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# Ethologic and Economic Examination of Aviary Housing for Commercial Laying Flocks

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## *Introduction*

In 1972, studies about different housing systems for poultry were carried out. The housing systems are: free range, deep litter, sloped wire and cages. These studies have increased our knowledge about behavior, health, diseases and egg production (Brunner and Fölsch, 1977; Fölsch, *et al.*, 1977; Huber and Fölsch, 1978; Fölsch and Stahel, 1979; Fölsch, 1980; Fölsch and Vestergaard, 1981).

The result of our work shows that appropriate housing is necessary for intensively kept hens and that the housing has to correspond to the vital needs and the nature of the animals.

This is important for two reasons: a) the innate needs of the birds must be satisfied; b) for the proper development of the animal and successful egg production.

The housing facilities should allow the following functional cycles without restrictions:

*Social organization:* the structuring of a group or unit of animals.

*Locomotion:* walking, running, fluttering, flying.

*Feeding behavior:* search for food and water, food and water pecking, ground scratching, scraping.

*Comfort behavior:* plumage care, stretching, dust bathing.

*Resting behavior:* standing, sleeping.

*Sexual behavior:* egg laying, nest building behavior.

Each one of these functional cycles requires its own area in the hen house. The hen house has to be arranged in order to accommodate the needs of the animals.

The management of the hen house should be easy and efficient. A clearly arranged house is an agreeable place to work.

The technical components in aviary housing are: feedtroughs, waternipples, dropping pits, perches, nests, and deep litter areas.

In the Cantonal Agricultural School of Zürich (Strickhof), we built a small experimental aviary hen coop for fifty animals in 1978/79.

In 1979 it was also possible to change an old hen house with deep litter into an aviary system. This system belongs to the experimental farm "Weiningen" of an animal food factory (Klingentalmühle AG). Like the rest of this enterprise, the aviary is run according to economic principles.

