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AMBIENT CONDITIONS AND ECONOMIC LOSSES IN INTENSIVE RABBIT BREEDING

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ABSTRACT

In Italy recently and in a rather quick way, rabbit farms changed from a domestic and small scale production to an intensive one, increasing the concentration of animals in the buildings. The purpose of this research has been to evaluate if the buildings actually used are suitable for the intensive rabbit breeding. Two farms, different in number of females and in type of buildings, have been analysed. Between December 97 and August 98, the inside temperature and relative humidity have been recorded. Two regression equations, relating the daily weight increase and the daily food consumption with the ambient temperature, have been adopted. By using the values of the average meat price and cost of food it has been possible to calculate, for each temperature difference from the optimum one (17°C), the economic losses in the two farms analysed. The difference of the inside temperature from the optimal one was limited in winter time. On the contrary, in summer time both buildings were not able to keep the temperature in the right range for intensive rabbit breeding and the economic losses raised up to 20% of GAO.

INTRODUCTION

In Italy recently (end 60's, beginning 70's) and in a rather quick way, rabbit farms changed from a domestic and small scale production to an intensive one, increasing the concentration of animals in the buildings. Sometimes these buildings have been designed, built or simply restructured without putting enough attention to the environmental conditions. This inefficiency conditions the animals' health and, consequently, their productivity.

In intensive breeding the best productive performances are achieved with a temperature between 15 and 20 °C. In fact with lower values the rabbits eat more and with higher ones the effect is the opposite (Gardini, 1977; Bordi, 1986; Chiumenti, 1987; Samoggia, 1987; Xausa et al., 1987; Casamassima et al., 1988; Gamberini, 1993).

The purpose of the present research has been to evaluate if the buildings actually used are suitable for the intensive rabbits breeding. In other words, it has been checked if the environmental conditions (temperature and relative humidity) in these buildings were in the optimum range for the rabbits during the year.

MATERIAL AND METHODS

For this research two farms, both in the north of Italy, have been analysed. The choice was made accordingly to the following criteria:

1. number of females >500. This number is important because less than 500 females, the revenue generated from this activity is considered an integration of the main revenue of the farm.

2. type of building. In this case it has been splitted between new buildings specifically built for breeding and existing ones readapted for this purpose (industrial shed, cowshed, pighouses, etc…).

In the following scheme it is possible to find the main characteristics of the chosen farms. It is possible to see some differences in number of females and for type of buildings between these farms:

- Farm A

Tunnel with supporting structure in steel and walls in glass fiber. **This building has been designed specifically for intensive rabbit breeding**	
Ventilation system: induced draght computer controlled	
Useful surface (m^2):	940
Useful volume (m^3):	3261
N° of females:	650

- Farm B

Industrial shed in precast concrete with couple-close roof. **This building has been readapted for intensive rabbit breeding**	
Ventilation system: induced draght computer controlled	
Useful surface (m^2):	1600
Useful volume (m^3):	7260
N° of females (nest places):	1200

Between December 97 and August 98 the temperature and relative humidity in the buildings A and B have been checked. The external data of temperature and relative humidity have been supplied by "Istituto per la Cerealicoltura di Bergamo-Italia".

Measurements of environmental parameters

Temperature: probes interfaced with electronic data loggers with signal conditioning have been used. These data loggers perform an analog-to-digital conversion of the signals and record them into a static storage from where they can be transferred to a PC through a serial connection and a specific data transfer software.

The data loggers have been set up to record the temperature data at 30 minutes interval. The accuracy of the measurements was ± 1°C.

Relative Humidity: hygrometers able to record the RH continuously on a paper diagram have been used.

In each farm a temperature data logger and a hygrometer have been positioned just above the cages of the fattening area.

Data processing and evaluation

Diagrams of the values of temperature and relative humidity recorded in the two farms, together with the values of external temperature and relative humidity, have been obtained by using an electronic spreadsheet. Thus it has been possible to verify the thermal and humidity profiles inside the buildings and to compare them with the external ones for all the test period.

In order to evaluate the influence of temperature and humidity profiles on the productivity of the breeding, two regression equations, obtained by Castellò in 1983, have been adopted:

$$x_1 = 27.6 + 1.488y - 0.052y^2 \quad (r = 0.99)$$
$$x_2 = 145.9 + 1.391y - 0.01y^2 \quad (r = 0.96)$$

where:
x_1 = daily weight increase in grams
x_2 = daily food intake in grams
y = temperature in °C, in the range 5-30 °C

These equations relate daily weight increase and daily food intake with the ambient temperature. By using them it is possible to assess the influence of this parameter on the two production factors. The equations have been used with the daily-recorded temperature of the two farms. The values of weight increase have been multiplied with the average meat price of the Verona market in the period from December 1997 to August 1998 (1.427 €/kg_{pv}) while the values of food consumption have been multiplied with the average cost of food sustained by the farmers during the same period (0.227 €/kg).
This model has been used to obtain the value of temperature (17 °C) which maximise the difference between GAO (Gross Agriculture Output) and food cost. Thus, for each temperature difference from the optimum one it is possible to calculate the economic losses. These losses have been calculated on a daily basis and then summarised on a three-month basis for each farm, considering the fattening section only.

