the welfare of animals, both at physic and psychic level. From a physic point of view the use of straw allows to prevent lesions of legs and feet, very common on slatted floors.

From a psychic point of view, the straw is an important element for recreation of the animals, particularly of pigs, which for the availability of straw can satisfy their ancestral instincts, such as rooting, chewing and straw ingestion and appear more quiet and less aggressive. On the other hand pens without straw bedding offer pigs fewer recreation opportunities to follow their behavioural patterns. Oral behaviours above all are greatly modified, in fact pigs in pen without straw bedding often show these behaviours towards objects or other pigs in the building. In pig houses without straw bedding there is consequently a greater presence of abnormal behaviours such as cannibalism (tails and ears biting). The described aspects have been known for long time and are stressed in the wide international literature.

In a recent study Barbari (2001) remarked a higher animal welfare in straw-flow pens in comparison with pens with slatted floor or full concrete floor for growing pigs (60 kg). This conclusion is supported by the particularly high total lying time (84.1%), by the time dedicated to a deep sleep (56.6%), by the intensive activity of exploring the environment and locomotion (the average daily walk of a 60 kg pig in a straw-flow pen is 1,229 m).

Straw bedding has also important insulating functions which favour the animal thermal comfort, above all in low temperatures. Consequently the lowest critical temperature for pigs on straw is extremely inferior to the one of pigs on different types of floor. In building with bedding it is possible to keep temperatures lower than in buildings with straw bedding. It is also possible to keep a ventilation rate superior to the minimum one with a consequent better quality of air (fewer microbial charge, lower concentration of noxious gases).

An important aspect related to the use of straw is the hygienic-health one. The employment of the straw favours the cleaning of the body by the animals, which in this way remain cleaner. For example pigs, which cannot reach each part of the body with their own legs or snout, to clean themselves gladly rub on the straw. Obviously this condition is satisfied only when straw is clean and dry.

For the above mentioned reasons we think the solutions with straw bedding can be conveniently used also in the delicate weaning phase.

According to the fewer thermal needs of animals on straw, bedded based solutions can be suitably realized with simple buildings, characterized by light structures, absence of insulation, use of poor materials, presence of wide openings. In these cases the energetic cost to ventilate and to heat the building is practically zero.

Straw based solutions are also suitable when it is necessary to reuse old buildings, such as pig houses, cattle barns or other farm buildings. Few changes are usually necessary and are limited to the constructions of partitions, remaking of waterworks, interventions to floor.

Among the negative aspects connected to straw in pig farms we must consider the running costs, of course superior to the ones in buildings with full concrete or partially/totally slatted floors. In particular housing of pigs on straw bedding requires a great labor for straw distribution and for periodic cleaning. In the deep bedded systems it is also necessary a peak of labour when carrying out muck from the building.

Deep bedded systems generally show some negative aspects: - a high surface area per head ratio; - a relevant labour requirement, with peaks of labour during the removal of the bedding; - the necessity to introduce great amount of straw and to evacuate big quantities of manure.

Owing to the scarce experience about bedding materials and design standards, inadequate interventions have been carried out. The use of straw has not always given the expected advantages, particularly when the straw bedding has been managed with irrational criteria. In such situations there has often been a rise in the managerial costs, as well as, serious problems in the meat and carcass quality of the hogs at slaughter. Generally straw bedding, improperly managed, and wood shavings used in deep bedding have given the greatest inconveniences.

For the above said motives housing solutions must be investigated, which allow to obtain the double aim, to produce muck of a good quality and to guarantee acceptable comfort conditions of the animals, with low running costs.

MATERIALS AND METHODS

The building chosen for the tests is placed in Po Plain (Parma Province). It is a loose barn for cows with deep straw bedding in the resting area, recently converted into an experimental pig house. It is designed for post-weaned piglets and presents a dunging-exercise area with straw bedding.

The building has a bearing structure with reinforced concrete pillars, with interaxis of 4.9 m and a covering package composed of a brick-concrete floor, an insulating rock wool panel and a fibrous-cement sheeting; the external walls are perforated brick blocks.

On both long sides of the building there are opening windows. On the side of the resting area (eastern side) transom windows are installed, sash windows on the opposite side (western side). The inside dimensions of the building are 44.4 x 11 m, for a total surface of 488 m²; the heave height is 3.6 m, whereas the inside height on the top of the covering is 5.35 m.