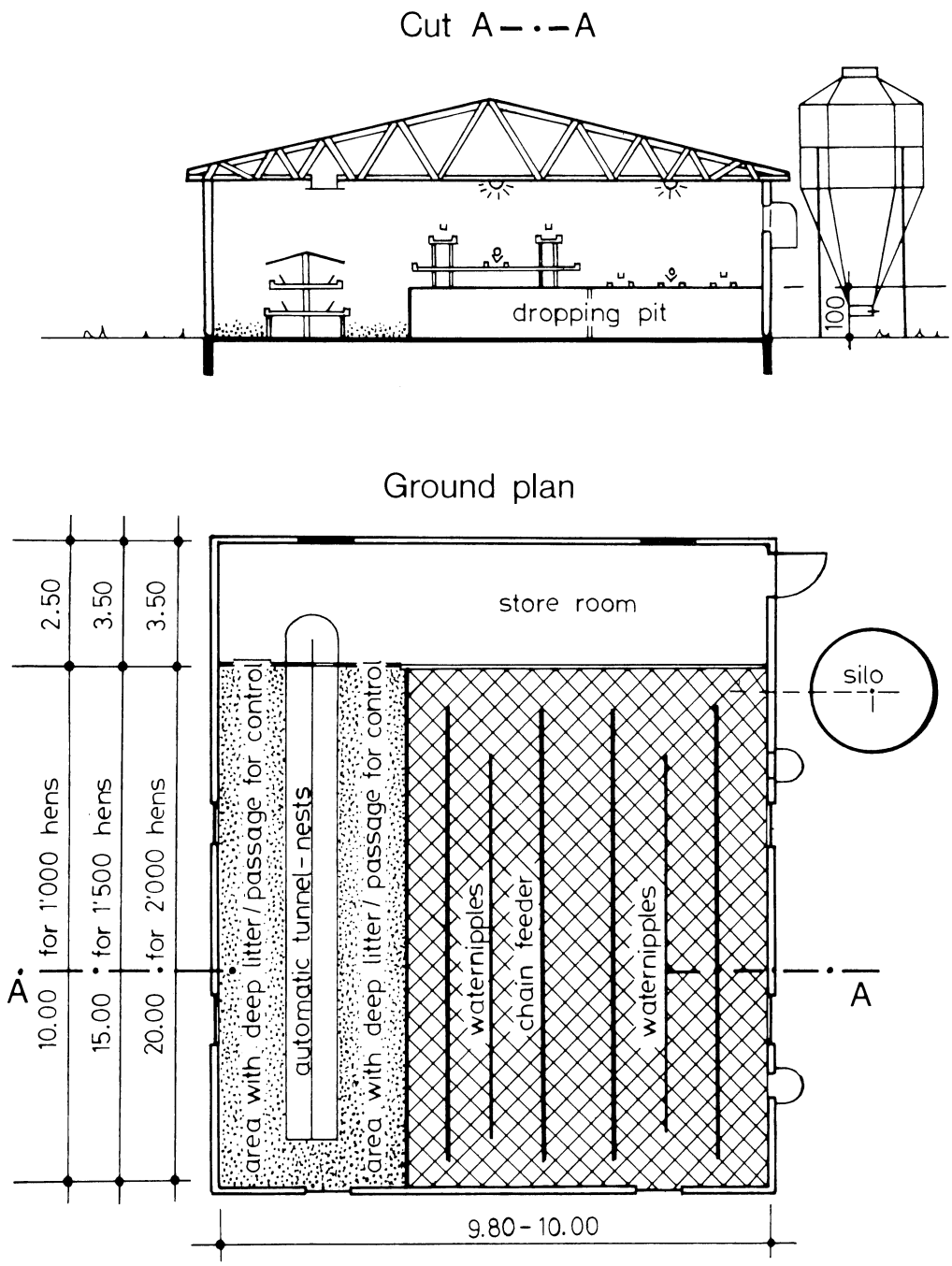


**FIGURE 1** Plan of Swiss Aviary System (see also Fig. 3)

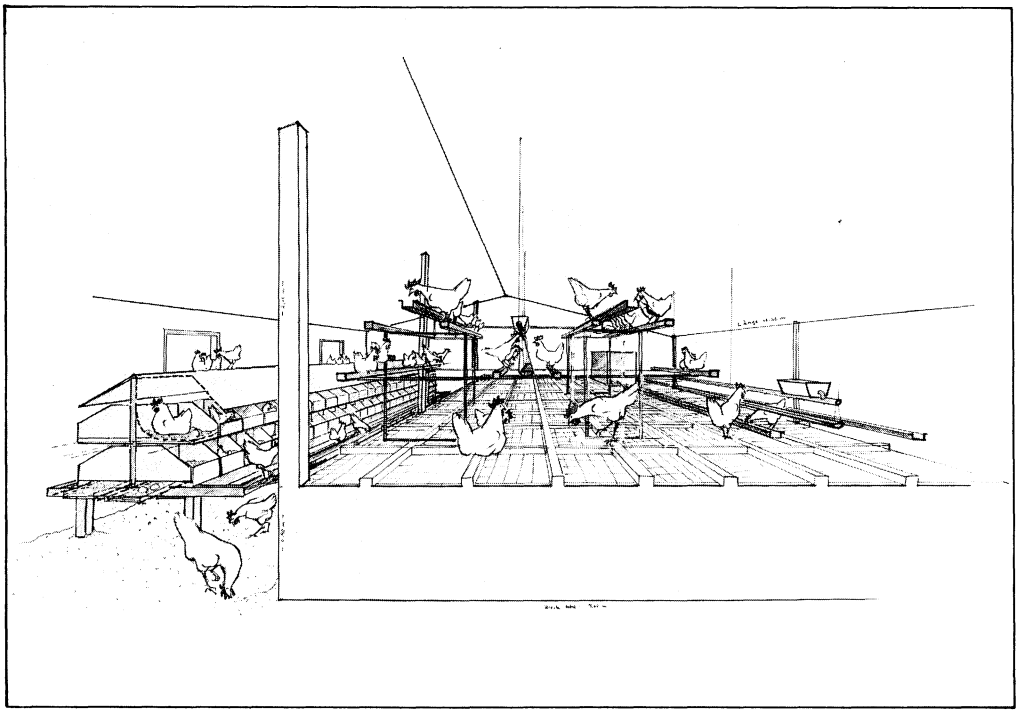

**FIGURE 2** Plan of Swiss Aviary System for Breeders/Parent Stock

Since December, 1979, this house has been occupied by a thousand hens. (Hisex white, ten hens per $m^2$ or three hens per $m^3$.) By the end of 1981, another aviary house was completed on the same farm and stocked with 2,000 animals to serve as breeders.

