GREEN INITIATIVES: OVERALL EVALUATION OF INNOVATIVE PIG FATTENING SYSTEMS FOR ANIMAL-WELFARE LABEL PRODUCTION

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ABSTRACT

Changing public opinion and subsequently increasing political pressure require new solutions in farm building and housing. Within the current research project four innovative pig-fattening systems are evaluated for their effects on animal welfare and profitability. The ethological assessment concept consists of four parts, among them direct observation with the scan-sampling method supported by a new video technique and the integument scoring following the method after "Ekesbo" will be specified. In addition, the systems are compared and evaluated according to indoor air quality, functionality and consumer acceptance. Therefore, twenty recently built pig-fattening units (five single fattener houses per system) on commercial farms are investigated in a field study.

INTRODUCTION

In this research project, four innovative pig-fattening systems are evaluated for their effects on animal welfare and profitability. In addition, the systems are compared and evaluated according to labour time requirements, indoor air quality, functionality and consumer acceptance. Therefore, twenty recently built pig-fattening units (five units per system) on commercial farms are investigated. A database is created that will reveal, on one hand how the common requirements of a good relationship between animal welfare and good profitability for the farmers can be fulfilled with these new systems, and on the other hand where problems are and how they can be approached. Finally, the results will be discussed in a public "round table dialogue" with experts including representatives from animal welfare organisations, consumer organisations, agricultural and veterinarian administration, scientific institutes, as well as marketing organisations and practical farmers with the aim of knowledge sharing for all participants and lead to a better understanding between all interest groups involved.

FIELD STUDY DESIGN

The research project evaluates four innovative pig-fattening systems. For each system, five similar stables are monitored, to have statistically more robust results and to reduce the "farmer effect".

Investigated Pig Fattening Systems

Altogether twenty recently built pig-fattening units on commercial farms had been investigated. The single systems are characterized as follows:

1) Insulated confinements with slatted floors and improved animal welfare (larger groups of 20 to 40 animals, pens structured in functional areas, activity stimulation) (Figure 1).

2) Sloped floors with a single climatic area, including both insulated as well as non-insulated buildings. Limited straw quantities are offered to the pigs (30 to 60 g per animal per day). However, the dung removal system is still slurry-based (Figure 2).

3) Open front units with free ventilation and insulated sleeping boxes. Limited straw quantities are offered and the dung removal system is slurry based (Figure 3).

4) Straw-based classic two-area-pen systems with indoor pen and training area on slatted as well as solid floors outside. Straw is offered as activity stimulation or bedding (Figure 4).

Figure 1. Example of a conventional stable with improved animal welfare (activity stimulation).

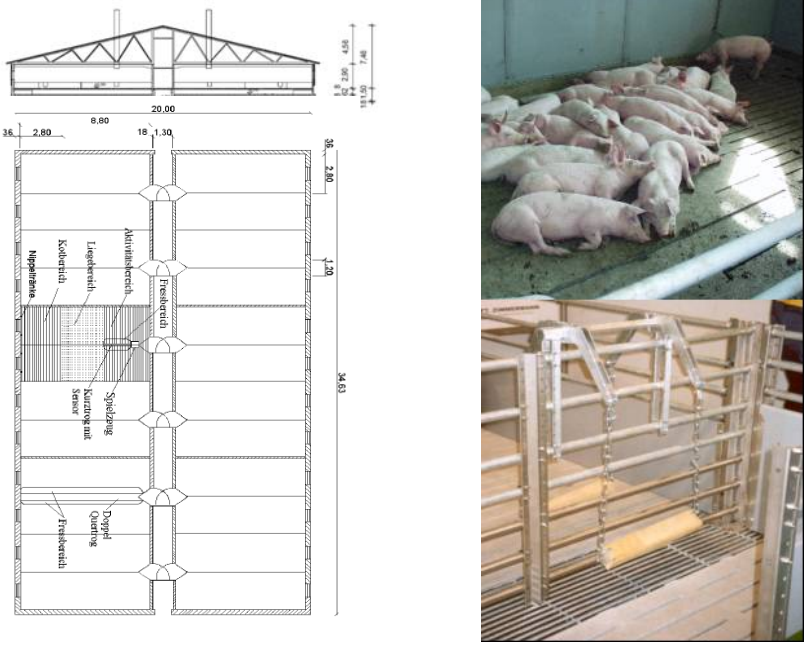


Figure 2. Example of a sloped floor stable with limited straw offering.

