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Review of Sheep and Goat Research and Development in Egypt since the Forties: I- Introduction and Utilization of Temperate European Sheep Breeds

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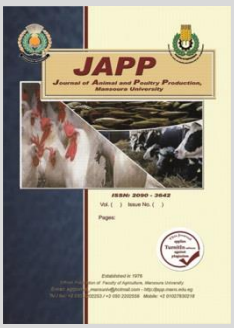

ABSTRACT

Number of European sheep breeds were introduced to Egypt since the forties. The breeding plans involved assessing their performance under Egyptian conditions; and to upgrade the local breeds. Suffolk - crosses with Ossimi (Sc), performed better than both parents, heavier body weights and longer breeding season. Low Sc was suitable for the Egyptian conditions than high Sc. Hampshire crosses with Ossimi did not perform well and were not recommended. Crosses of Fleisch Merino (Mc) with Ossimi or Barki were better than both parents. Individual heterosis contributes highly to the 1st cross, and maternal heterosis contributes to the backcrosses. Merino crosses mate each 8 months, with better performance in May mating, in consistent with their oestrus activity. Crossing Rahmani (R)and Ossimi (O) with Finn landrace (F) sheep, improved prolificacy of the 1st crosses by 69 and 65 % in FR and FO, respectively, and by half these values for the 1/4 Finn crosses with ability to mate each 8 months, they performed well with the smallholders in the villages. Romanov breed (V) improved annual fecundity of 1/4 VR by 25%, having slight advantage over the Finn-cross. Chios crosses with Ossimi were better than their mid-parent and weaned heavier lambs.

Keywords: Sheep, Egyptian breeds, European breeds, Crosses.

INTRODUCTION

Starting by the forties, number of standard European breeds were imported to Egypt, mainly by Ministry of Agriculture, in an attempt to improve lamb production from local sheep breeds, starting by the standard British mutton breeds. The breeding program involved assessing the performance of the imported European breeds under sub-tropical Egyptian conditions, together with upgrading the main local breeds (Ossimi, Barki and Rahmani) with the imported breeds. The earliest results reported by Sidky (1948) showed high improvement in lamb production of Ossimi sheep by crossing with the mutton British breeds (Suffolk or Hampshire). The sixties were the era of the Merinos, which was imported by different research and developing organizations, for improving lamb and wool production from local breeds (Ossimi and Barki. The main breeding objective in the eighties was to utilize the prolific sheep breeds (Finn, Romanov and Chios) for improving lamb production. All these trials were ceased early, therefor it is of most important to review the results of these interest trials before planning any future sheep breeding program in Egypt, and other subtropical countries, where the issue of breeding adapted low producing local breeds, versus the high producing low tolerant exogenous ones, is widely debated. The article will be followed by part II on the performance of the local breeds, and their adaptability to the prevailing sub-tropical conditions and expected climatic changes.

RESULTS AND DISCUSSION

Mutton breeds:

Suffolk sheep:

The main trial with the Suffolk sheep was carried out by Ministry of Agriculture. There were two importations of the Suffolk from UK; the 1st one in 1940 of four rams, the second was in 1948, and involved the importation of 50 purebred Suffolk ewes and rams. The flock was raised at El-Gimmezah farm in Mid-Delta. The breeding program involved upgrading the local fat tailed Ossimi sheep, as the most common breed in the country with Suffolk sires up to 15/16 Suffolk. Some individuals with higher percent of Suffolk blood were also produced. Starting from 1957, the Suffolk crosses were inter-se mated, and considered as Suffolk crossbred flock (Sc) of 70-90% Suffolk blood (Aboul Naga, 1978; El Shobokshy and Aboul Naga 1978). The authors studied the performance of the Suffolk crossbreds versus the local Ossimi and the Suffolk. The results indicating insignificant differences in the reproductive performance of the Suffolk sheep and the local Ossimi, where the crossbred ewes performed better than both parents. The hybrid vigour expressed the highest fertility and the lowest incidence of twinning. The main differences between the breeding groups were in their breeding season. All the Suffolk ewes showed anoestrous period from late January till late July, similar to its performance in the home country (Hafez,1952), while the local Ossimi showed oestrous activity all the year around (Fig. 1).

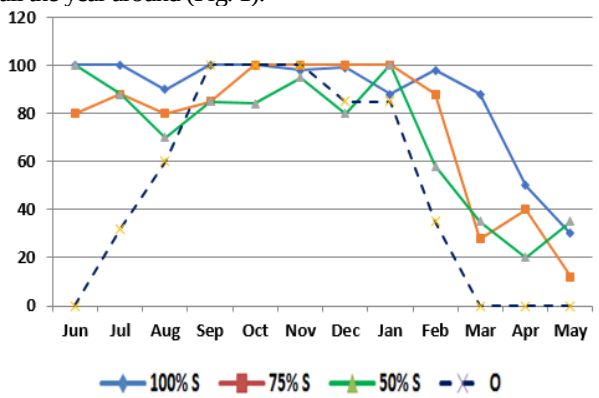

Fig. 1. Oestrous activity around the year for Suffolk crosses vs, Ossimi

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Better performance of Suffolk crossbreds was confirmed by Aboul Naga et al. (1985 a, b; Aboul Naga and Aboul Ela, 1987) on different Suffolk crossbred group (Table 1).

