Development of Rabbit Industry in Egypt

E.S.E. GALAL*
M. H. KHALIL**
* FAO REGIONAL OFFICE FOR THE NEAR EAST
P.O. BOX 2223, DOKKI, CAIRO, EGYPT
** DEPARTMENT OF ANIMAL PRODUCTION,
FACULTY OF AGRICULTURE AT MOSHTOHOR,
ZAGAZIG UNIVERSITY, EGYPT.

SUMMARY - An estimate of 88-90% of rabbit population in Egypt is in the hands of small-holders while the rest belongs to the commercial sector. Rabbits are mainly bred by families as a backyard farming where small breeding units are conveniently set up not only in the villages, but also in towns. The most widespread rabbit raising system in Egypt is the one which utilizes hutches or cages. Underground cells are also used. Ten years ago, commercial rabbit farms have started to expand in Egypt and several farms are now engaged in large-scale production. Rabbits in Egypt currently fall far short from reaching the limits of their potential for carcass production. In comparison with other types of meat, the annual consumption of rabbit meat per head of population is very low (0.7 kg in 1992). Most of the local breeds of rabbits appear to be in real danger of extinction. Origin and distribution of local germ plasms along with their performances were reviewed. Local breeds of rabbits (e.g. Giza White, Baladi Red, Baladi White and Baladi Black) showed, in general, lower performance than acclimatized exotic breeds (e.g. Bouscat, Chinchilla, White Giant Flander, Grey Giant Flander) for different productive traits. The genetic potentials of introduced breeds (e.g. New Zealand White and Californian) and the importance of genetic-by-environment interactions are not fully exploited under Egyptian conditions. Crossbreeding experiments including New Zealand White and Californian along with local Egyptian breeds gave evidence to the possibility of the improvement of most economic traits in rabbits in Egypt.

Key words: Rabbit industry, germ plasm, breed performance, crossbreeding, Egypt.

Introduction

An FAO Expert Consultation on Rural Rabbit Production (FINZI, 1987) emphasized that if the high rate of growth in meat consumption in future years was to be met, much of the increase in production would has to come from short-cycle animals kept by the small-scale farmers such as rabbits. The domestic rabbit when compared with other livestock animals is characterized by early sexual maturity, high prolificacy, relatively short gestation length, short generation interval, high productive potential (number of progeny produced per doe per annum), rapid growth, good ability to utilize forages and fibrous plant materials and agricultural by-product (i.e. does not need a lot of concentrate in its diet), more efficient feed conversion, low cost per breeding female and by its profitability for small-scale system of production and in backyards (CHEECKE, 1986; FINZI and AMICI, 1991). Also, the rabbit meat is nearly white, fine grained, palatable, mild flavored, high in good quality protein content, low in fat and caloric contents, contains a higher percent of minerals than other meats, nearly of the same nutritive value as beef meat and comparable to that of broiler chicken, of good meat-to-bone ratio and is acceptable to the general

consumer in most countries of the world (REDDY et al, 1977; LUKEFAHR et al, 1989). Therefore, rabbit production might play a considerable role in solving the problem of meat shortage in Egypt and particularly on the level of the small-scale farmers.

The objective of the present article is to review the development and significance of rabbit production in Egypt.

Efficiency of rabbit meat production in Egypt

RELEVANT RABBIT STATISTICS

Rabbit statistics in Egypt (CAPMS, 1993) indicate that the total number was 7.7 million in 1992. At the beginning of the present decade, about 88-90% of this population was in the hands of small-holders and 10-12% belonged to large commercial project sector. In 1992, rabbits in Egypt represented for 7.1% of that poultry (Table 1). Table 1 also shows that the share of the rabbit population in the total livestock units in Egypt increased from 5.6% in 1980 to 7.1% in 1992. Also, the contribution of rabbit to the total meat produced in Egypt was shown to increase from 2.3% in 1980 to 3.6% in 1992 (Table 1).