The housing typology has a full floor with dunging area on straw bedding. For this purpose part of the floor was rebuilt at inferior level of about 0.3 m compared to the original floor. The new consists of a plain area (dunging area) and a rising area towards the original floor. Each pen, therefore, shows a dunging area on straw bedding, an exercise area with sloped floor and a resting-feeding area in kennel. Each kennel is supplied of localized heating (2 infrared lamps per pen) and plastic transparent strips at the passage from the resting area to exercise area. At the side there is the service-feeding passage.

The pens are divided by separating walls of metallic wires, which can be opened to allow the cleaning of the dunging area through small tractor with a bucket or carrying shovel. The divisions of the exercise and resting areas are obtained with plastic panels with a box structure 50 mm thick so that contact, also the visual one, among pigs of adjoining pens is avoided.

In the area close to service passage straw dispensers and multi-space hopper feeders are placed, respectively one and two per pen (fig. 3).

The plant for drinking water consists of a distribution net and 3 nipple drinkers per pen, placed in the dunging area along the western wall.

In total 15 pens for breeding of pigs in the post-weaning phase (from a starting weight of 5÷7 kg to a final weight of 25÷35 kg) were built, and precisely:

- 7 pens for 78 heads, each 3.2 m wide;
- 4 pens for 75 heads, each 3 m wide;
- 4 pens for 62 heads, each 2.5 m wide.

The main aspects on which we concentrated the experimental tests are:

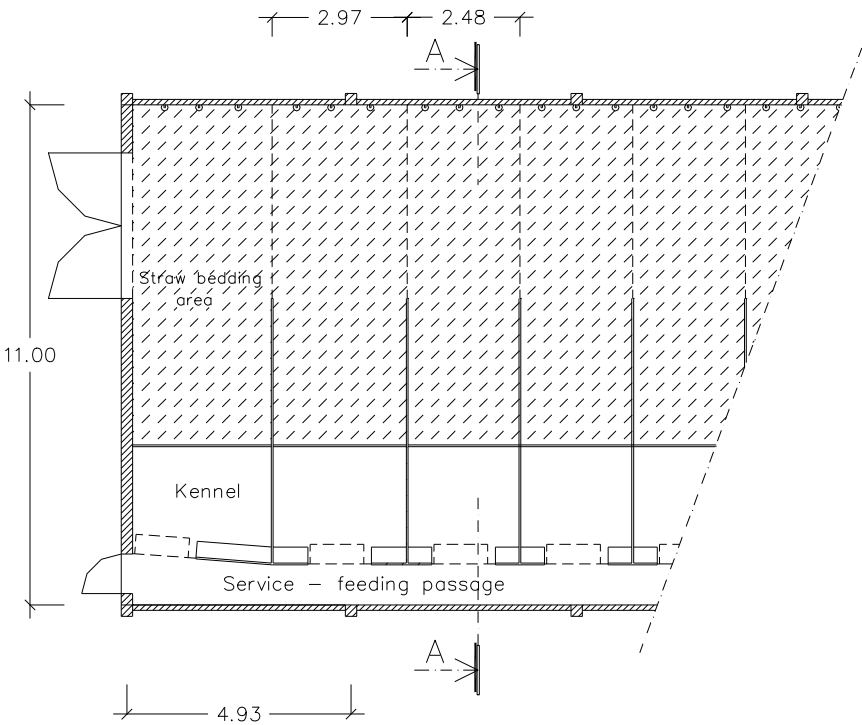
- productive parameters (weight increase, food conversion rate, mortality);
- technical-managerial parameters (straw consumption, drinking water consumption and need of labour);
- microclimatic parameters (temperature and relative humidity, outside and inside in the different areas in the pen, air velocity and noxious gases);
- behavioural parameters (resting and activity times, identification of the different functional areas).

The experimental protocol of the phase established the installation of the monitoring equipment and, in particular, of a data logger provided with thermometric and hygrometric probes. During the test to have a permanent check of the air temperature and relative humidity inside and outside the building an appropriate equipment was installed, composed of an instrument for the collection and processing of meteo-climatic and environmental data placed within a waterproof box and three probes for temperature and relative humidity.

