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# THE ATTAINMENT OF HUMANE HOUSING FOR FARM LIVESTOCK

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In discussing animal welfare it is very easy for the discussion to become bogged down by misunderstandings. Commonly the first misunderstanding arises over the definition of animal welfare. In the content of this article we will take it for granted that any definition includes the physical well-being of the animal as well as ensuring that the animal can fulfill much of its genetically controlled behavioral repertoire. The second misunderstanding arises when the political and scientific assessments of the subject are meshed together. In a scientific assessment, the aim should be to examine welfare problems strictly from what we know about the physiology and behavior of the species under consideration. In relation to the humane housing of farm animals, it should aim at informing the public of the pros and cons of different housing systems with respect to the animals' physiology and behavior. From this knowledge the politicians and their electorate can choose which level of welfare they can adopt while protecting their farmers, for example, from cheap imports from countries where the standards of animal welfare are lower. In this article we shall discuss from the ethological viewpoint how the various ways by which housing systems for farm animals can be assessed with respect to the animals' welfare, and how an ethologically suitable system can be attained.

Many people would advocate the use of production records as a means of assessing the standard of welfare of animals in a particular housing system. The general argument is that only contented animals could perform as well as those found in the average modern intensive system. However, closer consideration shows that production records are inadequate for the assessment of welfare. For example, it is possible for animals that are lame or otherwise injured from their housing to give an adequately profitable return. Furthermore, if production records are to be used legally as a guideline, there is the difficulty of choosing the correct standard. For example, is it to be milk production or milk quality? In addition, it is likely that today's standard may be at variance with the standard required of a certain class of livestock in ten years time. Finally, there is the fact that many animals do not achieve their full potential, for in many enterprises we cater for the average animal.

In order to improve housing systems, it has been advocated that the animal should be allowed to choose its own environment. A number of research workers have investigated this approach. Baldwin and his colleagues (Baldwin and Meese 1977; Baldwin 1974) have carried out experiments in which a pig is allowed to choose its own degree of illumination or to select its own environmental temperature. While such experiments yield some very interesting results, they have certain short-comings. An animal alone in an experiment may behave rather differently from one in a social group. Furthermore, environments have many facets and the desired mixture of these by an animal may differ from the picture obtained by allowing it to choose one at a time rather than in a total combination. In addition, animals may choose a particular environment because it resembles what they are used to (Dawkins 1977; Hughes and Black 1973). Strict interpretation is also difficult. Does the observation that animals choose one environment, or part of it, for a small part of their time, indicate a preference for the other environment or a real need of short duration for the former? Conversely, the choice of one environment over another by the animal may not indicate that the preferred environment is the optimal one. Dr. Marion Dawkins (personal communication), for example, has recently produced data which she interprets as indicating that the hen may not perceive herself as suffering in the battery cage. However, should stronger evidence support this, it does not mean that the battery cage is the best environment for the hen. Several equally objective studies have shown that the hen does find it unsatisfactory in certain respects (Wood-Gush 1972; Vestergaard 1978). Furthermore, when an animal alters the degree of illumination in its environment, is it doing so because it really wants to change the degree of light or because in a dull environment it wants some sort of change? In the wild, animals show a great deal of exploratory behavior for it is advantageous for them to know about their environments and of any changes in them. It is highly likely that this type of behavior is still present in our farm livestock species as studies have shown that they retain many of the behavior patterns of their ancestors (Desforges and Wood-Gush 1975). This tendency to explore the environment and to remain alert to changes in it suggests that the torpidity seen in many animals is likely to be a learnt response to a boring environment, rather than an indication of their true innate behavior.

The assessment of stress by physiological methods is potentially a very useful guide, and a number of endocrine studies have been carried out (Arnone and Dantzer 1980; Barnett et al. 1981), but there are a number of technical snags and more studies are needed on animals under conditions of chronic, as opposed to acute, stress.

When under frustration or when thwarted, animals show particular types of behavioral responses and the use of some of these behavior patterns for the assessment of well-being is promising. However, at present, their use is limited for we have no idea of their levels of occurrence under apparently optimal conditions. Nor have they been systemically studied in all species of farm livestock with the result that we cannot be certain of them in those species.