Table 1. Reproduction performance of different Suffolk crossbred groups.

Suffolk (%)	No. of ewes	Conception (%)		Lambs born		multiple birth /ewe		lambs weaned	
		X	S *	*X*	S*	*X*	S*	*X*	S*
40-49	239	0.91	28.2	1.05	29.6	0.15	4.6	1.06	6.0
50-59	128	0.84	18.3	0.97	19.8	0.14	4.0	1.01	1.0
60-69	94	0.84	18.3	1.00	23.5	0.19	8.6	0.98	-2.0
70-79	322	0.83	16.9	0.94	16.0	0.13	1.4	0.99	-1.0
80-89	372	0.78	9.9	0.91	12.3	0.14	3.8	1.03	3.0
90-99	148	0.78	7.0	0.89	9.9	0.15	3.7	0.94	-6.0

*** Superiority percentage over local Ossimi ewes**

Low Suffolk cross (35-45%), weaned 21% more lambs /ewe joined than the local Ossimi, being heavier by 7.7, 14.2, and 17.1% than the Ossimi at birth, weaning and yearling weights. They have extended breeding season and cycling more regular than the Ossimi. They were inter-se mated for number of generations, therefore their advantage cannot be attributed to heterotic effect, but rather to the advantage of combining regular cycling of the temperate parent, and the prolonged breeding season of the sub- tropical parent. Ewes' reproduction performance and lamb production declined with increasing the percentage of Suffolk blood. Mating the Suffolk crossbred each 8 months, showed significantly better performance for September mating, followed by January mating (Table 2, Aboul -Naga and Aboul-Ela, 1987). Analysing the records of the Sc flock from 1957-1966, Labban, et al. (1970) reported lambing rate of 113.5% for the Suffolk cross, with no significant year or age differences. Carcass quality improved with increasing Suffolk blood.

Table 2. Reproductive performance of Suffolk(S) crosses in different mating seasons.

Breed group	June – Aug.	Sept. – Feb.	March – May	Overall year
S	25.1	78.2	0.0	44.9
75% S	67.7	82.2	18.8	62.4
50% S	93.2	87.9	50.8	80.0
O	72.0	74.2	29.2	61.7

Concerning fattening performance, Suffolk crossbred lambs gained slightly better weight than the Ossimi (Aboul-Naga and El-Shobokshy, 1974). They have significantly heavier and better carcasses, where Ossimi was of more leanly carcass. Feed conversion efficiency and Performance of Sc ewe-lambs was studied by Gaber (1978) and Aboul Naga et al. (1980) under different levels of feeding. Low Suffolk cross (35-45% Sc) was of better growth and reproduction performance than high Sc (70-90%), differences increased with advancing age. Crossbred groups were intermediate between the two parents.

Physiological responses of Suffolk to heat stress was studied by El-Sheikh et al. (1981), in comparison with local breeds. After 2 h exposure to direct solar radiation, respiration rate and rectal temperature of the Suffolk increased detectably than the local breeds (147 vs. 90-100 Res./min). The authors concluded that the Suffolk sheep is less adapted to heat stress than the local breeds but was better than other temperate European breeds (Finn and Ile-de-France). The Suffolk crossbred flock was kept as experimental animals till the nineties, when the trial was completely ceased.

Hampshire sheep:

In 1948, four rams and 24 ewes of Hampshire (H) sheep were imported from UK by Ministry of Agriculture and raised at Mehallet-Mousa farm in mid-Delta (Aboulnaga and Afifi,1980). The breeding plan was to upgrade local Ossimi sheep with the Hampshire up to 7/8th H. Some other crosses were further produced (3/8th H and 5/8th H) as well as the inter-se mating of the 1st cross. Purebred Hampshire performed less than the local Ossimi, they weaned 0.56 lambs/ewe, vs. 0.82 lambs for Ossimi ewes in May mating. The authors attribute these findings to the restricted breeding season of Hampshire sheep. The H cross ewes showed better reproduction performance than the pure Hampshire but were inferior to the Ossimi (Table 3). The best cross was the 1st crossbred; and the performance declined with increasing Hampshire blood. Lamb performance improved in the recombined crossbred groups (3/8 H & 5/8 H). Hampshire crosses gave better and heavier fleeces than the Ossimi. Labban et al. (1970) reported lambing rate of 112.1% for the Hampshire crossbred ewes, with insignificant year and age differences. In conclusion, Hampshire did not improve lamb production of local subtropical breeds, but only increased fleece weight; and the trial was ceased in 1967 (Aboulnaga and Afifi, 1980).

Table 3. Production performance of Hampshire and their crosses with Ossimi.