According to our concept (Fölsch, 1982), the ethological question is: Can a proper aviary system be achieved by dividing the room into different horizontal levels and by installing mobile elements such as feeders and conveyor belts in the nests?

## Specific Questions and Procedure of the Experiment

1) Does a single animal move around in the whole hen house or only in one part of it?

2) What are the animals doing during the daytime phase using natural and artificial light, what is their position, and, how many are active?

## Method

To analyze the first question, fifty animals were marked with red and white number tags. The sections of the hen house were designated with big letters. The observers then noted which tagged animals were in which field, what position they occupied, and what activities they were engaged in. To address the second question, the observations were done within a limited part of the house which represented a cross section. The observers, following a fixed timetable, watched the marked positions (feeders, perches, etc.) in the cross section and counted the number of animals and recorded their activities. One observer watched the floor and the nest area. A second observer stood on the dropping pit.

The observations were recorded on forms which were prepared beforehand. Dependent upon the number of positions in the nest area, floor area, or dropping

pit, it was possible to observe the same position twice or three times per house (multi-moment technique of observation).

It was necessary to observe the nests more closely during the egg laying period, as well as the floor area during dust bathing time, and the food places during feeding time.

Moreover, control was exercised over all the places where the eggs were laid. The eggs were collected by hand and the number of eggs in the nests, the floor, and on the dropping pit were counted.

Further information was obtained regarding the physiological conditions of the animals: were any changes of the feet, cloaca, and plumage evident upon examination?

Analysis of this information yielded results concerning the behavior of a flock in a certain hen house. According to this study, each aviary hen house was unique in its complexity. Since most aviary hen houses will be conversions, a great variety in the interior design is expected in aviary housing.

In spring 1980, the first observations of the small experimental flock, as well as the commercial laying flock, were made. Our method has been useful so far.

## Results

1) The observation of the marked animals showed that they made use of the whole room according to their needs. All the marked animals moved around during the observation period (eight-hour period). The entire length of the house, the perches on the different levels, and the nests were frequented. The hens spread out equally over the whole hen house. So far, the arrangement seems to be correct according to the hens' needs. Few negative social interactions occurred. Cannibalism and hysteria did not occur.

2) The method shows whether or not the design of the hen house is useful and corresponding to the behavioral needs of the animals. Such design includes: the deep litter area, the kind and number of nests, arrangement of the different perches, structure of the dropping pit, the working frequency of the conveyor belts, and the illumination of the hen house.

After a laying period of 14 months, the animals seemed to be in good health. The external appearance was judged to be good and the number of sick or dead animals was low (Table 1).

Egg production and food consumption of commercially run aviary flocks

**TABLE 1 Production During 14 Months (Summary)**

| | Deep Litter (Zollikofen, 1980) | Cages (Zollikofen, 1980) | Aviary (Weiningen, 1980) |
|---|---|---|---|
| Duration of production since the 20th week, in days | 425.0 | 425.0 | 425.0 |
| Egg production per average hen according to feeding days, in % | 74.4 | 76.3 | 76.7 |
| Mortality, in % | 15.9 | 8.5 | 8.8 |
| Egg production per "starting hen," in % | 68.5 | 73.1 | 73.9 |
| Food consumption per egg, in grams | 166.9 | 150.1 | 154.9 |
| Food consumption per animal and day, in grams | 124.2 | 114.5 | 118.8 |

can compete with the results of deep litter systems and cages. Those results are published by the Swiss Central Poultry Breeding School at Zollikofen, Berne.

After the first cycle of 14 months, a second cycle with Hisex white was started. The experiment was terminated after 6 months duration as the results closely resembled those from the preceding trial. A third cycle with Hisex brown was started on December 16, 1981.