SIZE AND STRUCTURE OF RABBIT UNITS

The rabbit industry in Egypt has not received much attention from formal institutions or from individual animal producers. Before 1980, it has not been widely spread but was limited to a few farms scattered at different locations. Rabbits are mainly bred by families as a backyard farming. Small breeding units are conveniently set up not only in the villages, but also in the town outskirts where feed is more expensive and more difficult to get, but meat marketing is easier. In most rural areas, one buck and five does are the most frequent size where their offsprings are mainly for home consumption. Since the setting-up of rural rabbit breeding was normally based on mere imitation, the influence of the more modern means of production, mainly housing, is frequently evident.

The Cage

The most widespread rabbit raising system in Egypt is the one which utilizes hutches or cages. Before 1980's, this system was introduced after the hutch models which have been developed before the beginning of the industrial intensified rabbit breeding. The system is based on wire net cages. The hutches are normally built with local or scrap materials. Also good wood-wire hutches or even whole-metal cages (e.g. flat deck, Californian cage, inclined slope battery and com pact batteries) are often observed. These are mainly built by people who have higher income or who have some sort of public financial support, or got involved in rural development programmes.

Underground cell

Since a better environment can be found underground, a cell can be prepared with stones, bricks, clay slides or concrete (FINZI and AMICI, 1991). The cell can be covered by earth and put in communication with an external cage through a pipe. With this system rabbits can choose the more convenient environment, the under- or above- ground. A number of concrete pyramid-shaped underground cells were put in place in the Demonstration Centre of West Noubaria (FINZI, 1987). The external cages were built with wood and palm-date leaves protected from the inside with a thin wire net. The cages are usually hung onto the northern side of the house. The original three breeding units demonstrated at the Centre of West Noubaria have now grown to eighteen (FINZI and AMICI, 1991). Recently, these units have been modified using local clay

handicraft and about fifty families are adopting the modified design.

Projects engaged

More advances in the rabbit industry were introduced in the last decade. Commercial rabbit farms have started to expand in Egypt and several farms are now engaged in large-scale production , e.g. that of an investment company in Ismailia governorate with a capacity of 15000 does, in San El-Hager, Sharkia governorate, where New Zealand White, California and Bouscat rabbits were introduced from Hungary to produce hybrids to be distributed in rural areas and to produce dressed rabbit meat, breeding rabbits and pelleted feed to be distributed to the multipliers and small holders, and other small projects with a capacity of 1200 does.

Research/extension flocks were also established, the main ones were: i) University linkage of Ain Shams University, Faculty of Agriculture with the partnership of American colleagues to introduce new hybrids (Flemish Giant X New Zealand White) using ovulation promoters and artificial insemination techniques. ii) National Rabbit Project, Faculty of Agriculture, Zagazig University (in coordination with the Egyptian Academy of Scientific Research and Technology), a project with 400 New Zealand White and California does with the objective of distributing purebred New Zealand and Californian rabbits along with an extension package to small farmers. iii) A small farmer's project in coordination with USA AID and National Development Agriculture Bank was established to promote rabbit production in rural areas through soft loans.

MEAT PRODUCTION PER DOE PER ANNUM

In the conventional system of production in Egypt, the general practice is to obtain four litters from each doe per year (breeding season begins in October and ends in May). The annual carcass yield of the doe is six times as much as her weight (Table 2). In intensive production system, however, the annual carcass yield per doe is 10.5 times. Evidently, the intensification of rabbit production in Egypt will be of considerable advantages.

The figures in Table 2 indicate that rabbits in Egypt currently fall far short from reaching the limits of their potential for carcass production. The causes of the gap are numerous and some of these causes are biologically unavoidable. It is unlikely that substantial advances will be achieved in this aspect until techniques of management and disease control are well studied under the Egyptian conditions.

RABBIT MEAT CONSUMPTION

Table 1 shows the annual consumption of rabbit's meat in Egypt in comparison with other domestically produced meats. The annual consumption of rabbit meat per head of population in 1992 was very low (0.7 kg) in comparison with other types of meat. It represents 3.7% of the total home-produced meat consumed per year. In other Mediterranean countries, the annual per capita consumption of rabbit meat is 3.6, 3.5, 3.5 kg in France, Italy and Spain, respectively. These figures indicate that there is a potential for developing a home market in Egypt.

