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## EVOLUTION OF AN UNCONVENTIONAL RABBIT BREEDING SYSTEM FOR HOT-CLIMATE DEVELOPING COUNTRIES

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To develop rabbit breeding it is common to try to transfer sophisticated technologies from industrialized to tropical countries.

But the success is not sure. Frequently infrastructures are not sufficient to support the needs of complex production systems and market is unable to trade large scale productions. To import buildings and/or cages is very expensive and to control the environment is more difficult than in temperate climates. As a consequence it is frequent that productivity is not such to permit successful economical results (Finzi, 1987; Finzi, 1988).

Courtyard breedings are not so vulnerable by the over mentioned factors. Moreover it has been shown that thousands of families can breed an overall doe number much larger than any industrial breeding (Finzi, 1986). Beside, from a developmental point of view, it is better to provide to the economical and nutritional needs of thousands of families than to few investors which produce for the rich customers of the potentially big town markets (Finzi, 1992).

For these reasons in 1987 an unconventional rabbit housing system was projected and settled in West Noubaria near Alexandria, as a side enterprise of a FAO consultancy (Finzi, 1987). The limiting factor, considered in the project, was the summer temperature (Casedy et al., 1962; Gonzales et al., 1971; Nichelmann, 1971; Nichelmann et al., 1973; Gonzales et al., 1974; Prud'hon, 1976; Eberhart, 1980; El-Sherry et al., 1980; Matheron and Martial, 1981; Whaley, 1983; Cheeke, 1983; Camps et al., 1985; Finzi, 1991).

In tropical countries hot climate impairs reproduction (Chou et al., 1974; Moller-Holtkamp et al., 1976; Waites, 1976; Waitze et al., 1976; Blume et al., 1977; Rastimeshin, 1979; Kadlecik, 1983; Battaglini and Costantini, 1985; Bagliacca et al., 1987; Morera et al., 1990; Kuzminsky et al., 1990). Mating is not even performed during a period of about three months (Afifi et al., 1992) with the result to reduce the productivity per doe and to make uneconomical any industrial breeding unable to overcome this very important limiting factor.

The traits considered in the project were that the housing system should be:

Cheap: local material should be utilized and handicraft preferred.

Simple: the structure should be easy to be built and to consent a simple management.

Efficient in environmental thermoregulation.

Adaptable to different situations.

Accepted by the breeders and sustainable.

The drawing of the first prototype is shown in fig.1.

The basic idea was to exploit the insulating power of ground and to permit the rabbits to reach an underground cell.

This one was made with cement in the first prototype and it had a trunked cone or pyramid shape. It could be done as a single piece prepared on a mould (trunk conic shape) or made up with cement slides which were set together to build the cell (trunk pyramid shape, fig. 2). The cell was covered with the ground nearly to the top and it had an insulating wooden upper lid to permit to explore the inside. It was considered important that the lid could not warm up not to irradiate the cell.