In some cases the relationship between overt behavior and concurrent physiological measurements are sometimes at variance with expectation. Baldwin and Stephens (1975), for example, reported that in pigs, emotional behavior such as vocalization did not correlate well with the discharge of adrenocortical hormones. In the case of the domestic fowl, a similar finding was made by Duncan and Filshie (1980) using heart rate as the physiological measurement. However, the performance of stereotypies does seem to be useful indicator of an unsuitable environment. These are short sequences of behavior or a single behavior pattern that are repeated over without any apparent objective. In the tethered sow, bar-biting and head-weaving are two examples of this. Experimentally they can be produced by severe frustration in which the animal is presented with an insoluble problem (Duncan and Wood-Gush 1972), but they are also extremely common in animals living in dull environments. Sometimes the behavior can be abolished by the addition of features to the environment. Fraser (1975), for example, found that the provision of a little straw to tethered sows reduced the incidence of stereotypies significantly. More recently, the occurrence of stereotypies in tethered sows has been correlated with release of endorphins (Wiepkema et al. 1984). While the performance of stereotypies may help the animal to cope with a dull, bare environment, the evidence certainly seems to point to the fact that this type of behavior is a good indicator of an unsatisfactory environment. Dull environments can have other effects on the behavior of the animals. Stolba and Wood-Gush (1980, 1981) found that fattening pigs from bare environments react significantly more strongly to a novel stimulus than those from "richer" environments. On the other hand, the barer environments may lead to the piglets being less reactive to environmental changes, such as temperature changes (Wood-Gush and Beilharz 1982). Thus, the absence of stereotypies and mere inactivity cannot be taken to mean that all is well with the pigs' environment.

Another approach is to list the animal's physiological requirements and its behavioral "drives" or motivational systems and to test the present or hypothetical environment against the list by asking whether the environment permits the behavior or not. This approach, however, has many snags on the behavioral side. Quite frankly, we do not know enough about the behavior of our domestic animals and how the various motivational systems are controlled. For example, do animals have behavioral needs or can one, by supplying the animal with the goal, obviate the animal's desire to perform the behavior that usually leads to that goal, or is the performance of the behavior in some cases more, or as important as the goal itself? No categorical answers can be given to these questions at present, although it does seem likely that the provision of a goal will not suppress the behavior. It is known, for example, that if a dog, which eats X grams a day, is given X grams of food directly into the stomach, the dog continues to show signs of hunger. The intragastric meal has to be much larger than a normal meal in order to satisfy the dog. Finally, there is the question of whether certain motivational systems can be considered to be expendable.

Until we know a great deal more about motivation and the behavior of farm livestock, the most valuable approach seems to be to study the behavior of the species under consideration under a variety of environments, including ones that are enriched by a diversity of ecological features and by a social mixture of animals of different ages and both sexes. The study of behavior under such conditions will allow one to see a fuller, if not the full, repertoire of behavior of the animals and furthermore, it will give insight into the motivation and control of behavior. It is important to realize that animal behavior is controlled not only by internal physiological factors but that it is also guided and often elicited by external key stimuli. Investigations have shown that often these are of surprising simplicity. While to us, an animal may appear to be reacting to an entire object or set of objects, it is in fact responding to only some elements of the configuration in a certain context rather as we do when we recognize a politician from a few strokes in a caricature. While the detailed observations on the behavior of animals in an enriched environment will not by themselves allow one to know which part of the object is the actual key stimulus, it will allow one to see which objects are important, and it will usually allow the animals to complete chains of behavior that are seen as enigmatic behavior patterns in intensive conditions. Furthermore, from such studies, once the repertoire of behavior is known together with the important environmental features, then it is possible to make a reasonable assessment of different housing systems (Wood-Gush 1973).

Observations have been carried out on pigs in a semi-natural enclosure at the Edinburgh School of Agriculture over a six-year period. The enclosure, which is about 1.2 hectares, contains woodland, a marsh, a stream, bushes, and grassland. The study population consisted of several groups containing four to five sows, their current litters, an adult boar, a young gilt and a sub-adult boar. This structure and size of population is a compromise between repeating the population structure of the European Wild Boar, in which basically a few females and their current offspring live together while the boars seem to live independently, and the moving of a boar to and from the study enclosure with its attendant management problems. Other populations including mono-caste populations in conventional fattening pens, were studied in environments in some of which the environmental complexity was systematically reduced. In all, thirteen groups were studied in outdoor enclosures, twelve groups in paddocks and yards, and ten groups in conventional fattening pens (Stolba 1982b).