Certain conditions were improved upon in an effort to upgrade the hen house.

For example, after the first cycle, windows were installed to allow for more daylight. Small curtains were placed in front of the nests in order to provide the hens with a dark, quiet area for laying. This addition was also found to help reduce the number of dirty or broken eggs.

A heat exchanger should be installed to improve the climate in the hen house.

The investigators also wanted to judge the economic situation, the manageability of an aviary housing system:

*Work situation*

- Animals kept in aviary housing are easy to survey.
- The keeper can walk through it and catch sick animals without difficulties.
- It is possible to mechanize daily duties like feeding, watering, and egg collection. Droppings can also be removed of mechanically.

*Economic situation*

According to our experience and to newer estimates (1982), one has to reckon about thirty dollars of construction costs per bird for a newly built aviary house. This price can be reduced by 15 to 20% if the caretaker or farmer does part of the construction himself. All these statements are valid for Switzerland only. The construction of a hen house with cages costs the same amount, whereas 20% of the implemental funds can be used to finance the buildings. The installation of an aviary will become even cheaper, if a building is already in existence. Furthermore, the price can be lowered by 50% depending

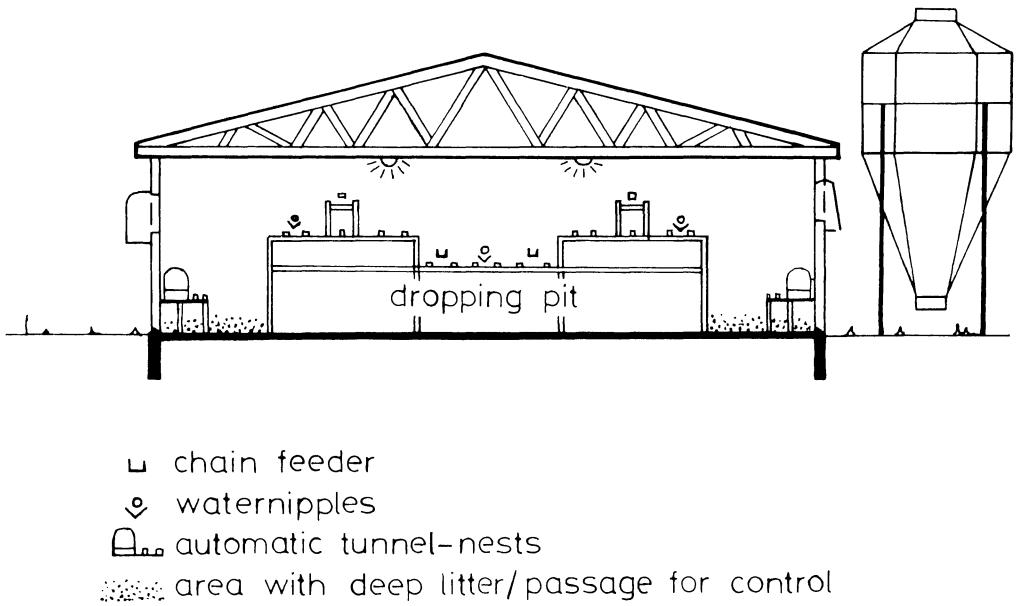


**FIGURE 3** Swiss Aviary System with Layers

on how much work the caretaker is willing to do himself.

The input of work per animal and egg depends on the extent of mechanization. This input is lower than in the conventional deep litter system, but higher than in conventional houses with cages.

The food consumption of the hens per egg is slightly higher than in cages.

## Summary

Intensively kept hens must have appropriate housing facilities. This conclusion is the result of studies which were done utilizing different housing systems and different numbers of animals per unit of area.

In 1979, the construction of aviary houses was started. The characteristic components of the aviary housing system are: deep litter area for scraping, nests, perches on different levels with access to the feeders and waterers, the influence of daylight and the outdoor climate.

The method of observation, reporting and interpretation was developed. All the hens utilized the depth and length of the hen house, the perches, the nests, and the deep litter areas. The state of health and production were considered to be good.

## Acknowledgment

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* – *with English summaries.*