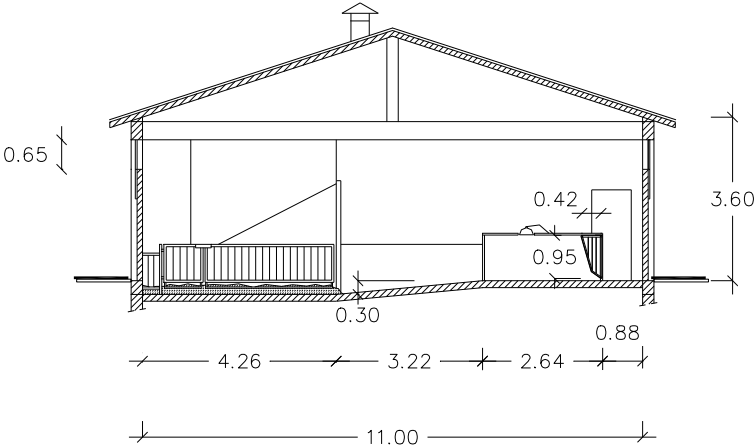
To have a survey in progress of the animal behaviour it was necessary to install a closed circuit television set. In particular the monitoring was carried out through time-lapse video

recorder, a monitor, two infrared lamps for the night filming and two professional video cameras.

The tests were carried out in two pens 3 m wide. The surface / head is 0.4 m² (feeders included). The tests were executed in winter 2001 and lasted 24 days.



LAYOUT



SECTION A-A

Fig.1: Layout and section of the experimental pig house.



Fig.2: View of the experimental pig house.



Fig.3: In the area close to the service passage a straw dispenser and two feeders are placed.

RESULTS AND DISCUSSION

Productive parameters

The productive performances of the test are summarized in tab.1. In the pen chosen for the behavioural survey 73 heads with a starting average weight of 7.12 kg were inserted.

The final weighing executed on 10th March 2001 showed an average weight of 16.71 kg for the remaining 70 heads. The losses of pigs during the test period came to 3 heads (4.1%), two swerves rejected for excessive wasting away and one dead.

The total feed consumption was 1,140 kg.

Managerial parameters

The emptying operations of bedding take place weekly. For this purpose it was necessary to place the dividing gates at a height of at least 0.2 m from the floor providing them in the inferior part with a pivot anti-mixing pipe and to fill the necessary amount of straw for a week.

With a straw consumption of about 0.25÷0.30 kg/d, piglet, the requirement of straw per pen is 18÷22 kg/d.

For the removal of bedding and for distribution of straw 2 working units for a period of 180÷200 minutes are necessary. The daily labour requirements inside the building, where about 1,100 pigs are accommodated, are altogether about 55÷60 minutes.

Tab.1: Characteristics and productive performances during the trials.

Data	<i>PEN A</i>	<i>PEN B</i>
<i>Starting date</i>	14 th February, 2001	14 th February, 2001
<i>Number of heads at the beginning of the test</i>	73	73
<i>Average weight at the beginning of the test (kg/head)</i>	7.12	6.57
<i>Final date</i>	10 th march, 2001	10 th march, 2001
<i>Number of heads at the end of the test</i>	70	71
<i>Average weight at the end of the test (kg/head)</i>	16.71	13.10
<i>Length of the test (d)</i>	24	24
<i>Food consumption (kg/head, d)</i>	0.66	0.49
<i>Average daily growth (kg/head, d)</i>	0.40	0.27
<i>Food conversion rate</i>	1.65	1.81
<i>Consumption of drinking water (l/head, d)</i>	0.38	Non measured

Microclimatic data

During the trials the average outside temperature was 7.7°C (min. – 2,2°C, max. 25.0°C). Inside the building the temperature was on average 13.0°C (min. 9.9°C, max. 16.5°C). Obviously in the kennel we found a higher temperature (on average 1.4°C). The average relative humidity inside the building was 73.7°C.

Behavioural data

Fig. 4 summarizes the distribution in percentage of the behaviours of the piglets in the different areas during the testing period: the bigger percentages were recorded in the straw

bedding zone (81% of the total of the heads against 19% of the kennel), of which 80% in resting and 20% in activity.

In the kennel the distribution of the heads is the following:

- 40% resting;
- 40% at the feeder;
- 20% in activity.

The piglets spend on average the 72.5% of the time resting and the 27.5% in activity. The activity times are surely superior to the ones recorded in other tests executed recently (reported in an other study published in the proceedings of the Congress, Barbari 2001).

The activity times superior to the ones generally recorded in a pen with a totally or partially concrete slatted floor or with metallic slats are surely to be attributed to the stimulating environment for the use of straw. Pigs spend long periods of the day in activities connected to the use of straw, in particular play, run, grubbing. This datum confirms what pointed out in a previous study already mentioned in the introduction (Barbari, 2001).