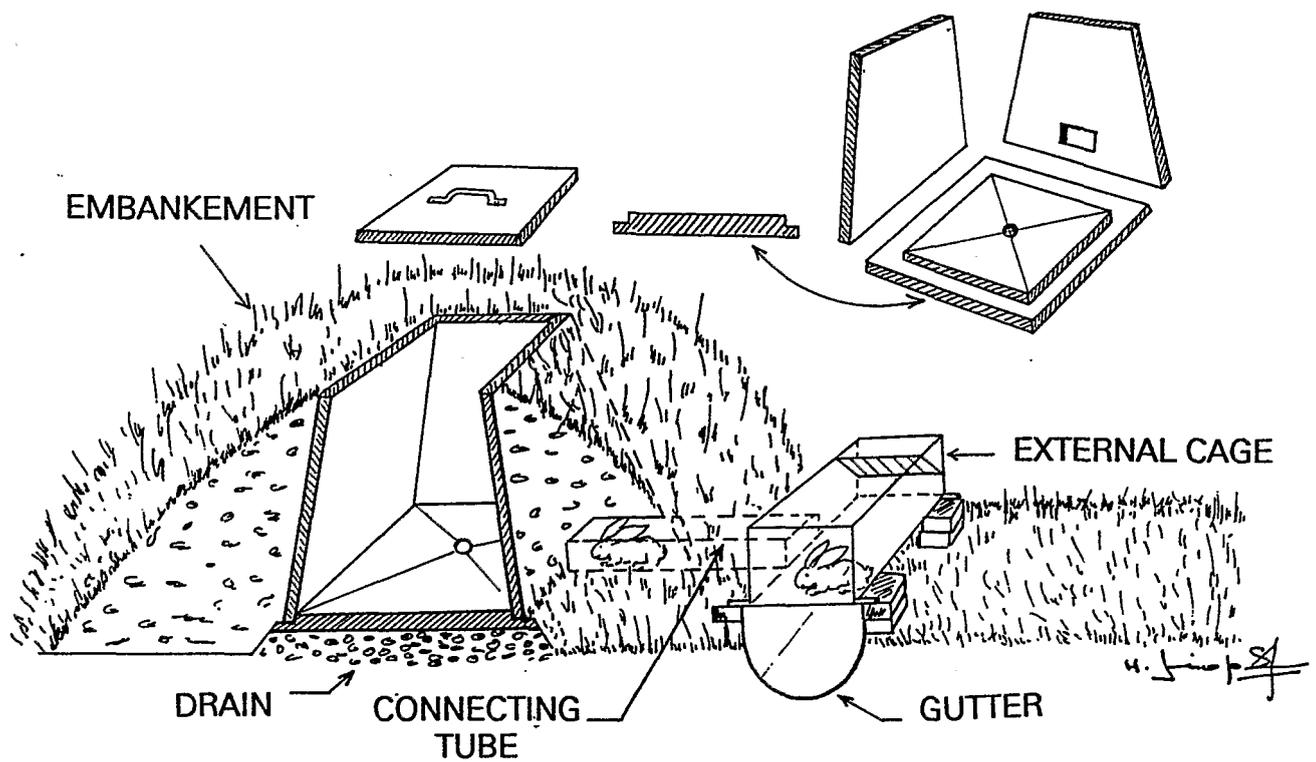


Fig. 1 - First prototype of the underground cell housing.

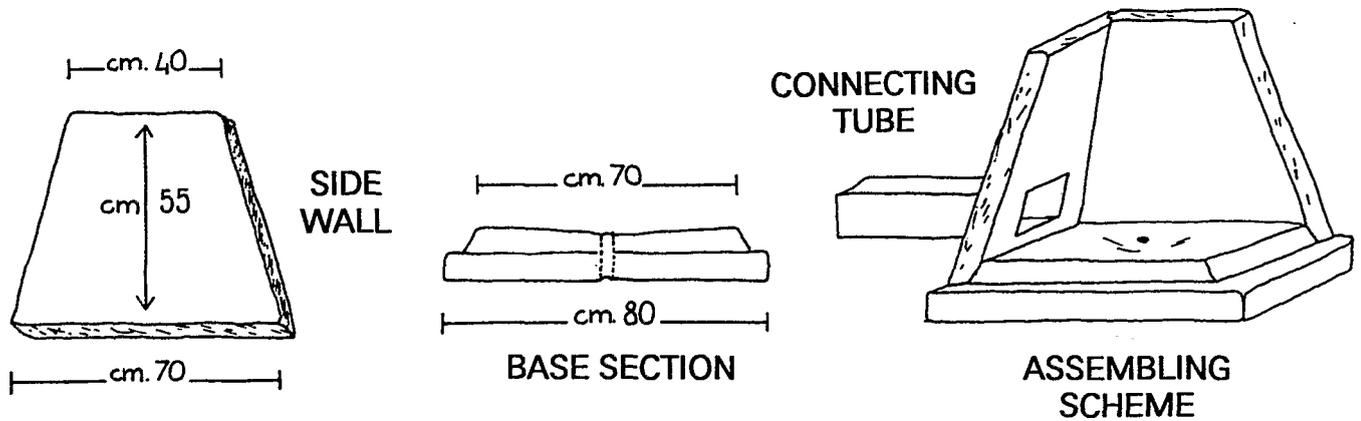


Fig. 2 - Draft of the cement underground cell.

