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TECHNOLOGICAL RECOMMENDATIONS IN RABBIT PRODUCTION: SOME FACTORS OF HOUSING CONDITIONS

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ABSTRACT
In the last ten years a number of research were done and articles were published in order to improve or change the housing conditions of rabbits. These studies focus on the customer needs and changes in expectations based usually on animal welfare. During farm visits we found that the housing circumstances among those factors which are emphasized individually or jointly appeared in the everyday life of rabbit farming (for example: optimal micro-climate, cage floor space, type of floor, keeping mode, environmental enrichment, etc.). In our work we tried to determine the advantages and disadvantages of each procedure. In many cases it is difficult to create perfect coherence with the ideas of animal rights, animal needs and economic interests of the farmers. The number of results and ideas for implementation of all the correct procedures is so great that it is certainly impossible to keep them a time and place in a single technology. Of course, if the changes are generated by the consumer demands, then the farmer has to adapt to expectations in order to keep the market (and sometimes ignoring some other aspects).

KEYWORDS: rabbit, housing facilities, animal welfare, environmental enrichment

INTRODUCTION

In the last ten years a number of research were done and articles were published in order to improve or change the housing conditions of rabbits. These studies focus on the ethology of the rabbit, the European legislation, the customer needs and the changes in expectations based usually on animal welfare. The aim of the study was the summarization of some practical experiences and research result on housing facilities.

MATERIAL AND METHOD

During our study several farms of various sizes, visits of trade exhibitions and conversations with producers happened to our experience we compared the results of scientific literature. We were looking for a less favourable side benefit of certain technical and technological solutions. The pros and cons of the recommended methods in animals and/or the farmers' point of view we tried to present.

RESULTS

The housing conditions are very diverse in the Hungarian rabbit farming. The facilities are depends on the size of the farm, the capital supply, the traditions, the purpose and intensity of production, the legal regulation and on the applied technology. There is a coexistence of wooden or wire-mesh cages and pen housing; traditional feeding with hay, cereals and by-products with bottle drinkers and automated feeder and drinker systems; old barns and almost air-conditioned buildings.

Thus, the following general requirements for the housing of rabbits can be summarized as follows:

- no pain, no avoidable suffering and no injuries caused by housing;
- protection against predators and parasites;
- provision of feed and water according to the needs of rabbits (mostly *ad libitum*);
- protection against adverse climatic conditions;
- good hygiene in the rabbit house;
- a good handling of animals;
- from time to time use of "all in – all out" with cleaning and disinfection;
- environmentally enriched housing system (HOY, 2008)

The rabbits shall have permanent access to water of good quality. There has to be in minimum one nipple waterer per cage or pen in single housing. More than one nipple waterer should be used in groups of more than ten rabbits. The width of the feeding place has to be 6 to 8 cm, depending on the size of the rabbits, up to a live weight of 4 kg. For bucks the width of the feeding place should be 10 cm. If the rabbits are fed *ad libitum* the width of the feeding place can be reduced to half of the width.

Older technologies are often cheaper, but need more labour, while the new/modern systems are expensive and sometimes do not mean less labour (see welfare).

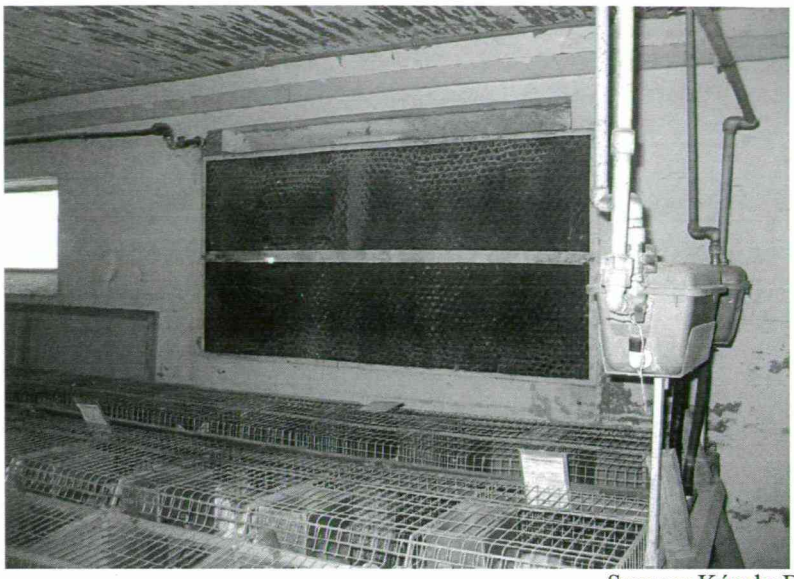
Microclimate

Temperature is one of the most important factors as it directly affects a number of elements. The optimal environmental temperature is 10-20 °C for production. Rabbits have a constant body (rectal: 38.5-39.0 °C) temperature so heat production and losses must vary to maintain body temperature. They do this by modifying their feed intake level. They use three methods to control heat loss: general body position, breathing rate and peripheral temperature, especially by ear temperature.