Local germ plasm

There are six breeds and strains of rabbits in Egypt. Performances, distribution and domestic use of these recognized breed populations are in needed for documentation (KHALIL, 1993). Based upon breed registration, it would appear that most of these breeds may be in real danger of extinction (KHALIL, 1993).

GIZA WHITE

In 1932, a native stock of rabbits was bred by the Animal Breeding Department, Cairo University, Giza, Egypt, in an attempt to form a breed of uniform characteristic (EL-KHISHIN et al, 1951). These rabbits were of different colours and sizes. Colours were isolated and black and albino colours were genetically segregated. In 1937, systematic breeding took place with the object of obtaining an albino type of a rabbit with faster rate of growth and a larger litter size which is presently known as Giza White breed. Closed breeding in albino population for several years was performed. The rabbits of this breed are albino with a soft silky fur.

BALADI STRAINS

Crossbreeding for several generations was practiced between local (native) rabbits and Giant Flander (G) in stations of the Poultry Breeding Section, Ministry of Agriculture (BADAWY, 1975). The breeding plan used for producing three native strains of Baladi Red (R), Baladi Black (B) and Baladi White (W) is presented in the following diagram:

Baladi X Baladi

Selecting does with heavy weight and of particular colour

	Red-coloured Baladi (R)	White-coloured Baladi (W)	Black-coloured Baladi (B)
Parents	♂G x R♀	♂G x W♀	♂G x B♀
F1	1/2G 1/2R	1/2G 1/2W	1/2G 1/2B
Parents of backcross	♂G x 1/2G 1/2R♀	♂G x 1/2G 1/2W♀	♂G x 1/2G 1/2B♀
Backcross	3/4G 1/4R	3/4G 1/4W	3/4G 1/4B

Heavy does of 3/4 Giant 1/4 Baladi genotype were upgraded by mating them to pure Giant Flander bucks for several generations and selection for pure colour of Red, White and Black was practiced for producing strains of Red Baladi, White Baladi and Black Baladi. Does of each strain were mated with bucks of the same strain for several generations until characters and colour were established.

GABALI RABBITS

This is a medium-sized breed. There are two strains of rabbits in Egypt bearing the name "Gabali", but they unlikely to be the same. One of these strains found in the western desert on Mediterranean coast and the other in Siani. The two strains seem to be adapted to the desert condition. Colour of rabbits is mainly grey. The breed characterized by a large litter size (8-12) and heavy body weight (3.5-4.5 kg). Desert Research Centre has recently started a project in Maryout (north western coast of Egypt) to characterize this breed. The preliminary results of this

project are given in Table 3.

Introduced breeds

In 1947, Bouscat, Chinchilla and Flemish Giant stocks were brought to the Department of Animal Breeding, Faculty of Agriculture, Cairo University, Giza, in an attempt to test their adaptability to the Egyptian conditions (EL-KHISHIN, 1951).

In the last ten years, new standard breeds of New Zealand White (NZW) and Californian (CAL) rabbits were introduced to Egypt and were used in a large scale commercial production in different areas of Egypt. The NZW and, to a lesser extent, CAL were found to exhibit outstanding maternal abilities as related to maternal behavior, fecundity or fertility, lactation, preweaning and postweaning growth and survival (YOUSSEF, 1992; KHALIL et al, 1993; KHALIL, 1994a).

The diversity that exists between standard breeds (NZW and CAL in particular) and the Egyptian local breeds is likely to provide basis for selection of genetic combinations suited to a variety of environments and production systems in Egypt. Performances of New Zealand White and Californian rabbits and their crosses have not been extensively investigated in Egypt, although pure breeding and crossbreeding experiments (HASSAN, 1988; OUDAH, 1990; EL-MAGHAWRY, 1990; El-Desoki, 1991; YOUSSEF, 1992) have been carried out to improve reproductive and growth performances of these breeds under the local Egyptian conditions. Genetic information on litter traits, growth performance and carcass traits of these two breeds raised under the Egyptian conditions is very limited (EL-MAGHAWRY, 1990; KHALIL et al, 1993; KHALIL, 1994a).