Breed group	No ewes	Ewes conceived	lambs born/ ewe	Lambs wean. /ewe	fleece wt. (kg)	120-days wt. (kg)	Yearling wt.(kg)
Ossimi (O)	115	0.76 ± 0.09b	1.20 ±0.08^{a}	0.87± 0.13^{b}	1.43±0.14^{b}	18.89±0.54^{a}	33.35± 1.06a
½ H O	145	0.72 ± 0.07b	1.22± 0.07a	0.71±0.09^{bc}	1.99±0.10^{b}	20.37±0.72^{ab}	33.58± 1.32a
¾ H.O	36	0.52± 0.13b	1.34± 0.12a	0.51± .26ab	2.07±0.20^{c}	18.86± 1.7^{ab}	37.82± 4.68a
5/8 H O	66	0.68 ± 0.08b	1.15± 0.07a	0.52 ±.10ac	2.08±0.11^{c}	20.73 ±0.82^{b}	34.71± 1.47a
Hampshire(H)	45	0.32 ± 0.10a	1.11± 0.11a	0.31± 0.13a	1.56±0.22^{a}	-	-

***Estimates followed by the same symbol do not differ significantly (p < 0.05)**

Merinos' sheep:

Merino sheep was first introduced to Egypt in large numbers by Mohmed Ali Pasha around 1840 A.D., with the objective of producing fine wool locally and establishing fine-wool textiles manufacture. It was very innovative trial, but it did not progress and seems to be considered not successful. Merinos' introduction was followed in the sixties by number of rese and development organisations (Ministry of Agriculture, Desert Research Center, Alexandria University, and Meat & Milk Organisation), in attempts to improve both lamb and wool production from local breeds. The main findings of these trials were:

Fliesch Merino sheep:

Ministry of Agriculture had imported Fliesch Merino flock (360 ewes and 40 rams) from East Germany in 1960. Introducing the Fleisch Merino sheep has been the most significant trial with the European breeds in Egypt. The objectives were to assess their performance as fine wool breed under Egyptian subtropical conditions and cross them with white coarse wool fat- tailed breeds (Ossimi and Barki), to improve their lamb and wool production (Aboul Naga, et al., 1968; Ghoniem et al., 1968; Aboulnaga et al., 1972; El-Shobokshy et al., 1976). The flock was raised at Sakha Farm in mid-Delta, the breeding plan was to cross Ossimi and Barki

breeds with the Merino up to 3/4 M, which thought to be the appropriate cross for establishing a new strain of medium wool, and retain the adaptability of the local breeds to the prevailing sub-tropical conditions.

Crossbred ewes and lambs were of better performance than both purebred parents (Table 4). Individual heterosis contribute highly to the performance of the 1st cross, while maternal heterosis contribute largely to the performance of the backcrosses (Aboul-Naga, et al., 1972; Aboul-Naga, 1974; Aboul-Naga, 1975; Galal at al., 1972). Individual heterosis diminished remarkably with the inter-se mating of the 3/4 M, which was compensated partly by the recombination effect (Aboul-Naga, et al., 1973).

Generally, Barki crosses with Merino were of less advantage than the Ossimi crosses, especially in lamb liveability. Barki cross line was ceased in 1975, and the breeding plan was revised toward backcrossing to the local Ossimi to produce 1/4MO. Performance of 1/4 Merino cross was not around that of the 3/4 Merino; and their inter-se mating for number of generations, did not diminish their performance, as happened with the Merino backcross. Starting from 1970, the Merino flock was bred each 8 months (September, May, and January) compiling with the local breeds. Purebred Merino weaned more lambs / ewe joined than the local ewes. Merino lambs performed somewhat better than both Ossimi and Barki lambs, except for lamb survival. Merino performed detectably better in the Autumn than the local Ossimi, mainly through more multiple births. Aboul-Naga et al. (1985) reported differences between long seasonal temperate Merino ewes and the local subtropical Ossimi in their oestrous activity, with the ability of the Merino to extent their oestrous activity till March, and to start their breeding activity early in May (Fig 2). When the crossbreds were mated each 8 months, annual lamb born / ewe joined was 1.30 for 1/4 M vs. 1.11 for Ossimi. Their advantage over local ewes was more detected in May mating (90.86 vs. 67.68); these are in compilation with their oestrus activity pattern vs. the Ossimi and other Merino crosses.

Table 4. Production performance of Merino, Ossimi, Barki and their crosses.

Breed group	No.	Ewes conceive	Lambs weaned	Multiple births	120-days wt. (kg)	Yearling wt. (F)	fleece wt (F).
Merino (M)	2555	0.90±0.01 a*	0.80± 0.02a	0.18± 0.01a	18.51± 0.15a	31.29± 0.26a	1.43± 002a
Ossimi (O)	1033	0.86± 0.01b	0.81 ± 0.02a	0.12± 0.02bc	19.06± 0.16a	33.37± 0.31a	0.98± .02
Barki (B)	603	0.88±0.02ab	0.80± 0.02a	0.00± 0.02d	18.42± 0.20	33.18±0.39ab	0.92± .03
MO	822	1.04± 0.01	1.08± 0.02a	0.17 ± 0.02ab	23.84± 0.22	39.40± 0.37	1.88±.03
MB	477	1.01±0.02cd	0.96 ± 0.02b	0.07 ± 0.02c	20.94± 0.25c	34.93±0.46cd	1.54±.04bcd
¾ M ¼ O	698	1.00± 0.02d	0.94± 0.02b	0.17± 0.02ab	22.55± 0.22	35.76± 0.36c	1.85± .03c
¾ M ¼ B	467	0.98±0.03de	0.92 ± 0.02b	0.10± 0.02bc	21.41± 0.28c	33.89±0.47bd	1.68± .04d
(¾ M ¼ O)^2	157	0.96±0.03ad	0.88±0.04ab	0.11±0.03abc	19.57± 0.34b	33.90±0.61bd	1.77±.06b
(¾ M ¼ B)^2	143	0.89±0.03ab	0.83±0.02ab	0.07±0.03abc	18.76± .36ab	32.09±0.63a	1.56±.06ab

