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# Aspects in the design of outruns for horse keeping systems

*Nowadays horse keeping has achieved great importance within livestock systems with horse population in Germany expanding from some 350 000 to around 900 000 in the last decade. The majority of these animals are leisure horses kept in individual boxes without continuous outdoor access. It is, however, necessary that such animals should always have the possibility of movement and this means certain requirements in designing stable outruns suitable for both animals and the environment.*

Along with the rise in horse numbers in Germany, the farms keeping the animals have also increased substantially (~ 15 000). With this has also risen the importance of welfare-oriented horse keeping systems featuring sufficient room for movement. Horse housing characterised by little freedom of movement, poor air supply and missing social contact leads to increases in movement, airway and digestion organ problems resulting in chronic disease situations and associated lower life expectation. Even by the fifth year a substantial increase in disease frequency can be established where housing conditions are unsuitable [1]. In Germany animal protection law – especially §2 (species-oriented livestock keeping) – determines the ground rules for keeping of animals. These basic requirements for horse keeping were complemented in 1995 [2] through the „Guidelines for assessing the keeping of horses from the animal protection aspect“ wherein special value is given to ensuring sufficient movement room. Often such demands cannot be harmonised with the requirements from authorities for avoiding contamination of groundwater and soil.

## Requirements

The above problems make it clear that individual housing in boxes is not an ideal system for horses. In a welfare-oriented system, the species-specific requirements of a horse have to be considered, such as continuous non-hectic movement in fresh air, living in social groups, contact to its environment

with feed which is suited to its digestion physiology. Such factors must interact in the special design of individual keeping systems with the outrun or paddock being designed to offer welfare-oriented sure footing whilst at the same time avoiding the danger of contamination arising from seepage water.

## Investigations into group paddock systems with Haflingers

A trial [3] at the Institute for Agricultural Building Research looked at the influence of feeding frequency on the movement activities of horses with fenced outruns. The trial featured a feeding belt with time-controlled belt curtain for limiting the feeding periods. Additionally, a frost-protected drinker was situated outdoors. The feed was offered to the Haflingers at different frequencies and with different access possibilities between lying and feeding areas. It was found that the average individual distances covered daily in the systems including outruns varied between 2.7 and 4.9 km per horse. Thus, it is basically possible to induce movement in a positive way through practical design of the housing system and application of impulse givers.

## Preliminary trial on using outruns under differing climate factors

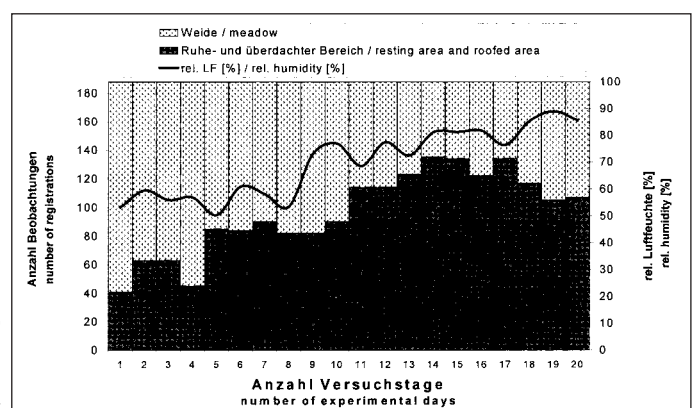
A choice trial with four Haflingers investigated the conditions under which animals chose to remain outdoors. Housing comprised an open-fronted bedded barn with a

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## Keywords

Horse keeping, design of paddocks, environmental protection, animal adapted systems, contamination of water under the paddocks

*Fig. 1: Use of the different areas of the husbandry-systems over 20 experimental days in comparison to the rel. humidity*



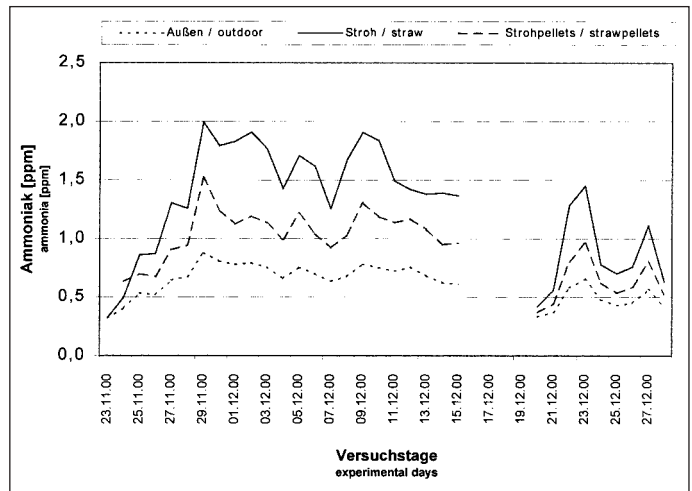
roofed, surfaced outrun and a non-roofed outrun with untreated surface. The outdoor selections of the respective horses were recorded by video and then processed. Investigated were the times and periods when horses sought the roofed outrun in association with outdoor temperature and relative humidity. A preliminary evaluation over a 20 day trial period (fig. 1) showed that the times spent in the resting area rose substantially in-line with increasing relative humidity ( $r = 0.87$ ;  $p \leq 0.05$ ). Additionally, the roofed or lying areas were tendentially visited more often in-line with a rise in temperatures or during sunny periods. These first results must however be further checked by additional multifactorial analyses and additional trial series.