Breed performance in Egypt

Litter performance (litter size, number born alive, litter weight, mortality rate, mean bunny weight per litter and lactation) of NZW and CAL rabbits raised in some European countries (e.g. Italy, Spain, France, ... etc.) is higher than those of the two breeds raised in Egypt (Table 3). The same conclusion is drawn for postweaning growth and carcass performance. The genetic potentials of these two standard breeds and the importance of genetic-by-environment interactions are not fully exploited under Egyptian conditions. The reviewed averages cited in the Egyptian studies also indicated that performance of doe traits for NZW rabbits are better than those for CAL (Table 3). This could be due to that NZW does are superior in their prenatal and postnatal maternal abilities than CAL does (EL-MAGHAWRY, 1990; OZIMBA and LUKEFAHR, 1991). Also, higher milk production for NZW does compared to local breeds could be added as another cause in this respect (SEDKI, 1991; KHALIL, 1994b).

Excluding Gabali rabbits, litter traits (Table 3), lactational traits, post weaning growth and carcass performance for NZW and CAL rabbits are better than those for local breeds (e.g. Giza White, Baladi Red, Baladi White and Baladi Black). Higher postnatal maternal ability and higher milk production in NZW rabbits than in local breeds could be the main reason for the relatively poorer performance of the local breeds (HASSAN, 1988; MOHAMED, 1989; HILMY, 1991; SEDKI, 1991; KHALIL, 1994b). Also, higher preweaning mortality rate in Baladi Red and Black rabbits (Table 3) could be added as another explanation (KHALIL, 1980; AFIFI and KHALIL, 1991; HASSAN, 1988; HILMY, 1991). The reviewed averages of mortality percent from birth up to weaning (Table 3) showed that litter losses among NZW rabbits raised in Egypt are nearly similar or relatively higher compared to those rabbits raised in other Mediterranean countries (e.g. Spain and Italy). The estimates averaged 22.1% at 4 weeks and 24.9% at 5 weeks in Egypt and 15.5% and 19.5% at the same two ages respectively in other Mediterranean countries. On the

other hand, rates of preweaning mortality in Giza White and Baladi Red rabbits (as local breeds) are higher than those observed for NZW rabbits raised in Egypt (Table 3). Carcass traits confirm the same trend observed previously for growth performance and litter traits for the same breeds of rabbits.

Means of reproductive intervals (days open, insemination period and kindling interval) reviewed for different breeds of rabbits raised in Egypt indicated that estimates for NZW and CAL rabbits ranged from 42 to 63 days for kindling interval, 22 to 27 days for service period and 23 to 36 days for open period. Such long reproductive intervals (Table 3) are one of the limiting factors for the effective use of these breeds on a large commercial scale in Egypt.

Crossbreeding

The Egyptian literature (EL-KHISHIN et al, 1951; SHAWER 1963; AFIFI, 1971; DORA, 1979; KHALIL, 1980; EMARA, 1982; KHALIL et al, 1987ab; HASSAN, 1988; KHALIL et al, 1988) revealed that the local breeds of rabbits (e.g. Giza White, Baladi Red, Baladi White and Baladi Black) showed, in general, lower performance than acclimatized exotic breeds (e.g. Bouscat, Chinchilla, White Giant Flander, Grey Giant Flander) for different productive traits. New standard breeds (e.g. New Zealand White and Californian) were introduced to Egypt and used in cross breeding experiments with local breeds. Results of some of these experiments are available (OUDAH, 1990; YOUSSEF, 1992) and some others are not obtained yet. All these previous findings encouraged the research workers for carrying out different crossbreeding experiments in Egypt using different local and acclimatized exotic breeds of rabbits. These experiments were started since 1971 up to 1990. Moreover, other crossbreeding experiments were carried out by other Egyptian investigators (TAG EL-DIN, 1979; SOLIMAN, 1983; SALLAM and HAFEZ, 1984; KOSBA et al, 1985; EL-SAYED, 1988; EL-QEN, 1988; OUDAH, 1990; YOUSSEF, 1992). These numerous studies of breed comparison and evaluation have been reviewed by AFIFI and KHALIL (1991). Results of these crossbreeding experiments could be summarized as:

1) Crossbreeding between different breeds of rabbits (local and exotic) under the Egyptian conditions was generally associated with an improvement in most economic traits in rabbits (e.g. litter size and weight, mortality, litter gain, mean young weight per litter, postweaning body weights and gain, ... etc.).

2) Heterotic effects in litter traits (e.g. litter size & litter weight) were more pronounced at weaning than at birth.

3) Breed of doe was more important than breed of buck in influencing the performance of crossbred litters.

4) Local breeds (e.g. Giza White & Baladi Red, Black and White) are superior in prenatal abilities while foreign breeds (e.g. New Zealand White, Californian, Bouscat, Giant Flander, Chinchilla, ... etc.) are superior in postnatal maternal abilities.

5) Double crossbred litters or rabbits (i.e. crossbred litters or rabbits produced by crossbred dams) were superior in their performance than those of single crossbreds (i.e. crossbred litters or rabbits produced by purebred dams) or purebreds. This encouraged the commercial breeders of rabbits in Egypt to use crossbred dams instead of pure ones.

(6) Crossbred litters and rabbits resulting from mating bucks of local breeds (e.g. Giza White, Baladi Red, Black and White) with those does of exotic breeds (e.g. New Zealand White, Californian, Chinchilla, Bouscat, ... etc.) showed considerable positive heterosis for most economic traits in rabbits, while crossbred litters and rabbits mothered by does of local breeds showed negative heterosis in most cases.

Prospects for future research

1) Reproductive traits (i.e. age at first kindling, kindling to first service interval, insemination period, days open, ovulation rate, uterine capacity, embryonic mortality, kindling interval) in pures were not investigated in Egypt and therefore more future investigations are needed.

2) Heterotic effects on lactational traits of different breeds (i.e. milk, fat and protein yields and lactation length and curve) need further investigation.

3) Rabbit production systems including social, economic and technical aspects need a though analysis and characterization to identify the real constraints in the system and how to overcome them.

References

AFIFI, E.A. (1971): A study of some economical and productive characters in some breeds of rabbits and their crosses. Ph.D. Thesis, Fac. of Agric., Ain-Shams Univ., Egypt.

AFIFI, E.A. and KHALIL, M.H. (1991): Crossbreeding experiments of rabbits in Egypt: Synthesis of results and overview. Options Mediterraneennes-Serie Seminaires, 17: 35-52, Spain.

BADAWY, A.G. (1975): Rabbit raising. Central Administration for Agricultural Culture, Ministry of Agriculture, Egypt. (2nd Edition, In Arabic).

CAPMS (1993): Central Agency for public Mobilization and Statistics. Statistics of Animal Wealth, Reference No. 71-12412/93, Egypt.

CHEECKE, P.R., (1986): Potentials of rabbit production in tropical and sub tropical agricultural systems. J. Anim. Sci., 63(5), 1581-1586.

DORA, T.M. (1979): Body size, feed efficiency and meat production in White Baladi, Bouscat and their crossbreds. M. Sci., Thesis, Mansoura Univ. Egypt.

El-Desoki, A.E.M. (1991): Study of the effect of some genetic and environmental factors affecting meat yield from some foreign and local breeds of rabbits and their crosses. M.Sc. Thesis, Fac. Agric., Mansoura Univ., Egypt.

EL-KHISHIN, A.F., BADRELDIN, A.L., OLOUFA, A.A. and KHEIR-ELDIN, M.A. (1951): Growth development and litter size in two breeds of rabbits. Bull. No. 2, Fac. of Agric., Cairo Univ., Egypt.