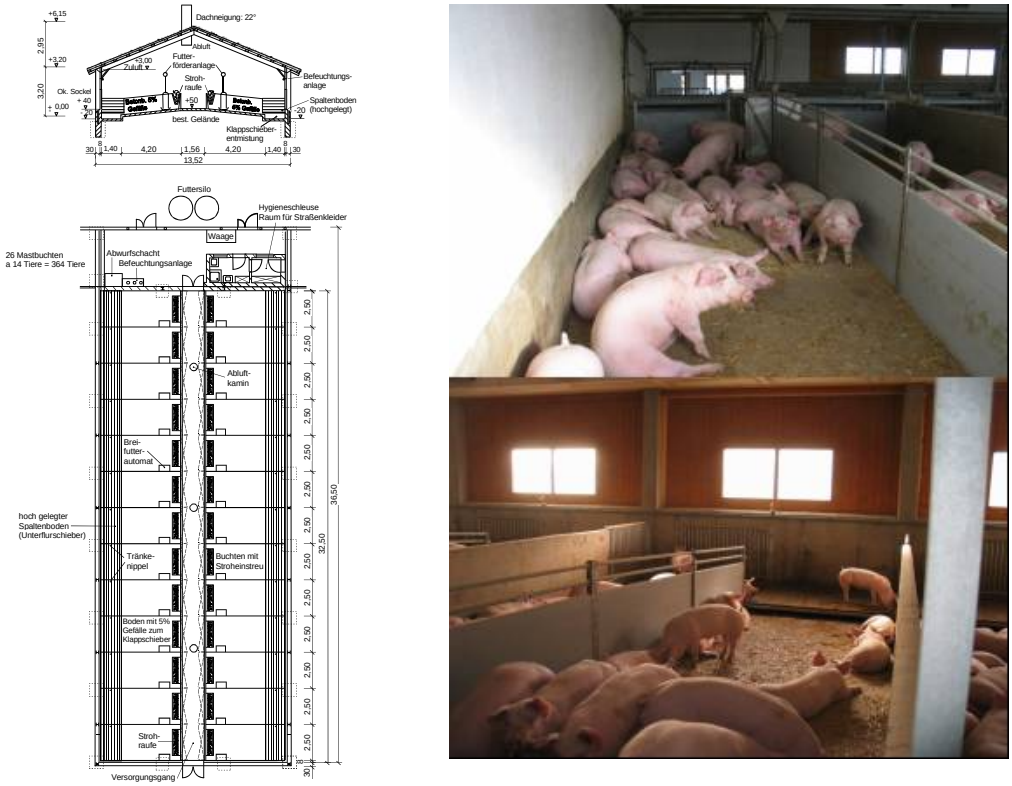
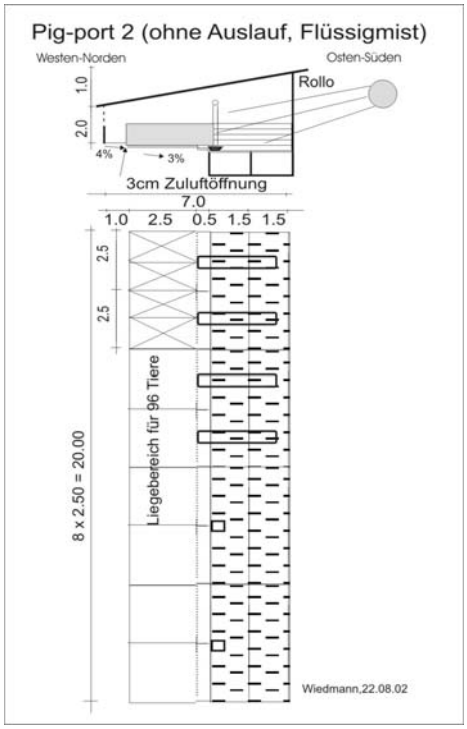


Figure 3. Example of an open front unit with free ventilation and insulated sleeping boxes.