### Alternative litter and air quality in the lying area

Conventional bedding systems with long straw mean high labour requirement. A further disadvantage is the large storage area required for straw and dung with respective capital investment involved. At the same time, high amounts of dust and bacteria contamination are often to be found with such a system along with, in many cases, a higher emission of polluting gas concentrations, especially ammonia. Stable areas polluted with dust, bacteria and damaging gases leads to diseases of the breathing organs. The advantage of the standard system with straw bedding lies in the material's reasonable purchase price and good availability. It can be expected that the use of alternative bedding materials such as hemp and flax waste as well as straw pellets is less labour intensive and gives a better stable climate.

In a trial series to test this, bedding materials, polluting gas concentrations, labour requirements and quantitative behavioural criteria were recorded. With regard to ammonia concentrations it was established that with the bedding variants straw and straw pellets in comparison to outdoor concentration in the area of the outrun that straw produced a higher value than straw pellets; concentration in the outrun was, however, still lower (fig. 2). All  $\text{NH}_3$  concentrations lay in a relatively low range. Thus, maximum concentration with straw was 1.99 ppm and so 0.47 ppm over the maximum value for the straw pellets. On average, the ppm values of straw pellets lay at 0.34 ppm under that of straw. Concentrations in the outdoor area were lower again. The determined differences differentiated significantly ( $p \leq 0.05$ ). With the hemp waste bedding, the  $\text{NH}_3$  concentration was even a little lower than the straw pellets. With regard to using outruns it could be established that through the selection of the ap-

Fig. 2: Proceed of the ammonia-concentration in average of a day in dependence of the littering materials straw and strawpellets in the lying area in comparison to the outdoor concentration in the paddock in a range of four weeks



propriate bedding material (straw pellets, hemp waste) the air quality in the stable could be improved and that this did not lead to the horses being forced into the outrun through the presence of „poorer“ air in the building. In the main, the need for movement is the reason for selection of the outrun.

### Investigation possibilities with the new trial building

So that animal-friendly and environmentally suitable horse keeping systems with outrun can be assessed systematically and in detail and then further developed from the building design aspect, a new trial building was erected on the FAL experimental station. This conception enables direct comparison of individual and group-housing systems in combination with outruns for, in each case, six large horses. Thus the effects of the keeping systems or of the building design on animal and environment could be investigated at the same time. Central to the first investigations was the interaction between the requirements of animal welfare and environment protection. Required for the animals is a daily outrun possibility over several hours year-round. Here there is the possibility this could lead to water and soil contamination outdoors. This possibility has led the environment protection authorities to deduce often that there is thus a danger to the ground water. Especially for horse farms, this assumption can have consequences when extensions or new buildings subject to planning permission applications are planned. The building permission regulation requirements can then turn out to be very complicated involving, for instance, surfacing of the whole outrun area with watertight concrete linked to the collection of surface water in a waste water container. These types of requirements are mainly taken from the guidelines for the building of dung middens and silage clamps. Such regulations increase the cost of horse

keeping to such an extent that they often detract from investment in welfare-oriented stabling.

The aim of the trials in the new experimental plant is to determine the polluting effect on ground water and soil through damaging substances, especially nitrate, in relation to types of ground surface and their differentiation, ground type, stabling system, stocking intensity and weather.

The outrun under-area was divided into six similarly sized collection basins. This allowed the separate collection of all rainwater and its pollutants with the liquid being channelled into separate containers for intermediate storage. Thus the seepage water can be measured and analysed with the ground being sampled at the same time. The water and ground analyses were carried out together with the Institute for Agricultural Ecology (FAL). Currently the outrun surface is of sand. This material was selected for the first investigations because it is relatively animal-friendly (sure-footing, shock-absorbing effect and water permeability) and also cost-effective. On the other hand its greatest danger is the throughflow of seepage water leading to contamination. Surface materials to be chosen in future will depend on the first results available.

### Literature

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