EL-MAGHAWRY, A.M. (1990): Genetic and Environmental factors affecting performance of broiler rabbits. Ph. D. Thesis, Fac. Agric., Zagazig, Univ., Zagazig, Egypt.

EL-QEN, R.Y.N. (1988): Genetic and environmental studies on rabbits. M. Sc. Thesis, Fac. Agric., Tanta University, Egypt.

EL-SAYED, H.M. (1988): Effect of breed crossing and feeding system on the meat production of rabbits. M. Sc. Thesis, Fac. of Agric., Zagazig Univ., Egypt.

EMARA, M.E.A. (1982): Effect of crossbreeding on some productive traits in rabbits. Ph.D.

Thesis, Fac. of Agric. Moshtohor, Zagazig Univ. Banha Branch, Egypt.

FINZI, A. (1987): Technical support to agricultural development and settlements in West Noubaria-Egypt. FAO Projects EGY/85/001.

FINZI, A. and AMICI, A. (1991): Traditional and alternative rabbit breeding systems for developing countries. Rivista di Agricultura Subtropicale e Tropicale, 6(1): 103-125.

HASSAN, N.S. (1988): Reproduction of New Zealand rabbits. M. Sc. Thesis, Fac. Agric., Cairo University, Egypt.

HILMY, A.F. (1991): Some productive aspects in rabbits. M.Sc. Thesis, Fac. of Agric., Moshtohor, Zagazig Univ., Egypt.

KHALIL, M.H. (1980): Genetic and environmental studies on some productive traits in rabbits. M. Sc. Thesis, Fac. Agric. Sci., Moshtohor, Zagazig Univ., Egypt.

KHALIL, M.H. (1993): Descriptive model for rabbit genetic resources data bank. World Rabbit Science, 1(4): (In press), France.

KHALIL, M.H. (1994a): Diversity of repeatability between parities for litter traits and reproductive intervals in doe rabbits. World Rabbit Science, 1(4): (In press), France.

KHALIL, M.H. (1994b): Lactational performance of Giza White rabbits and its relation with preweaning litter traits. Animal Production, 59: 111-115.

KHALIL, M.H., OWEN, J.B., and AFIFI, E.A. (1987a): A genetic analysis of litter traits in Bouscat and Giza White rabbits. Anim. Prod., 45: 123-134.

KHALIL, M.H., AFIFI, E. A., and OWEN, J.B. (1987b): A genetic analysis of body weight traits in young Bouscat and Giza White rabbits. Anim. Prod., 45: 135-144.

KHALIL, M.H., SOLIMAN, A.M. and KHALIL, HAMDIA, H.(1993): Litter-size correction factors and some genetic aspects of postweaning growth in New Zealand White and Californian rabbits. Egyptian Journal of Rabbit Science, 3(2): 199-217.

KHALIL, M.H., AFIFI, E. A., EMARA, M.E. and Owen, J.B. (1988): Genetic and phenotypic aspects of doe productivity in four breeds of rabbits. J. Agric. Sci., Cambridge 110: 191-197.

KOSBA, M.A.; FARGHALY, M.M.; HAMDY, S.; EL-EZZ, Z.A. and KAMEL, F.N. (1985): Two-and three-way crossing effect on body weight in rabbits. Egyptian J. of Genetics, 14(1): 27-34.

LUKEFAHR, S.D., NWOSU, C.V. and RAO, D.R. (1989): Cholestrol-level of rabbit meat and trait relationships among growth, carcass and lean yield performances. J. Anim. Sci., 67: 2009-2017.

MOHAMED, K.I. (1989): Studies on some productive traits in rabbits under the environmental conditions of El-Minia Governorate. M. Sc. Thesis, Fac. Agric., El-Minia Univ., Egypt.

OUDAH, S.M. (1990): Studies on some rabbit breeds and their crosses. M. Sc. Thesis, Fac. of Agric., Mansoura Univ., Egypt.