Estimates followed by the same symbol do not differ significantly (p < 0.05)

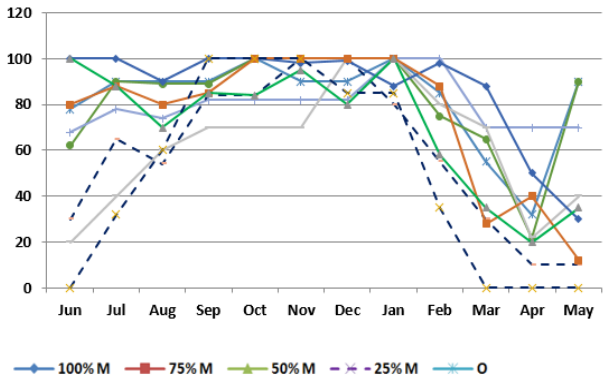

Fig. 2. Oestrous activity around the year for Merino crosses with, Ossimi and Barki

El-Gamal (1975) investigated thermoregulatory performance of the Fliesch Merino and its crosses. Merino was less tolerant to heat and had insignificantly higher skin and body temperature in summer than other crossbred groups. It was followed by the 3/4 M, while the 1/4 M was closer to the local Ossimi.

Breed group and seasonal variation of male performance were examined by Galal et al. (1978) and Aboul Naga and Mansour (1988). Semen characteristics and libido traits were not affected by the breed group, with little evidence of heterotic effect. Meanwhile, semen quality was affected by the season, being of better quality in Autumn and Spring than in Winter and Summer. With the limited advantage of Merino crosses and low adaptability of pure Merino, the trial was ceased early in the eighties.

Another smaller trial of crossing Fliesch Merino with Barki sheep was carried out by Alex. University (El-Kimary,1975). The author reported some advantages of the first cross over the Barki, but these were diminished in the Merino backcross. Shafie and Sharafeldin (1965) investigated heat tolerance of Fliesch and Caucasian Merino, in comparison with the local sheep and other exotic breeds. Caucasian Merino was the most heat tolerant group among the exotic ones, and the least breed to be affected by muscular activity, it showed similar values to the local Ossimi. The Merino was affected greatly by muscular activity.

Hungarian Merino sheep:

The other significant trail of introducing European Merino to Egypt was that carried on by Desert Research Centre with Hungarian Merino. The trial aimed to compare performance of the imported Hungarian Merino with the desert Barki sheep and their crosses under the arid conditions of the Coastal Zone of Western Desert. Galal (1985) reported that Merino had the lowest performance due to its low fertility and high lamb losses. The reported figures for kg weaned /ewe were 5.4 kg for Merino vs. 11.4 for Barki, 10.4 for 1/2 Merino, 9.9 for 5/8 Merino, 9.3 for 3/8 Merino and 7.1 for 1/4 Merino (Table 5). On the other hand, the crosses have heavier fleeces of finer fibres and less kemp content with higher variation in the fibre finesse (Ghanem, 1967).

Table 5. Reproductive performance of Hungarian Merino crosses with Barki.

Trait	EL/EE*	LB/EE	LW/EE	LB/EL
Breed group				
100% Merino	66	70	53	106
50% Merino Barki	93	94	100	101
25% Merino Barki	101	105	103	104

*** EL: ewe lambed; EE: ewe exposed; LB: lambs born; LW: lambs weaned.**

Prolific sheep breeds:

Finnish Landrace sheep:

Finnish Landrace sheep was first imported from Finland in 1974, where 10 Finn rams were imported by El Nahda Development Project (UNDP) and raised under the arid conditions of Coastal Zone of Western Desert. They faced high losses, and the survived Finn rams (4) were transferred to Sakha Farm of APRI in Mid-Delta. They were trained to mate with both Ossimi and Rahmani fat-tailed local breeds to improve their prolificacy. The breeding plan was to produce 1/4 Finn, and inter-se mating them for new synthetic strains of sheep with good prolificacy and adapted to local conditions. The 1/4 Finn is thought to be the appropriate breed group to be raised under the breeders' conditions of intensive agriculture system under subtropical environment. Such crossbreds can be easily propagated using the locally produced 1/2 Finn rams on the breeders' flocks. It has also small fat- tail, which is prerequisite for both breeders and consumers.