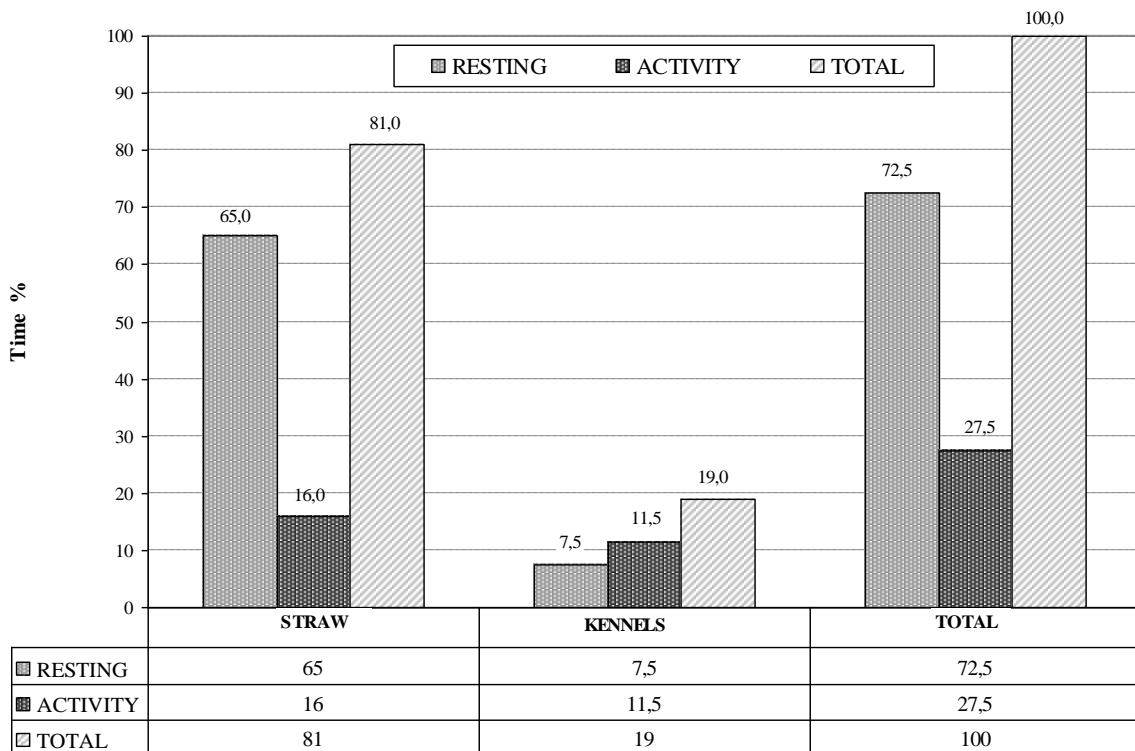


Fig.4: Resting and activity times (%) in the different areas during the trials.

From the analysis of the behavioural data it is clear that piglets surely prefer to use the straw area also for the resting activity, staying inside the kennel for limited times (19%). Actually the kennel is not particularly fit for a deep sleep by the animals, as the feeders are placed inside it. The kennel therefore is mainly a passage to reach feeder. Of the time spent inside the kennel the 11.5% is for activity and distributed in the following way: the 7.7% for feeding; the 3.8% for moving.

CONCLUSIONS

On the basis of experimental trials carried out in a pig house with straw bedding and heated kennels, it is possible to remark some positive aspects, which can encourage the use of this system in Italian pig farms also in the delicate post-weaning phase.

As it was to be expected piglets enjoy straw supply and spend the 27.5% of the time to the activity both connected to straw (play, running, grubbing) and to feeding.

The scheme suggested in the experimental building revealed to be a valid solution allowing to obtain satisfactory productive results with reasonable investment and running costs.

The use of heated kennels was however inferior to expectations. Piglets in fact use the covered and heated area almost exclusively for feeding. Resting inside the kennel is limited both in terms of total time in a day and in terms of length of a single action owing to the continuous movements of the animals recorded in the area.

The planning scheme could be lightly modified. In particular the covering of the kennel could be removed completely or moved to a more central area in the pen and be used exclusively in winter in the coldest days.

The adoption of bedding solutions, like the one described or anyway rational from the distributive point of view (e.g. straw-flow systems), will encourage in the next few years to overcome the breeders' resistances towards the use of straw.

REFERENCES

1. Barbari M. 2001. *Effects of Housing Typologies on the Welfare of Growing – Finishing Hogs*. VI International Livestock Environment Symposium, Louisville, Kentucky, 21-23 May.