OZIMBA, C.E. and LUKEFAHR, S.D. (1991): Comparison of rabbit breed types of postweaning litter growth, feed efficiency and survival performance traits. J. Anim. Sci., 69: 3494-3500.

REDDY, N.V., RAO, D.R. and CHEN, C.P. (1977): Comparative performance of rabbits and broilers. Nutrition Reports International, 16(1): 133-137.

SALLAM, M.T. and HAFEZ, M. (1984): The effect of crossbreeding on post-weaning growth and slaughter traits for rabbits. Annals of Agric. Sci. Moshtohor, 22: 91-103, Egypt.

SEDKI, A.E. (1991): Some behavioral studies on rabbits. M.Sc. Thesis, Fac. Agric., Zagazig Univ. Egypt.

SHAWER, M.F.K. (1963): A comparative study of production traits between Egyptian and standard bred breeds of rabbits. M. Sc. Thesis, Fac. Agric., Alexandria Univ., Egypt.

SOLIMAN, F.N.K. (1983): Genetic and physiological studies in rabbits. The effect of crossing on rabbits performance. M. Sc. Thesis, Fac. of Agric., Alexandria Univ., Egypt.

TAG EL-DIN, T.H. (1979): A comparative study of reproduction, mortality and body weight in White Baladi and Bouscat rabbits and their crossbred. M. Sc. The sis, Fac. of Agric., Mansoura Univ., Egypt.

YOUSSEF, M.K. (1992): The productive performance of purebred and crossbred rabbits. M.Sc. Thesis, Fac. of Agric., Moshtohor, Zagazig Univ., Egypt.

Table 1. Relevant rabbit statistics in Egypt+.

Statistic	Year				
	1980	1984	1988	1990	1992
Rabbit population for small-holders (000's):	1994	5553	6231	6591	6966
Rabbit population in large projects/commercial (000's):	--	260	805	780	720
Population in large projects relative to small-holders stock (%):	--	4.5	12.9	11.8	10.3
Rabbit population as % of poultry++	5.6	5.9	7.1	7.0	7.1
Rabbit meat production (Metric tons):	16	20	34	39	37
Contribution of rabbit meat to the total meat output (%):	2.3	2.4	3.5	4.0	3.6
Per capita consumption per year of rabbit meat (kg):	0.2	0.2	0.6	0.7	0.7
Per capita consumption per year of rabbit meat relative to total meat (%):	2.0	2.0	4.2	4.8	3.7

+Source:
1- Central Agency for public Mobilization and Statistics, 1990 (CAPMS, 1993), Egypt.
2- Central administration for Animal Production, Ministry of Agriculture, Unpublished data 1992, Egypt.
3- FAO yearbook 1991, FAO statistics series No. 104.
++Including chickens, turkeys, ducks, geese and pigeons.

Table 2. Meat production of bunnies in conventional and intensive systems of production in Egypt.

Item	Production system	
	Conventional	Intensive (commercial)
Weight of adult female (kg)	3.2	4.2
Number of litters born per doe per annum	3.4	7.3
Bunnies born per doe per annum	22	48
Average total litter weight at birth per annum (kg)	1.2	2.75
Bunnies weaned per doe per annum	18	38
Average total litter weight at weaning per annum (kg)	6.2	14
Ratio of weight of bunnies born per doe's weight	0.38	0.65
Ratio of bunnies weight at weaning per doe's weight	1.94	3.3
Rabbits marketed per doe per annum	14	32
Carcass weight of offsprings per annum (kg)	19.3	44
Carcass weight in relation to doe weight	6.0	10.5

Table 3. Means of different doe traits in local germ plasm and New Zealand White and Californian rabbits