The cell was considered as a fresh resting place for a single buck or doe. In the latter case it could receive a nest that, at beginning, was prepared simply with stones to separate a proper area where straw or dry grass could be properly disposed.

Building of external cages was made starting from cheap wood (branches of dates palms) containers. They are very common on the Egyptian market and they are used for transporting fruits, vegetables and small animals.

The wood frame had to be protected, by the inside, with a metal net, but since this had not mechanical functions, a thin net could be used for 5 sides of the cages. The floor was made eliminating the wood frame and putting in its place a sufficiently strong metal net (fig. 1 and 3). These cages are a little bit overdimensioned (cm 100 x 60 x 40), but this is not considered a negative aspect since the cages are sold at a very convenient cost.

The tube connecting the underground cell with the external cage had a square section of about cm 15. It was built with tin and wood, but any other solution is advisable.

The system was recognised as able to satisfy the condition considered in the project, but to avoid the work to prepare the pieces and to build up the cement cell it was substituted by a clay pot. This one was the first modification of the original project. It happened in the place as a result of locally developed criteria by local technicians.

The new underground breeding unit was then a pot-shaped clay-cell covered with earth and grass and moderately watered every day.

The measurements were:

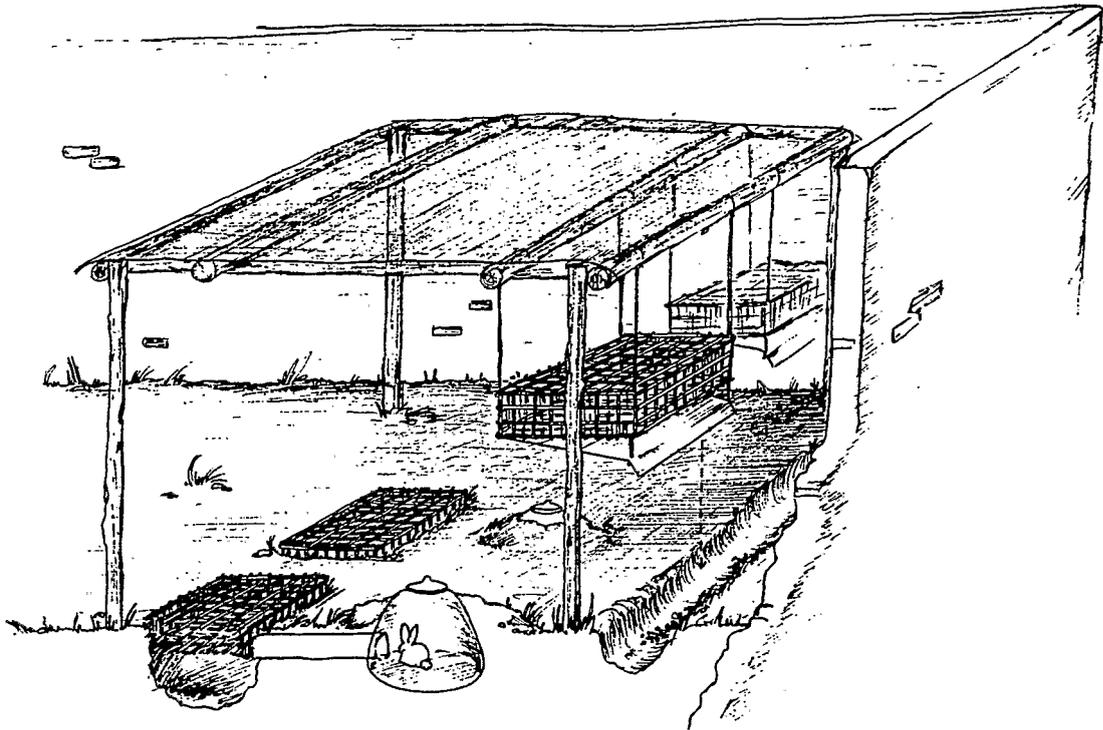
CLAY-POT FLOOR DIAMETER	50 cm
CLAY-POT HEIGHT	40 cm
CAGE AREA	75 x 40 cm
CAGE HEIGHT	40 cm
PIPE LENGTH	30 cm
PIPE DIAMETER	15 cm

A circular floor with a diameter of only cm 50 was not enough to permit a proper place for the nest and another one for the doe to rest. This was the original problem. The local craftsmen are not able to forge pots larger than this. This is the reasons why the original project was to build cement cells.