RESULTS AND DISCUSSION

Farm A

In the fattening section, the average daily temperature showed the following profile (figure 1):
- quarter December 1997- February 1998: the inside temperature (T_i) has always been above the 16 °C, also if the external temperature (T_e) was close or below zero in the coldest days.
- quarter March 1998-May 1998: the T_i followed the T_e, in a reduced way and raised over the 20°C. It must be noticed that, in the same period, reduction of the T_e have produced a reduction of the T_i till 16 °C while the increases of T_e, on the contrary, produced an increase of the T_i above the 25 °C.
- quarter June 1998-August 1998: also in this case, the T_i followed the profile of T_e, remaining in the range of 25-30 °C. Nevertheless, in some days dangerous values for animal survival have been reached (T_i >30°C).

The ventilation system was able to keep the relative humidity close to optimum values during winter time, but not in summer time when the inside humidity followed the profile of the external one with huge variation during the day.
The average economic losses, due to the difference of T_i from the optimum temperature, resulted of 0.033 €/head for a production cycle (90 days) during winter time and 0.939 €/head during summer time (figure 2).

Farm B

In the fattening section, the average daily temperature showed the following profile (figure 1):
- quarter December 1997- February 1998: the inside temperature (T_i) has been always around 15 °C.

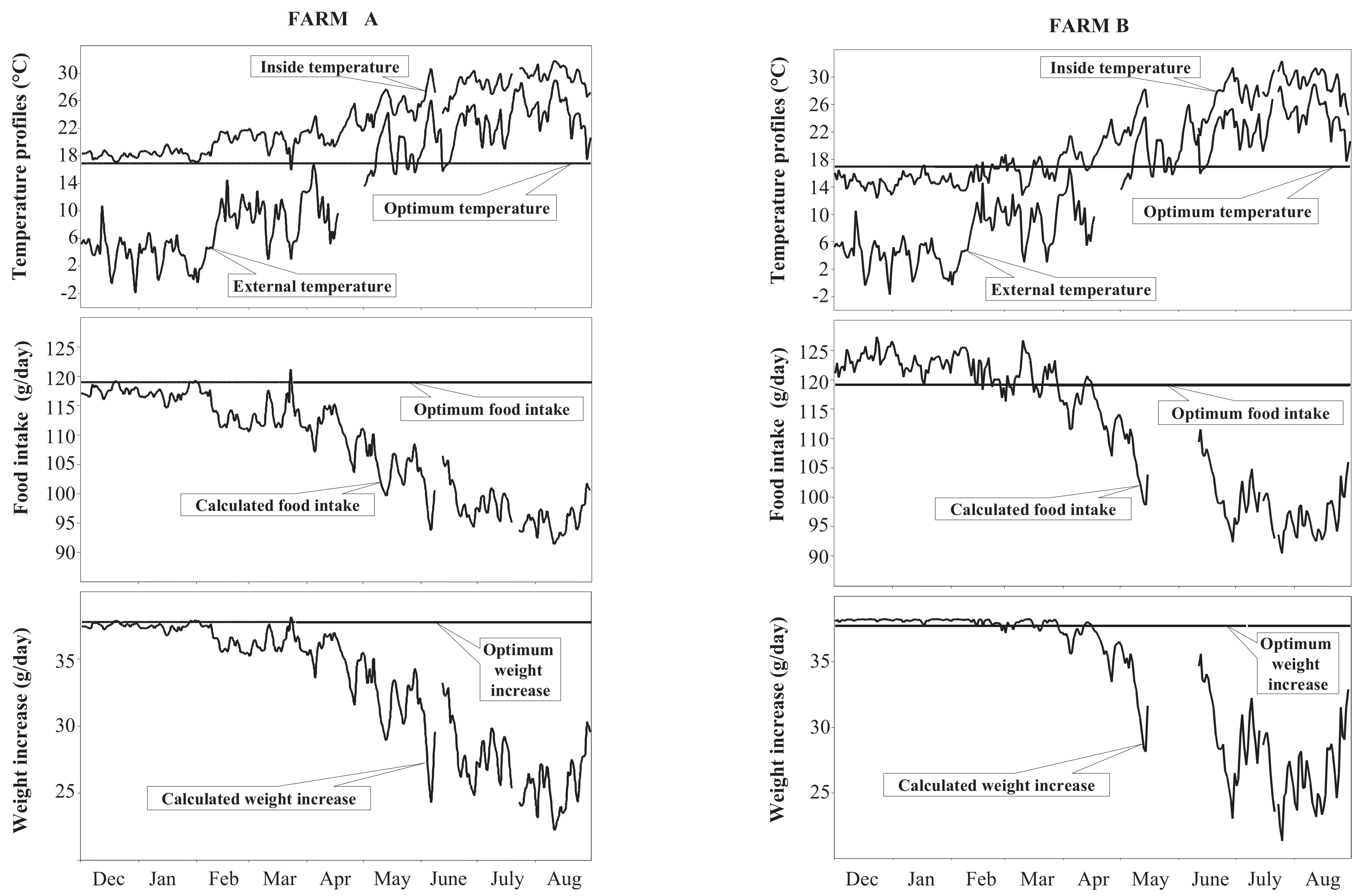

Figure 1. Temperature, Food intake and Weight increase profiles in FARM A and in FARM B.