The preliminary results of the study encouraged the importation of successive batches of Finn rams and ewes from Finland, in collaboration with FINNIDA, in a long- term collaborative project (1982-1993). Prolificacy was improved by 69 and 65% for 1/2 Finn Rahmani (1/2FR) and 1/2 Finn Ossimi (1/2FO), respectively, than the corresponding local breeds and by half these figures for the 1/4 Finn crosses (Aboul-Naga, 1985; Aboul-Naga et al.,1989; Aboul Naga 1996; Table 6). The resulted 1/4 Finn crosses were mated each 8 months (September, May, and January) in comparison with the local ewes. It showed better conception rate than the locals their superiority expressed more in the autumn breeding season. Such performance resulted in 85 and 56 % improvement in annual number of lambs produced from the first cross ewes of Rahami and Ossimi with Finn, respectively; and by 30 and 24 % in the 1/4 Finn cross mated each 8 months. These figures are expected to get higher with advance in age. Early weaning of the lambs at 8 weeks, shortened the lambing interval and increased frequency of lambing within its life span (Shehata, 1996).

Oestrus activity and ovulation rate of the imported Finn ewes and their crosses were studied. Oestrous activity of the 1/4 Fin was detectably higher than the pure Finn over the period from June to September (Fig. 3). Both local ewes were more regular in their oestrus activity. Ovulation rate of the 1/4 Finn averaged 2.05±0.33 vs. 1.51±0.19 for the local Ossimi. Finn crosses showed substantial improvement in prolificacy over local breeds, however, it was less than that expected according to the additive models, especially for the 1st and higher crosses (Mansour and Aboul Naga, 1988). Lamb performance of the Finn crosses was satisfactory for the breeders; however, their fat-tail were drastically reduced, against the preference of the consumer (Shehata, 1996).

An interest trial was further carried out in collaboration with Finnish Animal Breeding Research Institute, over group of half-sib Finn ewes, where half of them were kept in Finland and the other half was transferred to Egypt (Aboul -Naga et al 1984) to assess their oestrous and ovarian activities over the year. Percentage of ewes in oestrus and ovulation rate were high in both countries from October till May. However, Egypt group had less oestrous activity at the start and the end of the breeding season, with an extended breeding season in 50% of the ewes (Fig 4). The authors concluded that, even with the wide differences in day light length between the two locations, Finn ewes were not able to overcome the inherited physiological seasonal rhythm in the Finn Landrace.

The half- sibs Finn ewes were used further to investigate their physiological response to heat stress under the subtropical conditions (Aboul Ela et al., 1987; Shalaby, 1996). Rectal temperature and respiration rate were significantly higher (P<0.01) in Egypt group than in the Finland group, where serum T3 and T4 concentrates were consistently and significantly lower in Egypt than in Finland, indicating high heat stress under the prevailing subtropical conditions on the temperate Finn sheep. Physiological performance of the Finn crosses under the subtropical condition was further studied by El Sheikh et al. (1981) among other temperate breeds (Suffolk and Ille de France,) and their crosses with the local breeds (Barki, Ossimi, and Rahmani). Finn sheep was significantly the least adapted one among all the studied breeds (Table 8)

Table 6. Performance of Finn (F) crosses with Ossimi (O) and Rahmani (R).

Breed group	No.	Ewes conceived	Lamb born/ Ewe mated	Lambs born/ ewe lambed	No lambing / year	Lambs born/ewe/ year
R	775	0.715	1.01	1.37	1.07	1.47
FR	151	0.880	1.73	2.06	1.32	2.72
FR.R	160	0.826	1.14	1.54	1.24	1.91
R.FR	284	0.781	1.20	1.50	1.17	1.76
(FR.R) [2]	104	0.707	1.15	1.54	1.06	1.63
FO	77	0.768	1.48	1.93	1.15	2.22
O	411	0.743	0.98	1.28	1.11	1.42
FO.O	108	0.824	1.13	1.42	1.24	1.76
O.FO	40	0.847	1.31	1.55	1.27	1.97

Table 7. Analysis of 18 successive seasons (each 8 moths) for Finn crosses.

Breed group	No.	EL / EE*	LB / EL	LW / EE / year
Finn (F)	46	0.50	2.43	1.32
Rahmani (R)	1512	0.72	1.31	1.23
FR	743	0.77	1.68	1.65
R.FR	513	0.80	1.42	1.50
FR.R	428	0.80	1.44	1.49
(¼ F.R) [2]	741	0.76	1.40	1.40
Ossimi (O)	613	0.68	1.22	1.08
FO	382	0.75	1.52	1.47
O.FO	316	0.72	1.41	1.34
FO.O	229	0.80	1.34	1.37
(¼F.O) [2]	66	0.55	1.42	1.58

*** EL: ewe lambed; EE: ewe exposed to ram; LB: lambs born; LW: lambs weaned**

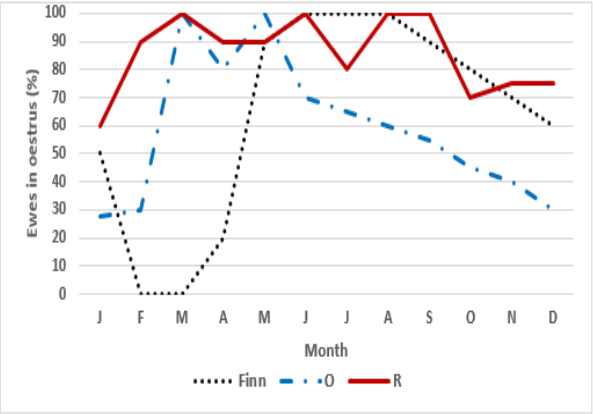

Fig. 3. Oestrous activity of Finn ewe's vs local Ossimi and Rahmani

Table 8. Rectal temperature (RT), respiration rate (RR) and tolerance index for local and exotic breeds under Egyptian conditions.