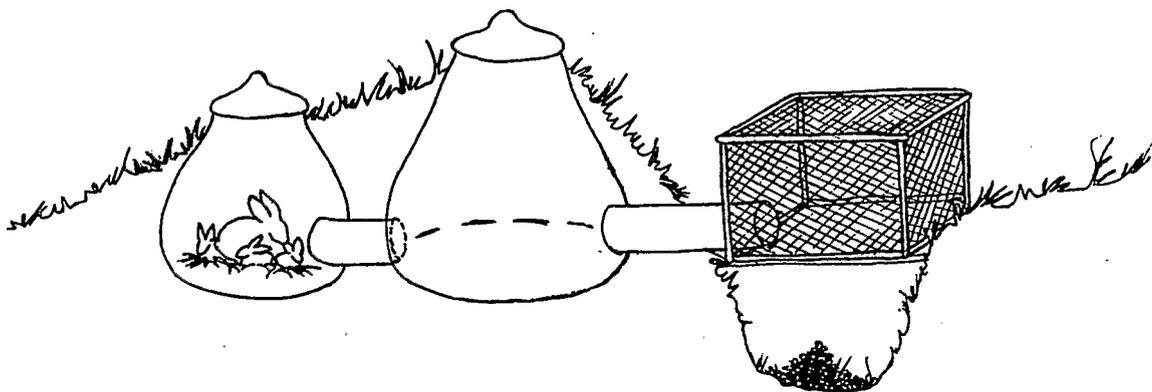
The Egyptian technician tried to solve the problem utilising a clay pigeon nest that is very common, cheap and easy be found in the area. This was connected next to the pot, but it remained very deep in the ground so that, to explore the nest, a long small clay tube was utilized. This permitted to explore the nest but not to manage the litter.

When the problem seemed to be arrived to a dead point it was developed the winning idea. As shown in fig. 4, the idea was to connect a smaller pot (to be used as nest place) next to the bigger one (to be used as naturally conditioned resting place for the doe). A brick could be inserted in the connecting tube so that the nest area could remain separated until the delivering time when the brick was set apart and the small pot prepared with straw to form the nest.

The managing system was very simple. A small wire-net door was disposed in the cage, at the mouth of the connecting tube. When a new doe was introduced in the cage the door was closed for two days in order to oblige the doe to choose the place in the cage were to make drops. When the door was opened the doe could exploit the naturally climatized underground cell during the hot hour of the day, to come back in the cage to eat, to drink or to make drops. This happened mainly from late afternoon to early morning.