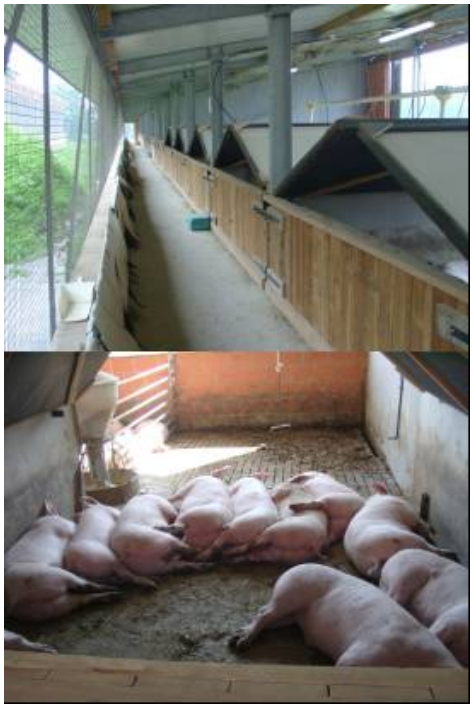
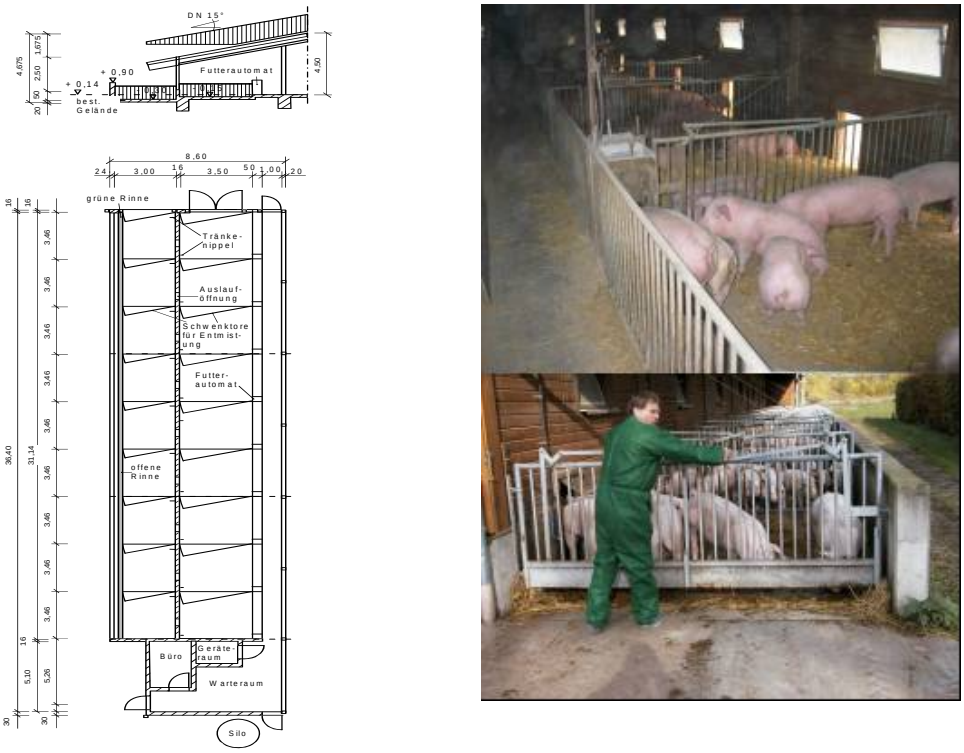


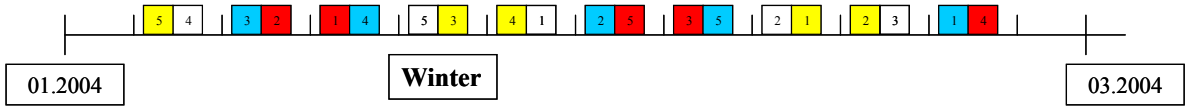
Figure 4. Example of a straw-based classic two-area-pen system.



Time Schedule

The units were studied for one year, thus including the seasonal effects. The year was divided into four 3-month observation periods similar to the seasons. In every observation period, each single stable was investigated for two days. Two farms were investigated each week, so in a ten week period, all pig houses were inspected. The single systems and farms were randomly distributed in every season.

Figure 5. Time schedule for the investigation section "winter".



= System a = System b = System c = System d

1- 5 = continuous farm-number within one system

Methods of Investigation

The main topic of this paper is the evaluation of the pig fattening systems for their effects on animal welfare. The ethological assessment of the systems was based on four pillars or methods. Two methods investigated animal welfare directly (animal based) and two methods investigated animal welfare indirectly (production-environment based). The first direct approach of the

assessment concept was the direct observation of the animals by the scan sampling method supported by a new video technique. Direct observation against video observation has the advantage of a more exact and better spacial view; further it is possible to use all senses, such as hearing. (Etter-Kjelsaas, 1986).