From this process of systematically reducing the environmental complexity, it became apparent that the pigs' behavior is guided by a number of specific features. These were found to be consistently present when certain behavior patterns were performed. For example, in the farrowing sow, nesting material is collected and deposited at the base of vertical structures such a tree or upright brush. In the adults, defecation was found to be statistically more frequent on wide paths where these ran between bushes, rather than anywhere else. Studies on the social behavior revealed that under these conditions of stability in which only the young were removed at bacon weight, close relationships were found between the adults (Stolba 1982b) as well as between the juveniles before weaning (Hutton et al. 1981). The intensity of these relationships is shown by an example cited by Stolba (1982b) in which two new sub-adults were introduced. For over a month they were not permitted to sleep in the communal nest. In another case involving sows, even after 190 days in the enclosure the strong initial social bonds were still evident, for the two sub-groups involved slept significantly more with members of the their own sub-group than with members of the other. In general there are very strong dam-daughter bonds while the boar remains relatively independent. The juveniles tend to form sub-groups at a few weeks of age and later consort a great deal with the sub-adult animals.

Summarizing the results from the studies on the populations in the different environments, Stolba (1982b) concluded that several features, some of which were only in the semi-natural enclosure, were important in guiding the pigs' behavior and that these could be reproduced in the design of a housing environment of enriched pens. They include the following:

A roofed and an open part of the pen to recreate a forest-border habitat where much of the behavior of the pigs in the semi-natural enclosure occurs.

The main feeding area placed away from the resting area.

A sheltered nest site with an open view out of the pen facing the front.

The preferred farrowing nest position against two bushes, recreated by pen walls and farrowing walls.

Space for a nest of 2-3 m in diameter as found outside.

A site for defecating in the morning 4.5-11 m away from the nest site.

A corridor for defecating during the day resembling the paths between bushes.

Peat or bark in a rooting area with a log for the pigs to lever.

A rack for gathering straw sheaves and a post for rubbing against and for marking behavior.

Head partitions between small feeding stalls to ensure sufficient individual space while feeding and to also decrease aggression.

Removable partition walls that allow pigs to hide and thus lower social tensions.

From the studies of social behavior it was concluded that the basic social unit should be small and stable and that the juveniles should remain in the group until the point of sale. Indeed, as will be seen, the system eradicates the practice of the mixing of strange pigs and also does away with the specialist types of housing found in modern piggeries. This basic unit designed by Stolba is reproduced in the *Family Pen System* and consists of four sows, a sub-adult male and a gilt (in case a replacement is needed). Each sow can have her own pen, but the four are linked by a permanently open corridor which is the main defecation site, resembling the paths used for defecation in the semi-natural enclosure. Two of the pens are shown in figure 1. Each pen consists of a peat-bedded rooting area, a straw-covered activity area which contains the feeding stalls, the marking post, the drinking site, and the straw sheaves in a rack. At the back is a straw-bedded nesting area which can be closed off and in which farrowing rails can be placed together with a lamp to form a creep area for very young piglets. Each pen can be closed off with its three components from others but the object is to allow freedom of movement from one pen to another. In the semi-natural enclosure, synchrony of estrus and conception during lactation is a common feature and this has been also found in this new Family Pen system. The boar is introduced on day 20 after farrowing and stays until the lactating sows have been mated and is then moved to another group of four pens if needed. The detailed management has been described elsewhere (Stolba 1982a, 1982b), as has the construction (Stolba 1982a).