**Fig. 3 - Evolution of the underground cell housing (a clay pot). Hanged handicraft cages are used for fattening.**



**Fig. 4 - A smaller clay pot is used as a nest.**

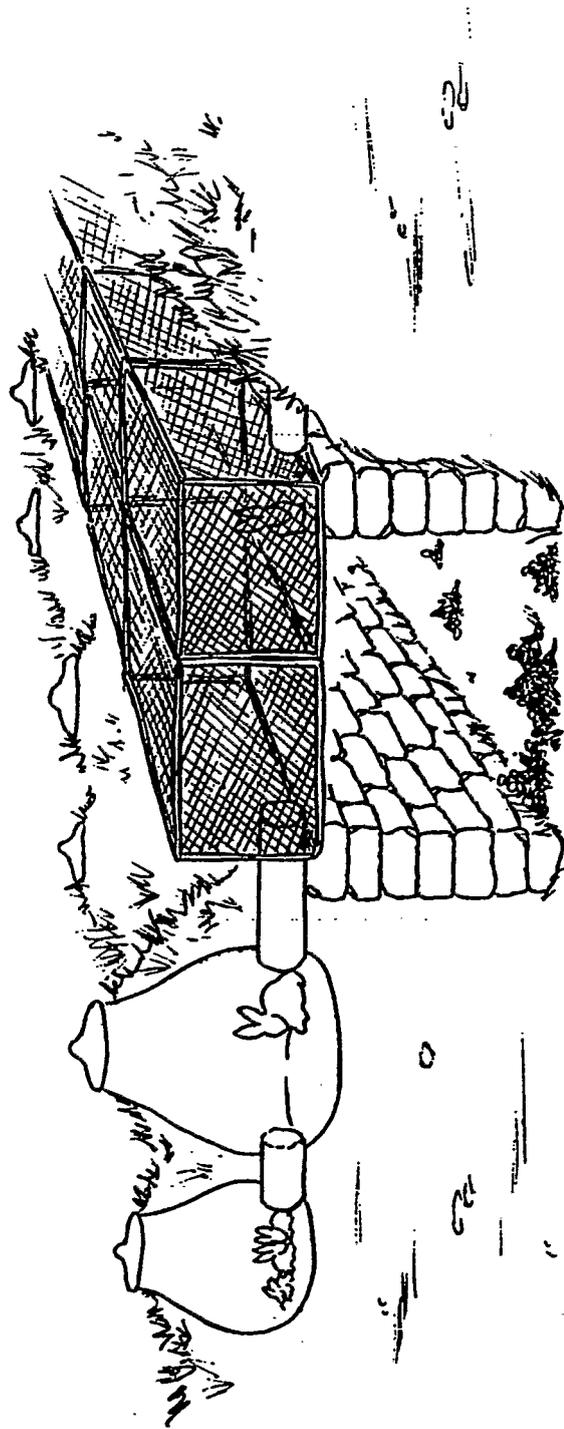


Fig. 5 - Evolution of the double pot housing.

Expanding the dimension of the breeding it was necessary to use more than a simple row of cells. In figure 5 a possible disposition is shown. The solution was given putting the cages one next to the other at the centre of an embankment elevating the level of the structure. The management was not so bad as it could look, since feeding was based on grasses which could be easily disposed over the cages, while cleaning was favoured by the deep place under the cages.

When the underground cell was compared with cages (Finzi et al., 1992a; Morera et al., 1989) ambient temperature in summertime was 1.6-2.0 °C significantly lower in the hottest hours of the day (3.3-5.5 °C in Italian trials) and body temperature was lower from 8.00 to 16.00. The analysis of behaviour showed that more than 80% of the animals lied stretched in the cages from 11.30 to 16.00, while 40% of rabbits in the cells had a normal posture and a 20% more was even active (Finzi et. al., 1992b).

In summertime it was observed that bucks, bred in the underground cell system, were 18,5% more quick to perform copulation and that the volume of ejaculates was 0.3-0.7 ml larger. (Morera et al., 1989; Kuzminsky et. al., 1990).

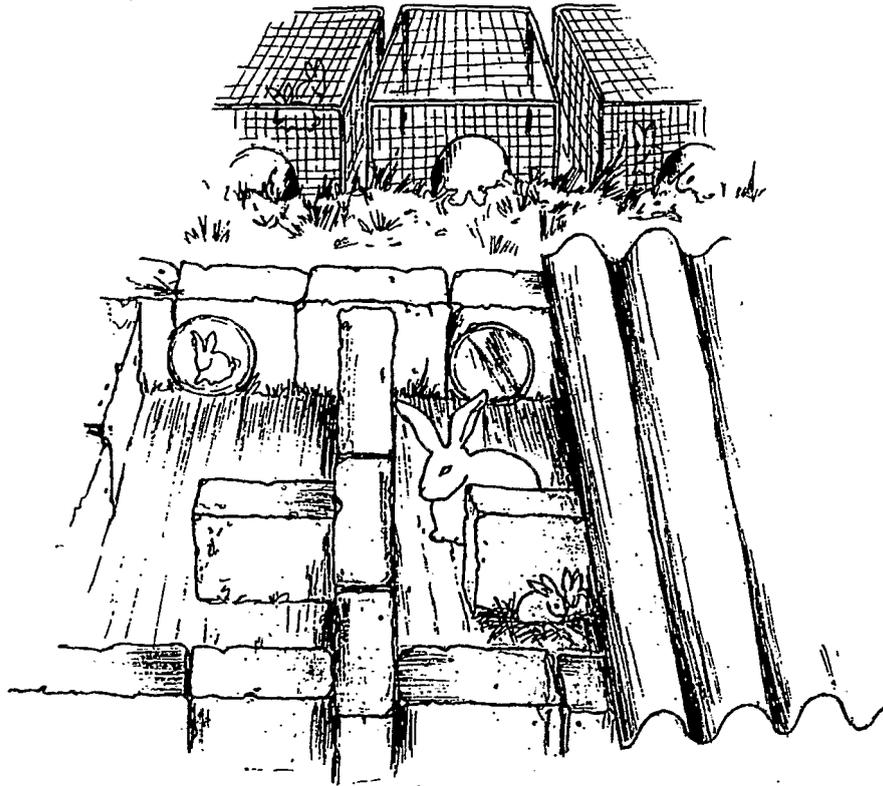
All the behavioural, physiological and biological data confirm that the underground cell system is very effective in controlling the environmental conditions and to produce a good welfare state. It looks as efficient as an industrial system. The cost of structures is very much reduced and environmental conditions are better, or comparable to the ones of industrial buildings when sophisticated cooling systems are utilized. The management is based on the control of each doe, and it represents a great advancement in comparison to traditional methods, which have a very rough management, being colony breedings.