Adversarial is the missing repeatability of the single observations, the potential animal manipulation and the health impact of the observer in the stable. The pigs were observed in two weight-ranges, from 40 to 50 kg and from 70 to 80 kg live weight. The pigs were all classic fattening breeds. The observation was divided into two parts. First it was scored where the animals are and what their body position was, e.g. lateral laying in the laying area. Based on these results, it could be concluded whether or not the functional areas were voluntarily accepted in the structured pens (Weber, 2003). In the second part, the behaviour shown (explorative behaviour, playing behaviour or stereotypic behaviour) was scored with 15 characteristics to get information about the relationship between housing environment and the opportunities to live out the behavioural attributes being typical for the species. Reverse stereotypic behaviour like blank chewing was a negative indicator for a housing system.

During the observation days, no disturbance like cleaning or penning of animals occured in the stables. In housing systems with straw, littering had to be done at least one hour before the observation started in order to have no expectations from the animals to the observer. During the direct-observation periods between 9 – 11 a.m. and 3 – 5 p.m. (main activity periods) the observer sat on a raised chair. After an adaptation period to the animals of at least 20 minutes before the first scan started, the watcher noted the scans in a time interval of six minutes per pen, always observing two pens in rotation. The six minute interval related to the average duration of the single behavioural parameter. The notification was done on a mobile and full ruggedized tablet PC with a pen on the touchscreen. An observation software (ETHOSCAN 04) had been programmed, which provides standardization of the data collection (Lehner, 1996). If there were stables with pen areas that cannot be observed directly (sleeping boxes, exercise areas), a specifically designed mobile video technique supported the observation contemporaneous. The technique consisted of four mobile cameras with wireless transmitters and a mobile receiver station with a digital video-recorder (clip maker) and a monitor which could be fixed to the observation chair. As a result, all pen areas could be observed at the same time. Because of the many observation dates, there had been several observers needed, and therefore it was necessary to have a good repeatability between the single persons. Therefore every season, an observer standardization with all persons being concerned was done on a farm (all watchers scan at the same time the same pen). The correlation coefficients between the single persons were between 80 and 90 %.

The integument scoring was done with a method following “Ekesbo”. Here, 20% of the pigs from four pens were randomly selected and scored. Two pens were scored during the weight-range 40 to 50 kg and two pens with 70 to 80 kg. Because of field conditions, the scoring list concentrated on the main aspects and was not so specific as in literature (Gloor, 1988). With this method, information was estimated about interaction between housing environment and animals (direct effects like sharp edged slatted floor) and the housing system influence on behaviour between animals (indirect effects). A pictorial criteria catalogue with the items dirt, dermis and hair, ears, body, tail, extremities and claws was made to standardize the observer.

Every three months (every season) the production environment of each stable was scored. Stable condition and pen soiling was recorded to investigate, if there is any relationship between season and, for example, pen soiling.

Finally, all fixed effects including pen measures, ventilation system, dung removal system, feeding system, activity stimulation, and management were regarded in a general farm recording. These data were estimated and compared to literature and governmental laws and ordinances.

In addition, temperature and humidity outside the stable and inside in the animal area (if there are two different climatic areas for the pigs, two measurements were made) were constantly recorded with data loggers. In the animal area, the data loggers were protected with wire baskets. During the two observation days, noxious gases (NH_3, CO_2, H_2S, CH_4,) were included in the measurements in the activity areas as well as in the sleeping boxes. Luminous intensity was measured at the brightest spot in the darkest pen, just as well as in the scan and "Ekesbo" pens at the height of the animals.