If the ambient temperature is low (below 10 °C) the animals curl up to minimize the total area losing heat and lower their ear temperature. If the temperature is high (above 25 °C to 30 °C), the animals stretch out so they can lose as much heat as possible by radiation and convection, and step up their ear temperature. The ears function like a car radiator. The efficiency of the cooling system depends on the air speed and humidity around the animal.

Due to the climate change the summers in Hungary often extreme hot, and the number of days over 30 °C are increasing. At environmental temperatures of 32 °C and higher heat stress occurs, leading to production losses. When temperatures of 35 °C and higher persist, the greatest losses from heat stress may result (EL-RAFFA, 2004). So the farmers should adapt technics against permanent heat stress. Appropriate advices could be given to avoid the heat stress on rabbits during the summer season. Some recommendations could be summarized as follows:

- Selecting a strain of rabbits that has shown the greatest degree of heat tolerance should be considered.
- Cool the drinking water.
- Using cooling panel to decrease room temperature (*Figure 1*).
- Adding vitamin C in drinking water.
- It is recommended to feed the rabbits during the coolest periods of the day, i.e. at early morning, late in the evening or by night which characterized with lower temperature and lower humidity in summer months.



Source: Károly Bodnár

Figure 1. Cooling panel in the wall

Rabbits are sensitive to very low **relative humidity** (below 55%) but not to very high humidity. This may be explained by the fact that wild rabbits spend much of their lives in underground burrows with a humidity level near saturation point (100 percent).
The rabbit has more to fear from sudden changes in humidity. Constant humidity is therefore the best solution, and this will depend on the housing design. Most of the breeders find 60-65% humidity levels successful, using only auxiliary heating in winter.
When the temperature is too high (close to the rabbit's body temperature) and humidity is also high, not much latent heat can be exported as water vapour through evaporation.
Air which is too dry (below 60% relative humidity) and too hot is even more dangerous. Not only does it upset the secretion of mucus but the ensuing evaporation shrinks the size of the droplets carrying infection agents, enabling them to penetrate more easily to the respiratory apparatus.

The rabbitry must have a certain minimum of **ventilation** to evacuate the harmful gases from urine and manure (e.g. NO_3, H_2S) or given off by the rabbits (CO_2), to renew the oxygen and get rid of excess humidity (evaporation, exhalation) and excess heat given off by the rabbits.
High ammonia air levels (20-30 ppm) greatly weaken the rabbits' upper respiratory tract and open the door to bacteria such as Pasteurella and Bordetella. To keep NH_3 levels down, ventilation can be increased. The risk is then overventilation, with all the negative consequences. A more effective solution is to limit NH_3 production from floor/litter (droppings and urine) by removing the litter quickly or keeping it dry. The measurement of NH_3 content in the air is difficult for farmers, so the simplest way of detection if the air is fresh and odourless inside the building.
To improve the quality of air pollutant emission management systems would be required (CALVET ET AL., 2012), especially if it would be of major interest to determine how different management practices (e.g., ventilation rates, feeding strategies and manure management) affect the emission of pollutants. Moreover, the characterization and quantification of air pollutants on rabbit farms is a necessary preliminary step that can contribute to design adequate reduction measures to control atmospheric pollutants (gases and solid particles), not only inside rabbit houses but also emissions into the atmosphere.

Illumination

There is a influence of light on rabbits, and these are almost exclusively concerned with the duration of lighting and seldom with light intensity. Practical recommendations on lighting are based more on observations in rabbitries than on experimental findings.

Exposure to light for eight out of 24 hours favours spermatogenesis and sexual activity in bucks. Conversely, exposure for 14 to 16 hours a day favours female sexual activity and fertilization. Performance is more constant in windowless rabbitries with artificial lighting than in buildings which supplement sunlight by artificial illumination.

Observations from different farms indicate that breeding does need considerable luminosity. In fact, many breeders who light their premises for 16 hours a day but not uniformly find that the does receiving the least light have the worst reproduction performance. When light distribution is made uniform, reproduction performance increase.

In Hungarian rabbitries lighting is provided by traditional bulbs or fluorescent tubes (spectrum usually: daylight type). The second one provides the necessary light intensity at a lower energy cost than incandescent lamps, but their installation cost is much higher.

In farms, the seasonal effects are limited when 16 h lighting is applied year around. Change of 8 h light to 16 h light eight days before insemination is effective to increase the receptivity and kindling rate (SZENDRO ET AL., 2016).