When the underground cell housing was reproduced by the Viterbo University to study and to improve its characteristics, it looked very fit to favour the setting of part-time rabbit breedings, to produce an extra income for the many small farms, which have an insufficient rent for the needs of the rural family (Gualterio et al., 1984). The advantages of the system appeared to be the elimination of the building and the modularity of the unities, allowing the breeding to grow up more or less quickly, according to the economical allowances of the breeder.

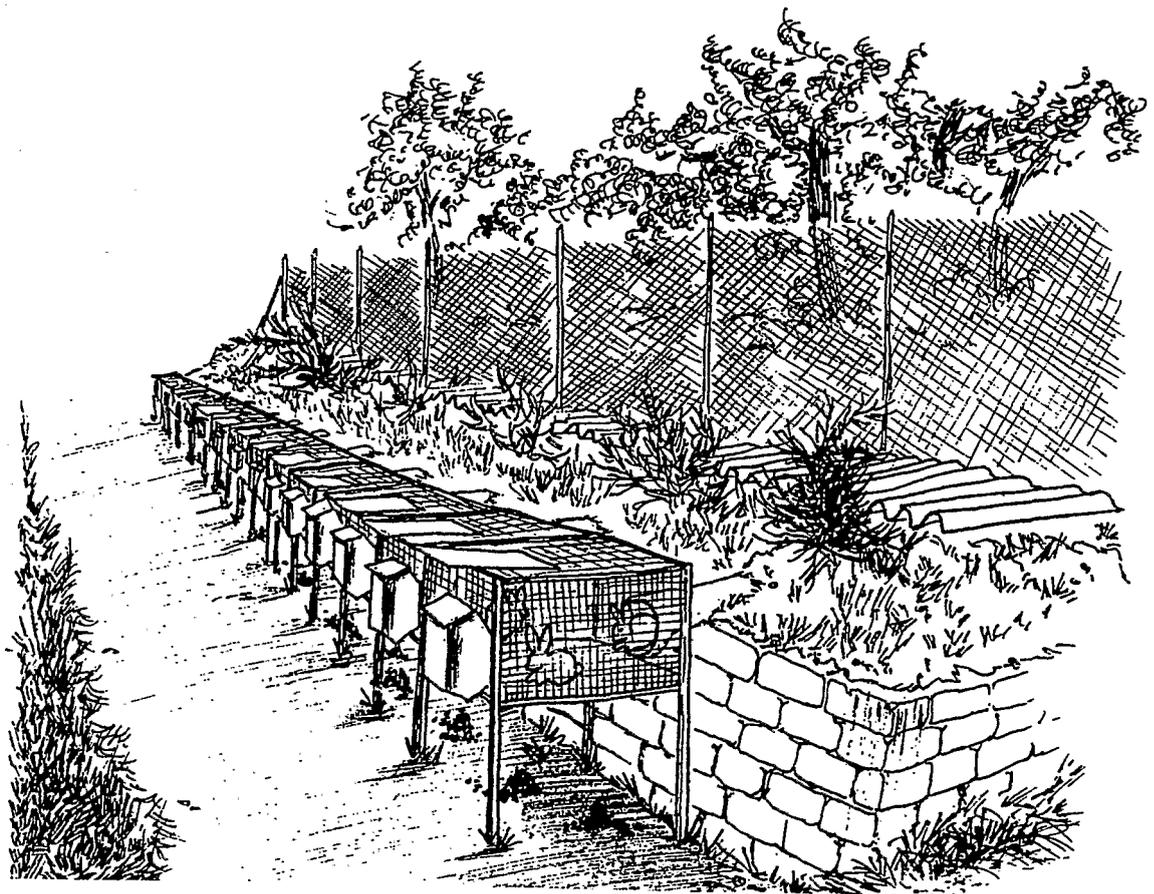
It was also proved that the hygienic conditions were improved as a consequence of high microbial dispersion in the air and the lacking of direct contact between the animals. The main result was the quick reduction of pasteurellosis (Finzi, 1985). Productivity was good, and normally not less than about 40 rabbits sold per doe per year (nowadays not less the 43-45).