Trait	Local germ plasm+					New Zealand White		Californian	
	GW	R	W	B	GB	Egypt	Europe++	Egypt	Europe++
Reproductive intervals:									
Age at first kindling (month)	9.5	9.5	9.0	9.0	na	6.2	5.6	.3	5.8
Days open	18	28	22	27	28	21	12	22	14
Kindling interval (days)	49	56	52	55	61	53	44	52	56
Litter size traits:									
Size at birth	6.7	6.2	5.8	5.5	6.8	7.5	11.0	7.4	10.0
Number born alive	6.0	6.0	5.4	5.2	6.3	7.3	8.4	7.2	8.5
Size at 21 days	6.0	4.7	na	na	6.0	5.5	7.4	5.6	7.2
Size at weaning (4 weeks)	5.8	4.5	5.5	5.2	na	5.3	6.7	5.4	7.0
Size at weaning (5 weeks)	4.5	4.6	5.3	4.5	5.3	5.2	6.4	5.2	6.6
Litter weight traits:									
Weight at birth (g)	330	322	323	320	460	390	520	380	490
Weight at 21 days (g)	1380	1040	na	na	na	1580	2260	1490	2200
Weight at weaning (4 weeks), g	1700	1548	1324	1780	na	2240	3390	1630	2810
Weight at weaning (5 weeks), g	1950	1781	1680	1800	2260	2860	3920	2100	3210
Average weight per litter:									
Weight at birth (g)	55	53	50	58	na	62	75	58	72
Weight at 21 days (g)	250	235	na	na	na	320	350	280	340
Weaning weight (4 weeks), g	340	335	250	330	na	420	560	410	540
Weaning weight (5 weeks), g	430	405	300	425	540	510	650	485	650
Mortality rate:									
Stillbirth %	5	7	2	3	3	3	11	4	14
Preweaning mortality (4 weeks), %	25	34	11	22	na	22	16	28	18
Preweaning mortality (5 weeks), %	37	35	13	14	16	25	20	34	26
Lactational traits:									
First seven days of milk yield (g)	640	540	na	na	450	840	na	820	na
Milk yield at 21 days (g)	2290	2150	na	na	1735	3200	5300	3300	4800
Total milk yield (g)	3495	3200	1950	na	2720	3800	7500	3660	6600

+ GW= Giza White, R= Baladi Red, W= Baladi White, B= Baladi Black and GB= Gabali. ++ Including only Italy, France and Spain.
na= not available.

Table 4. Means of different postweaning growth and carcass traits in local germ plasm.

Trait	Giza White	Baladi Red	Baladi White	Baladi Black	Gabali
Postweaning body weight (g):					
6-week weight	560	524	460	512	760
8-week weight	790	756	695	744	1250
12-week weight	1150	1183	812	1153	1650
16-week weight	1380	1530	1100	1505	2200
Adult weight	2800	2820	1950	2760	3200
Postweaning daily gain (g):					
6-8 weeks daily gain	14	16	12	17	24
8-12 weeks daily gain	12	13	10	15	22
12-16 weeks daily gain	11	12	9	13	21
Body measurements at 12 weeks of age (cm):					
Body length	25.0	27.7	na	28.3	na
Chest width	11.5	12.8	na	12.7	na
Thigh circumference	9.0	10.5	na	11.1	na
Carcass traits at 16 weeks of age:					
Hot carcass weight (g)	710	873	520	948	na
Dressing percentage	50.0	48	48	50	na
Front part (g)	180	202	170	198	na
Front part %+	38	39	34	34.5	na
Hind part (g)	185	201	182	205	na
Hind part %+	39	39	37	40.6	na
Loin weight (g)	99	108	85	105	na
Loin %+	24	21	29	26.5	na
Boneless meat %	80	78	76	83	na
Giblets weight (g)	78	83	68	90	na
Giblets %++	5.6	5.3	6.1	5.1	na
Head weight (g)	91	97	82	97	na
Head %++	6.5	6.2	7.4	5.5	na
Fur weight (g)	211	154	125	160	na
Fur %++	15	14.6	11.4	14.5	na
Blood weight (g)	55	57	52	58	na
Blood %++	3.9	3.7	3.5	2.7	na
Viscera weight (g)	320	340	295	345	na
Viscera %++	22.8	25.8	26.8	28.3	na

+Percentages relative to hot carcass weight.
++Percentages relative to preslaughter weight.
na= not available.