Cage size

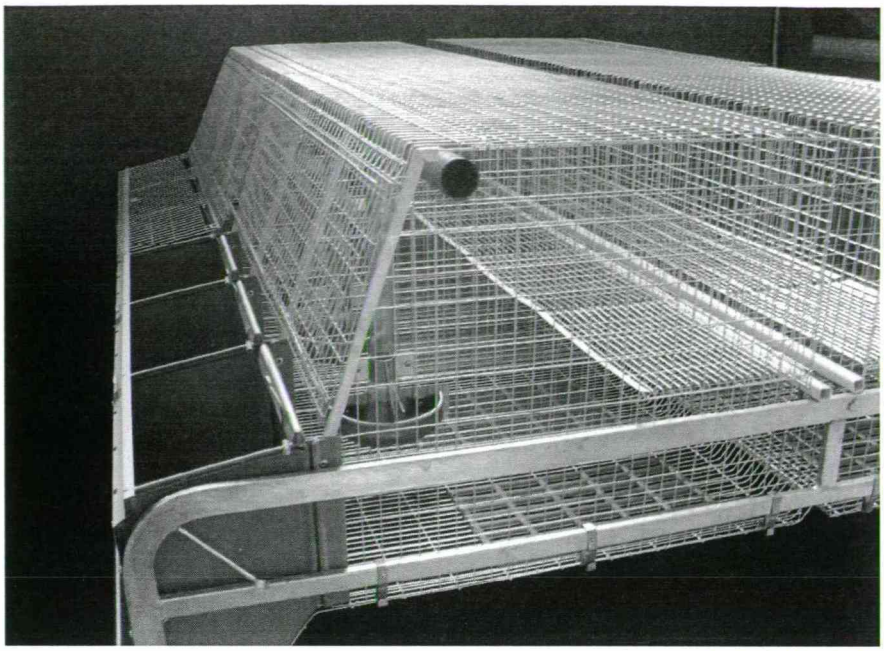
In practice there is a limit to the amount of space for animal accommodation in a farm facility, but it is important to try to optimize that which is available.

The non-pregnant rabbit does spent significantly more time (65%) in the larger cages every day. The cage choice showed the highest difference between the two cages between 23:00 and 5:00. It was the dark time period which was their active period (MIKO ET AL., 2012). The pregnant and lactating does spent most of their time (73.1%) in the larger cage. Although, parturition and lactation influenced the does' location preference, the effect of place (cage) of kindling was the largest on the cage choice.

It may be advantageous to change from caging to a penning system, which mayor may not be on the floor, with emphasis on environmental enrichment. Depending on the facility, small groups of rabbits could be kept in individual pens within an animal room, or larger groups could be housed in a stable. Even if this is not possible, it is very important to enrich the environment of the conventional single cage (*Figure 2*).

Floor type

In an experiment the floor of the pens was partly wire-mesh (1/3), plastic-mesh (1/3) and deep-litter (straw, 1/3). The rabbits showed the highest preference for plastic-mesh, at every age they spent more time there (70 and 52%, at the ages of 5.5 and 10.5 wk, respectively) than the expected value (33.3%) in case of random choice of floor type. Between the ages of 5.5 and 9.5 weeks the preference of the wire-mesh floor was significantly lower than 33.3% (20-27%), but at the age of 10.5 weeks it was not significantly different from value of 33.3%. Deep-litter was the least frequently chosen floor type at all ages (8 and 14%), at the ages of 5.5 and 10.5 wk, respectively.



Source: Károly Bodnár

Figure 2. Enlarged cage with wire mesh platform and plastic mesh pad

Similar tendencies were observed when the location preference was evaluated separately for the different day parts. Based on the results it can be concluded that at the temperature of 10°C the growing rabbits showed the highest preference for the plastic-mesh and the lowest preference for deep-litter, the preference of wire-mesh floor was a little lower than the expected value (33.3%) (GERENCSÉR ET AL., 2012).

The plastic pad must not obstruct the falling through of faecal drops and must be included in the cleaning and disinfection procedures. Enriched cages should be used allowing the rabbits to have access to material for engagement and – if possible – to an elevated platform. The elevated platform (the "third dimension") for breeding rabbits seems to be more important than an enlarged cage size. It allows the does to jump away from the kits. Lying in a stretched body position should be possible for all animals (HOY, 2008).

There are only a few farms apply pen with platform and litter on floor in rabbit husbandry in Hungary. One part of them belongs to a production system called Relaxrabbit, the others are small holders. This kind of production serves those consumers, who are willing to pay a higher price for "happy" rabbits, but usually the mortality and number of injuries are higher, the production/m^2 is less and labour requirement is bigger than in upgraded cage system.