A first very simple prototype, set up in a small commercial breeding, which is producing since 1989, is shown in fig. 6 and 7. The cell was formed by stone blocks disposed over a floor formed by two flat bricks. The best place to build this type of breeding is where the ground makes a mild slope but also in flat land a suitable solution is possible.

A model for flat land is shown in fig. 8 and 9. As it can be seen the ground structure can be elevated through a system of poles overposed. The cell was formed by an industrial, and relatively cheap, cement cube, used to drain the rain waters from houses. It is interesting to observe that the double row of this model is very similar and specular to the model (fig. 5) developed by the Egyptian technicians. The main difference is that in the industrialized countries the cell system is developed to reduce housing costs and to produce more rentable rabbits to be sold as high quality meat (De Lazzer and Finzi, 1992). In hot climate countries the system is fit to improve rural breedings, allowing the control of does and to overcome the negative effects of high temperatures.



**Fig. 6 - A stone bricks housing for mild climates.**



**Fig. 7 - An underground cell breeding in Italy.**

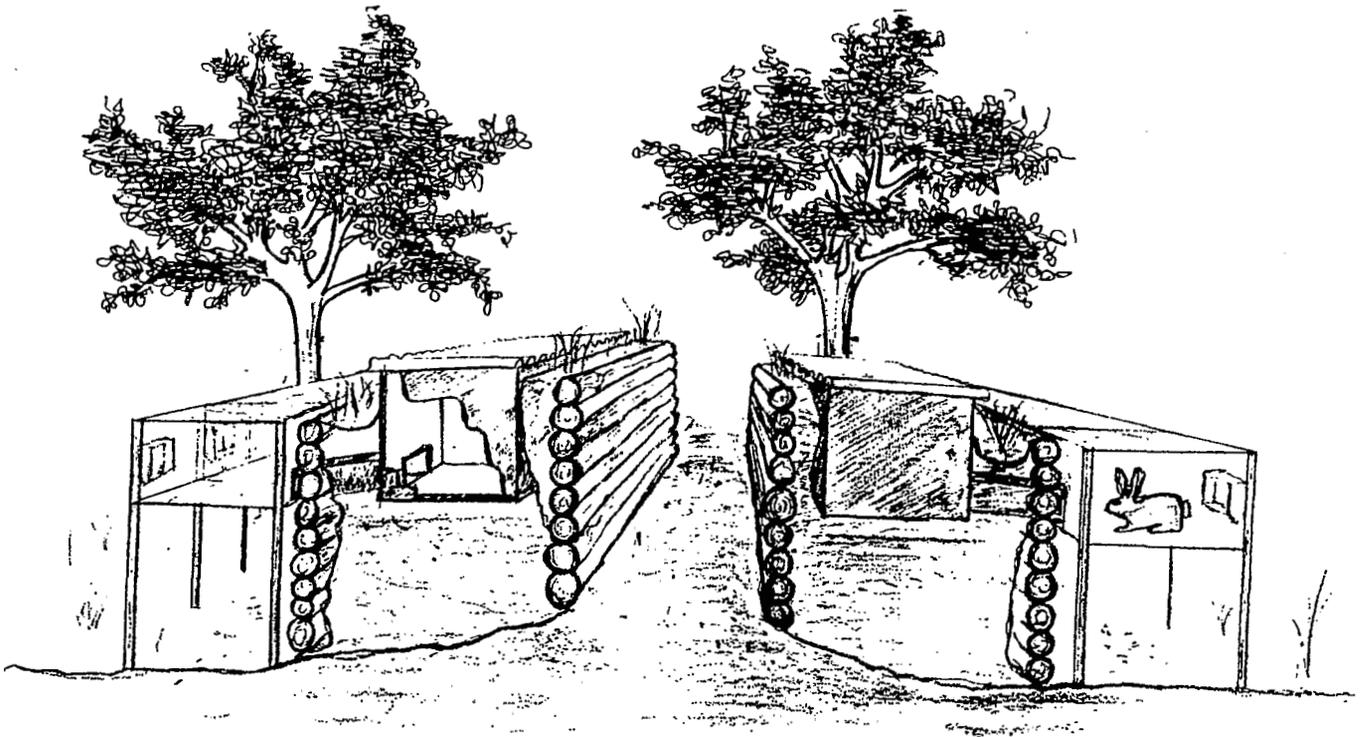
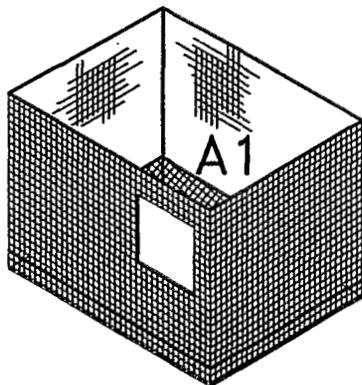
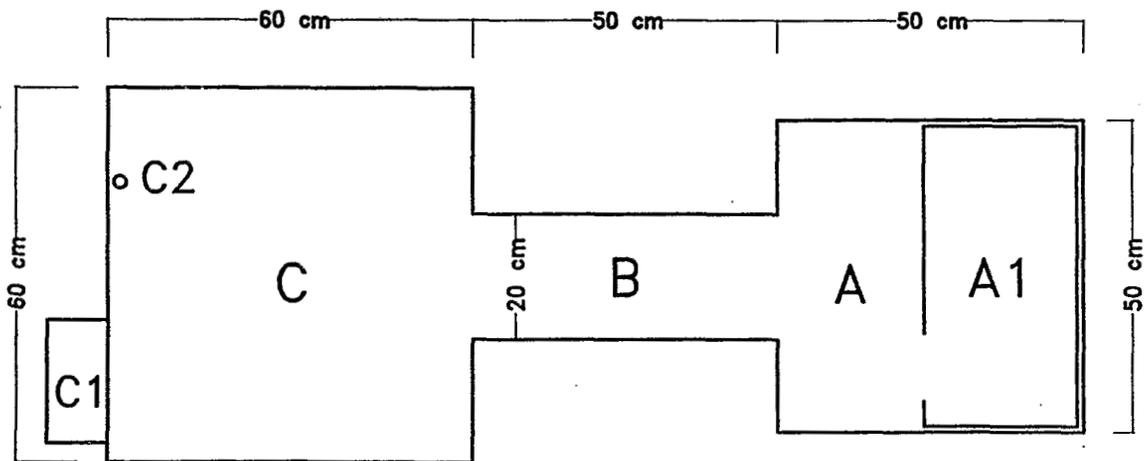


Fig. 8 - An underground cell breeding in a flat land area.



- A - CEMENT CUBE AS UNDERGROUND CELL
- A1 - WIRE NET NEST
- B - CONNECTING TUBE
- C - EXTERNAL CAGE
- C1 - FEEDER
- C2 - NIPPLE DRINKER

Fig. 9 - Draft of and underground cell housing in Italy.

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