Breed	RT	RR	Heat tolerance index*
Barki	39.5	70.9	79.1
Rahmani	39.3	57.0	82.9
Ossimi	39.3	60.5	81.6
Finnish	40.8	117.7	55.9
Ile-de-France	39.9	120.1	71.2
Suffolk	40.2	105.8	65.4

***Tolerance index**: =RT/38.3 + RR/23

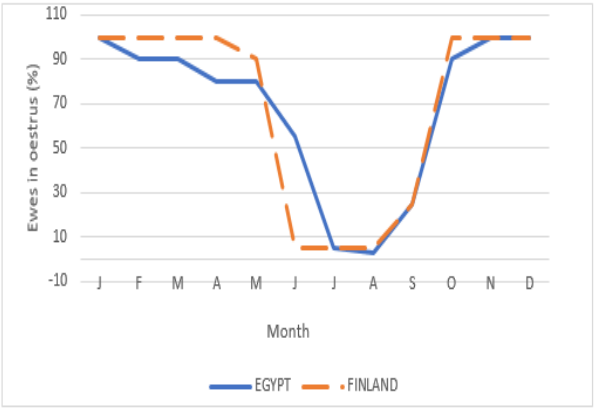

Fig. 4. Oestrus activity of Finn ewes in Egypt vs their half-sibs in Finland

Almahdy et al. (2000) evaluated the life cycle performance of flocks of Rahmani, Ossimi, and their crosses with Finn sheep mated once / year and those mated each 8 months. They concluded that introducing Finn sheep to Egypt improved both biological and economic efficiency of the sheep flocks, either under annual or accelerated mating. First FR cross was the most efficient group; however, the second generation cross (1/4 FR) was easier to maintain and propagate with the breeders. Finn-Ossimi cross performed well under accelerated mating.

With the encouraging results of the 1/4 Finn crosses in the experimental farms, number of farm trials were carried out from 1982 to 1990 to verify the performance of the Finn crosses with the breeders under intensive agriculture conditions (Sharkia Governorate, 77 breeders, Ismailia Governorate .26 breeders, and Nubaria zone 15 breeders) (Metawi,1996). It was carried out in two ways, the first was by disseminated 1/2 Finn rams to medium and large breeders to produce 1/4 Finn crosses in their farms (around 100 rams annually). Another way was to provide small farmers with 3-4 1/4 Finn ewes + one ram. The breeders were running the rams with the ewes all the time. Crossbreds' performances were followed for 4 successive years. Number of lambs born averaged 1.65 lamb/ewe lambed, with a clear trend of advancing with age. Annual number of lambs born was 2.2/year, and annual lambs weaned was 1.6 /year, which was satisfactory for lamb production under breeders conditioned (Aboul–Naga, 1988).

Metawi and Shehata (1994) analysed the performance of 1/4 Finn under the breeders' conditions. They concluded that introducing genotypes of good potentially to the breeders should accompanied by proper feed allowances to exhibit its better performance. Galal et al. (1996) investigated biological and economic efficiency of using Finn crosses by the small breeders 'in mid-Delta, they stated that the prevailing system is evolved to take care of the incidence of multiple births up to 30 %, anything higher than that was matched by raising management level. They added that Finn crosses are able to reproduce all year round and that continuous availability of the ram with the flock (as normally practised by the breeders) favoured considerably the economic performance of the farm and is recommended to continue under the traditional breeders conditioned. With the end of collaborative project, the flock was down sized, with no further introduction of pure Finn germplasm.

Intensive lamb production project:

Another trail utilized Finn Landrace sheep for improving prolificacy of Rahmani, Ossimi, and Barki sheep was carried out in the eighties by Al-Azhar University, sponsored by National Academy of Science and Technology, for intensive lamb production from local sheep. The breeding plan was to cross the 3 main local breeds; Ossimi(O), Rahmani (R) and Barki(B) with Finn rams (F) and use the 1st cross ewes, as dam line, to be sired by Suffolk or Ile de France rams to produce slaughter fat-lambs.

Some administrative problems caused the reduction of the flock size, and the delay of the scheduled plans. The available reports indicated that the Finn cross ewes were mated each 4 months, and those failed to conceive joined the next mating (Zahed, 1988). Finn crosses showed better fertility than the local B and R, they gave higher multiple births than the locals (Table 9). The advantage of the Finn cross was more detectable in LB/EE/yr.(lambs born/ewe exposed /year) being 41, 45, and 53% for FR, FB, and FO, respectively. FR lambs and FO were heavier at birth and heavier than FB (225, 253 and 176 g /day, respectively). Investigating tolerance performance of different exotic breed to heat stress showed that Finn sheep was the least tolerant temperate breed to the subtropical conditions, followed by Ile de France, where the Suffolk was reasonably adapted (Table 8, Zahed, 1988).