RESULTS

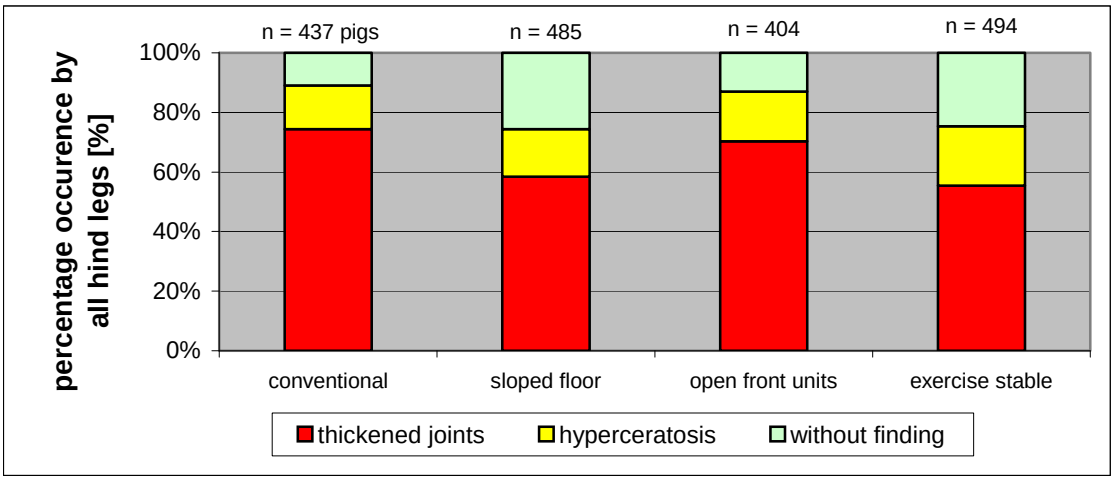
The results can be summarized as follows: The acceptance of the lying area in housing systems with separate climatic areas (open front stable 82.07%, outdoor exercise stable 62.64%) was twice as good as in systems with an uniform climate area (improved conventional system 31.39%, sloped floor system 43.94%).

A higher quantitative and qualitative exploration behaviour "rooting" was exercised in housing systems with straw litter, whereas a more frequent treatment of the pen equipment offered occupation technique in systems without straw was observed. Behavioural disorders were found to decrease from conventional systems (4.91%) to sloped floor systems (3.1%) to open front stable (2.34%) to outdoor exercise stable (2.26%), but on an altogether acceptable level.

Less pathophysiological changes with respect to injuries at the extremities, thus lamenesses, were detected in pens with straw litter compared to systems without straw, which underlines the absorbing protective function for the extremities of even small amounts of straw. Notwithstanding, these bodily changes existed across all housing systems on a high level (Figure 6).

A significant increase of the parameter "changes at the tail" is associated with a reduced net pen floor area per pig. All parameters to evaluate the animal friendliness of the housing systems were strongly influenced by the individual farm, thus the farm effect was partly higher than the effect of the housing system.

Figure 6. Integument scoring of the extremities behind.



In the course of the year the cleanness of the lying areas of nearly all stables was satisfactory. The highest risk for an utilisation reversion of the functional areas existed in the summer months for the outdoor exercise stable. The indoor climate measurements were at acceptable levels for the hydrothermical complex in nearly all stables. During the autumn months, especially in insulated stables, relatively high indoor air ammonia concentrations (> 20 ppm) occurred. The measurement of the illuminance revealed, that nearly no insulated stable met the legal requirement of 80 lux during 8 h (animal welfare productive livestock ordinance, 2006).

The calculated building costs per animal place (1.0 m²/pig each) amounted to 611€ for the improved conventional system, to 513€ for the sloped floor system, to 447€ for the open front stable and to 423€ for the outdoor exercise yard stable. For a conventional animal place according to animal welfare productive livestock ordinance (2006) with a required minimum floor space of 0.75m²/pig would calculate into building costs of 458€. The work requirement per animal place was higher in systems with straw litter (sloped floor system 1.42 APh, outdoor exercise system 1.76 APh) compared to systems without straw (conventional stable 0.98 APh, open front stable 0.81 APh). However, these differences were mainly caused by workings independent from the housing system.

The assessment of the animal friendliness of the housing systems is overriding for the overall consumers' judgement. They prefer stables with exercise yards relatively near to outdoor conditions. Slotted floor is not directly rejected when it is embedded in an integrated animal friendly concept. The donation of small amounts of straw with respect to the offer of occupation techniques were not recognised as to their ethological importance.

Further research has to be done particularly in a cause analysis since all systems result in the occurrence of thickened joints at the extremities of the pigs. Most likely a remedy can be found with floor materials which can be installed with operational reliability.

In view of the aim in this study, the outdoor exercise yard stable as well as the open front stable achieved the highest rank in the final overall evaluation with the digit of 1.9, closely followed by

the sloped floor stable with the rank digit of 2.5. For the improved conventional stable a rank digit of 3.7 was determined. In the whole study, the individual farm effect on the potential of the respective system became obvious.

In summary, all investigated stables in this field study with good construction work, pen design and corresponding animal care and marketing management were acceptable concerning animal friendliness, operational reliability and economics. Depending on the definition of requirements it has to decided individually which pig housing system is the most suitable for a single farm.

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