- quarter March 1998-May 1998: the T_i followed the T_e. During the first half of the quarter it has been in the range of 15-20°C, while in the second one it raised over the value of 20 °C first and of 25 °C after.
- quarter June 1998-August 1998: also in this case, the T_i followed the profile of T_e, remaining in the range of 25-30 °C. Nevertheless, in some days dangerous values for animal survival have been reached (T_i >30°C).

During winter time, the recorded values of relative humidity have been often higher than the optimum ones, getting close to the maximum external values. In summer time the inside humidity reached often values around 100%. This can be explained also by the fact that the manure removal was performed using water.

The average economic losses, due to the difference of the T_i from the optimum temperature, resulted of 0.032 €/head for a production cycle (90 days) during winter time and 0.858 €/head during summer time (figure 2).

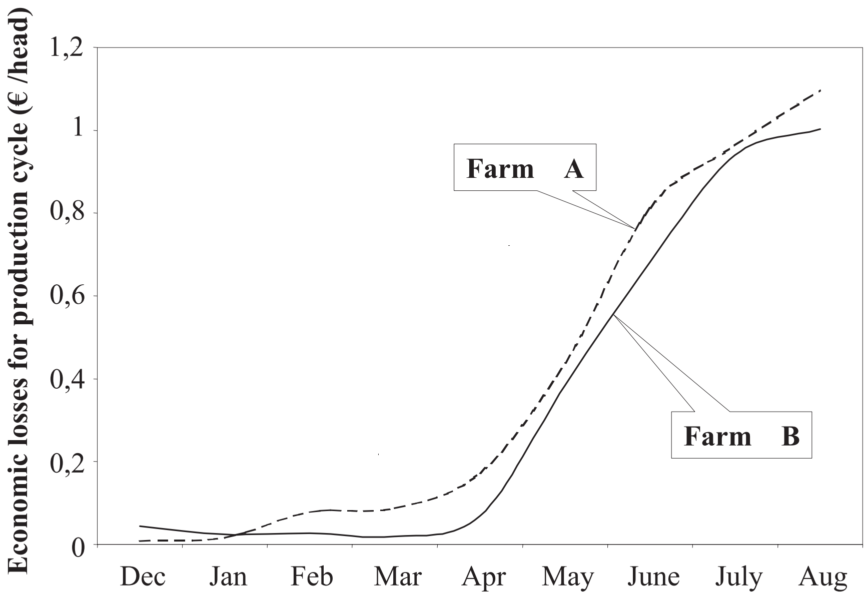

Figure 2. Economic losses for a production cycle (90 days) in FARM A and in FARM B

CONCLUSIONS

In the two rabbit farms analysed the inside temperature profile has been similar although far from the temperature condition which, according to the model used, maximise the difference between GAO and food cost.

The difference between the inside temperature and the optimum one has been lower in the winter time then in the summer one. In particular, in the quarter December 1997-February 1998, the T_i of farm A has always been over 17°C while in the farm B it has been, with few exceptions, always under this value. In these conditions food consumption would be in farm A lightly lower and in farm B higher than the optimum value.

The daily weight increase, on the contrary, would be almost the same for both farms and close to the optimum ones. Over all, the economic losses related to the difference between T_i and optimum one would be less than 1% of GAO.

In the period from March to August 1998, the temperature has always been well above the optimum value in both farms. In this condition food consumption and weight increase,

obtained by using the above mentioned equation, are far away from the optimum. The economic losses are therefore quite high reaching the 20% of GAO in the summer time.
Although these values are the outcome of the model, these results have been confirmed by the experience of the farmers.
The limited difference of the inside temperature from the optimal one and the consequent reduced incidence of economic losses on GAO, point out how the buildings of both farms, despite they are very different in design, building materials, volumes and number of animals, are enough adequate to maintain good inside conditions in winter time.
On the contrary, in summer time both buildings are not able to keep the temperature in the range of right values for intensive rabbit breeding. Considering the economic losses due to the high inside temperature, it can be evaluated the possibility to improve the ventilation and insulation systems and to install an adequate cooling system.
On the basis of the above considerations it can be emphasised the importance to carry out researches on the design of buildings for the intensive rabbit breeding in order to have good inside ambient conditions both in the summer and winter time.

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