Table 9. Performance of Finn crossbred ewes vs. local ewes in the Al Azhar trial.

Breed	No.	LE/EE*	LB/EL	L/yr.	LB/EE/year
Rahmani(R)	1951	0.41	1.10	1.04	0.86
Ossimi(O)	2545	0.52	1.07	0.95	0.83
Barki(B)	1903	0.40	1.07	1.02	0.64
F.R	33	0.49	1.30	1.00	0.96
F.O	68	0.55	1.46	1.04	1.20
F.B	78	0.52	1.25	1.19	0.98

***EL: ewe lambed; EE: ewe exposed; LB: lambs born; L: lambing**

Aboul-Naga (1988) reviewed the results of introducing Finn sheep to the subtropical Near East conditions (Egypt, Israel, Lebanon, Iraq, and Libya). He concluded that raising pure Finn sheep is not recommended for the subtropical conditions, while their crosses especially low Finn crosses proved to be well adapted to these conditions, and produced more lambs, and can be utilized successfully to improve lamb production from local sheep. Annual fecundity was the best indicator for the reproductive performance of the produced crosses, as it involves their ability to breed more than once /year together with their high prolificacy.

Globally, Finn sheep had been introduced to more than 40 countries around the globe, especially Western and Eastern Europe, North and South America, and Oceania's, Maijala (1988) and Fahmy (1996). It had utilized successfully in establishing number of synthetic breeds carrying the blood of the prolific Finn.

Romanov sheep:

Romanov sheep originated in south USSR, the first flock outside USSR was introduced to France, and then to many countries, include Egypt. It is Black in colour which change to grey with advance in age. It was characterized by early sexual maturity, long sexual season, and high letter size (2.4 in average, Ricordeau et al., 1988). It was introduced to Egypt in the eighties. The breeding plan was to cross it with the local Rahmani sheep of dark fleece to produce 1/4 Romanov in comparison with the Finn crosses. The preliminary results showed detectable improvement in the fecundity of the first cross over the local Rahmani (40 %, Table 10), whereas the 1/4 Romanov had advantage of 25% in their annual fecundity (Aboulnaga and Hanrahan, 1989). It has generally some advantage over their contemporary Finn crosses, especially in the live ability of the produced crossbred lambs.

Table 10. Performance of Romanov (V) crosses with Rahmani (R) mated /8 mon.

	Breed group			
	R	V.R	R.VR	(R.VR)2**
Fertility (%)	68.67± 1.7b*	78.03±1.98a	76.09 ± 1.99a	75.3 ± 7.28a
Prolificacy/ewe	1.20 ± 0.02c	1.63± 0.02a	1.45 ± 0.04b	1.42± 0.03b
Lamb survival (%)	86.36±3.88a	85.56 ± 2.8a	84.58 ± 2.71a	82.63± 2.7a
Lambs wean. wt. (kg)	13.26± .32a	11.63±0.24b	11.72 ± 0.25b	11.69 0.25b

Estimates followed by the same symbol don't differ significantly (p < 0.05)** * Inter-se mating group**

The breeding plan was to cross Rahmani ewes with Romanov rams, and backcross it to Rahmani to produce 1/4 V. Inter- se mating the 1/4V to produce new prolific strain adapted to Egyptian subtropical conditions. Data accumulated for 1845 Romanov crossbred ewes were analysed by Metawi (2001). Rahmani ewes weaned heavier lambs than the Romanov cross, whereas the first cross of Romanov give birth to 0.6 more lambs than the 1/4 Romanov, and 1.1 more lambs than the local Rahmani (Table 11).

Table 11. Ewe efficiency during the production cycle of each genotype.

Breed group	Lambs born/ ewe exposed	Lambs weaned/ ewe exposed	Relative efficiency Production /cycle**
R	2.8 ± 0.06c*	2.4 ± 0.06c	0.72 ± 0.02b
V.R	3.9 ± 0.07a	3.3 ± 0.06a	0.92 ± 0.02a
R.VR	3.3 ± 0.09b	2.7 ± 0.09b	0.78 ± 0.03b
$(R.VR)^2$	3.3 ± 0.10b	2.7 ± 0.11b	0.76 ± 0.04b

*** Estimates followed with the same symbol did not differ significant (P<0.05).**
**** Weight of lambs weaned per ewe exposed /ewe body weight**

Inter- se mating of the 1/4 Romanov did not affect its performance. Purebred Romanov give birth to 2.3 lambs/ewe lambed, yet the incidence of high lambs' losses reduced number of lambs weaned significantly. Prolificacy of the 1st cross was less than that expected from the additive contribution of Romanov genes. Discrepancy from the expectation in letter size at birth could be due to early embryonic losses in the high fecundity ewes under the prevailing subtropical conditions (Aboul-Ela and Aboul Naga,1987). Advantage of the crosses in their fertility, indicate positive heterosis in crossing the Romanov with the local Rahmani sheep.