Environment enrichment

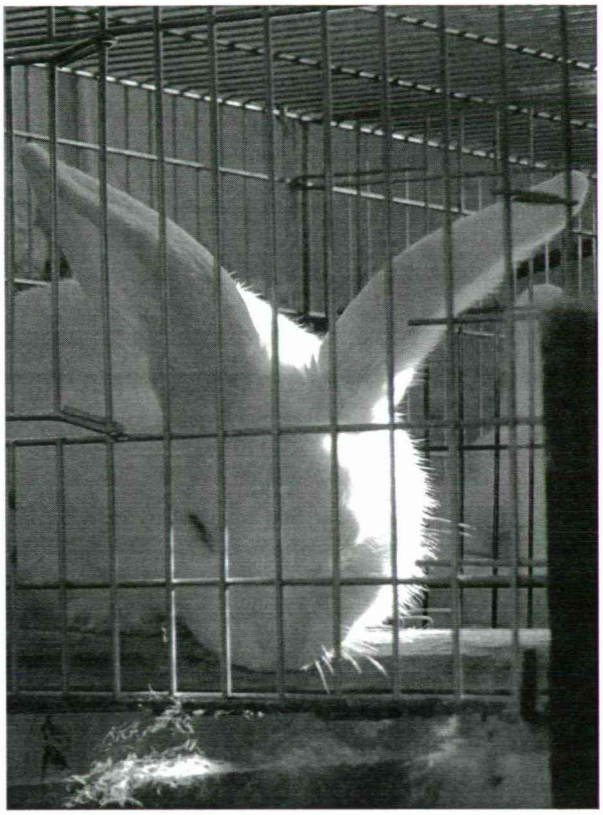
Environmental enrichment for rabbits could be done on several ways in pen or cage systems e.g. shelters, tubes, platforms, "toys", and materials to gnaw.

HANSEN AND BERTHELSEN'S (2000) results indicate that rabbits kept in an enriched cage system, particularly the females, had better welfare than rabbits kept in a conventional cage system because they had access to shelter and a better chance of interacting with the environment.

Farmers use for enrichment in classical wire-mesh cages hay, straw, carrot, apple, stale bread etc., not for their nutritional value but they give some activity for the animals and they have some stress relief effect. The addition of gnawing sticks either to individually

(JORDAN ET AL., 2008) or group housed growing rabbits resulted in significant decrement of biting wire.

The use of wooden stick is more and more popular (*Figure 3*). The breeders give them as sawn hardwood (fruit trees, ash, beech, oak, acacia, alder, maple, elm) however, they suggest the placement of leafy branches, too. Wooden sticks for gnawing made of spruce are not efficient environmental enrichment for growing rabbits housed individually in wire-mesh cages. In some cases the incidence of enterocolitis was higher when wooden stick was used (MIRABITO ET AL., 2000).



Source: Károly Bodnár

Figure 3. Rabbit doe gnaws a wooden stick

Research on the effect of the housing system on animal welfare is not yet sufficient to reach definitive conclusions on the best rabbit accommodation (TROCINO AND XICCATO, 2006). As far as fattening rabbits are concerned, group rearing is surely the best choice to satisfy rabbit social behaviour, even if optimal available surface and group size need to be further evaluated, also with a view to maintaining high final product quality. In reproducing animals, alternative housing systems, that permit does to separate themselves from their litters, should be developed as well as group rearing systems which prevent abnormal reproductive behaviour and guarantee kit welfare and survival.

Further investigation is also necessary on cage dimensions, equipment and floor types, to avoid abnormal behaviour and poor hygiene and health of kits and growing and reproducing rabbits. Although several aspects of housing and rearing systems appear easily modified in commercial breeding without serious effects on commercial results and offer guaranteed advantages for both rabbit and farmer in terms of improved welfare, health conditions and productivity, other changes could or should be applied with proven benefit to animal welfare at costs that might be repaid in terms of an improvement in the image of rabbit meat offers to consumers.

CONCLUSIONS

During farm visits we found that the housing circumstances among those factors which are emphasized individually or jointly appeared in the everyday life of rabbit farming (for example: optimal micro-climate, cage floor space, type of floor, keeping mode, environmental enrichment, etc.). In our work we tried to determine the advantages and disadvantages of each procedure. In many cases, it is difficult to create perfect coherence with the ideas of animal rights, animal needs and economic interests of the farmers. The number of results and ideas for the implementation of all the correct procedures are so great that it is certainly impossible to keep them a time and place in a single technology. Of course, if the changes are generated by the consumers' demands, then the farmer has to adapt to expectations in order to keep the market (and sometimes ignoring some other aspects).

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