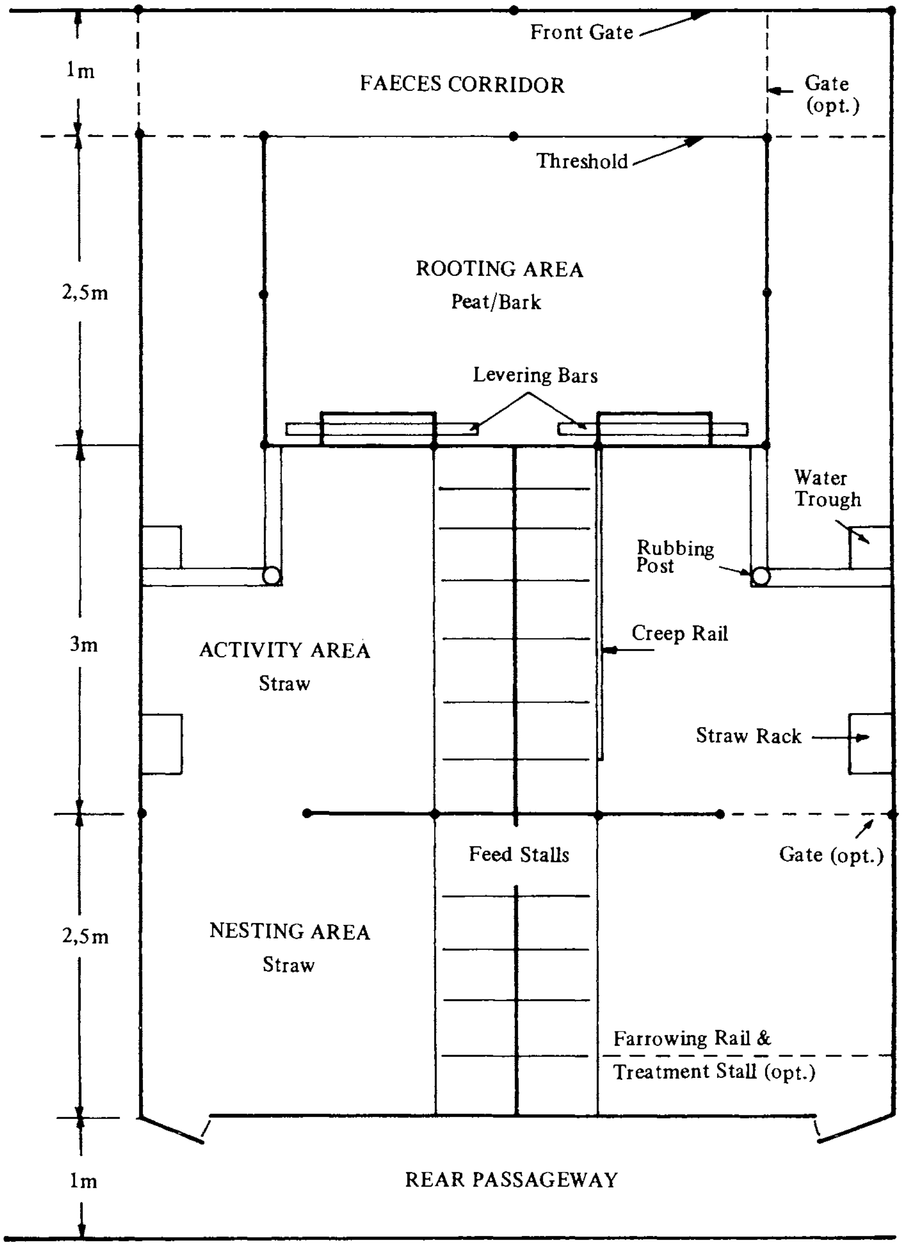


**Figure 1.** A plan view of two adjacent pens in a unit of four interleading pens in the family pen system. The other two pens are to the left and are linked by the feces corridor.

Many of the features used in the system have been used before but the combination allows a reasonably full expression of the pigs' behavior compared with the pig park and the production records have been comparable with those of the rest of the pig unit. It is with optimism that we enter the next stage of the experiment in which we will be paying more attention to production, as opposed to ethological measurements in order to bring the system to a level where it can be a commercial option, given a political commitment to animal welfare by society which would enable the change from very intensive systems.

The example from the pig study shows the possibility of how a housing system can be be built around the animals' requirements and yet still allow a fairly intensive housing system which also provides the operator with an agreeable working environment. With other species of farm livestock the solutions may be different but the approach should be the same: to study their behavior in habitats resembling that of the putative ancestor, to consider the role of environmental features in guiding their behavior, and to study their social structure under these conditions. While flexibility in social organization or structure is fairly common in wild species it does not always lead to a structure that is fully advantageous (Lott 1984) and therefore all variations should be critically examined from the ethological points of view so that the optimum can be selected.

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