Metawi (2001) investigated the productivity of 1/4 Romanov Rahmani under small farmers conditions (77 farmers) in comparison with the Finn cross. Romanov cross was significantly better than the Finn cross, 1/4 V ewes weaned 0.19 more lambs and 3.11 kg more than the 1/4 Finn cross. It was of interest to observe that the reproduction performance of the Finn and Romanov rosses was quite favourable by the breeders, and of better performance than their correspondence crossbreds in the research farms.

Recent genetic study by Shamaa Hassan et al. (2022) identified number of mutations in GDF9 gene contributing to fecundity in Rahmani cross with Finn and Romanov. The highest variation for GDF9 was in the Romanov, followed by the Finn, then VR and FR crosses. Twenty-nine mutants were detected, 5 of them differentiate between single and multiple births. This finding can be used to predict the fecundity in young crossbred lambs. Romanov crosses have high polymorphism, which favours them over the Finn cross. They concluded that Rahmani cross with Finn and Romanov has good genetic potentiality for multiple births.

Chios sheep:

Chios sheep are fat-tail, course wool sheep, medium size with white body, and black spotted face. They are known for their early sexual maturity, good prolificacy (170-200 %) and good milk production (180-300 kg) (Lysandrides,1981). Some ewes may lamb twice a year. Chios sheep had been recognized as prolific breed in Greece. Their importance for improving lamb production in the subtropics became apparent when the temperate prolific breeds failed to adapt as pure breeds under the subtropical conditions.

Chios sheep was the latest European breed imported to Egypt by mid-eighties from Cyprus, as a Mediterranean breed, and raised by Ministry of Agriculture as adapted breed to the subtropical conditions. The breeding plan was to cross with Ossimi and Awassi subtropical sheep at Malawi Farm, in Upper Egypt. The objective was to produce first crossbred flock, while kept the parents' flocks. Moussa et al. (1994) and Mousa and Marzouk (1994) reported that ovulation rate of the Chios ewes was significantly higher than other breed groups which leads to insignificantly more lamb born and weaned (Table 12)

Morsy (2002) report that the 1st cross Chios with Ossimi has generally better reproductive performance than both parents, they weaned 14% heavier lambs than their mid-parent (Table 13, Mousa et al., 1994). Their privilege was in their good fertility and lamb liveability. Ovulation rate in the Chios was significantly higher than their crosses and both Ossimi and Awassi subtropical sheep.

Table 12. Performance of Chios ewes, Ossimi, Awassi and their 1st crosses.

Breed group	No, of ews	Conception rate	Age at puberty(days)	Weight at puberty (kg)	Lambs born/ ewe lambed	Ovulation rate	Body wt. at mating (kg)
Ossimi (O)	15	75	296,8 a*	41,1 a	1,20	1,47 bc	42,1 a
Awassi (A)	18	69	284,6 a	38,7 a	1,22	1,22 c	37.2 b
Chios (C)	14	70	334,9 b	35,4 b	1,43	2.00 a	40.7 a
CO	18	82	318,8 ab	51,7 d	1,39	1,72 ab	40,2 a
CA	18	78	286.9 a	44 .7 d	1,14	1,39 bc	40.3 a

***Estimates followed by the same symbol don't differ significantly at 5%**

Table 13. Reproductive performance of Chios crosses with Ossimi sheep.

Items	Fertility	Litter size at birth	Litter size at weaning	Litter wt.at weaning	Ovulation rate	Body wt.
Chios (C)	0.65 ± 0.03 a	1.52± 0.04 a	1.30± 0.04 a	17.2± 0.6 a	2.0±0.15a	40.7 ±0.8a
Ossimi (O)	0.67 ± 0.03 a	1.20 ± 0.04 c	1.11 ± 0.04 b	15.3± 0.6b	1.47 ±0.15b	42.1 ±0.8a
CO	0.71 ± 0.01 a	1.49 ± 0.04 b	1.34± 0.04 a	18.5 ± 0.6a	1.72±0.13a	40.2 ±0.7a

***Estimates followed by the same symbol don't differ significantly at 5%propoability**

CONCLUSION

Importation of temperate European sheep breeds to Egypt for improving lamb and wool production of local breeds had faced number of difficulties, which for one reason or another abrupt the trails and caused ceasing all of them. The results were not encouraging for wide implementation of raising them in Egypt or crossing it with the local breeds. The breeding plans involve assessing performance of the European temperate breeds under the sub-tropical conditions, and to utilize them for upgrading the main local breeds (Ossimi, Barki and Rahmani) for better lamb production. The following conclusions can be drawn from different crossbreeding trials with the imported European breeds.

Generally, crossing local breeds with the European ones have some advantage in improving number of lambing born/year, and body and fleece weights. The European temperate breeds were not adapted to the prevailing subtropical conditions and showed low tolerance to heat stress**.**

- First crossbred showed clear hybrid vigour over the mid-parent, which declined in the higher crosses, and with inter-se mating them. Performance of the crosses was less than that expected according to the additive models. Maternal heterosis and recombination have minor effect in the performance of the backcrosses.
- The main advantage of the crossbreds was in their breeding season, which were long (as the local parent), and more regular (as the European parent). These allow them to mate successfully more than once/year. Annual lambs produced was the right indicator for assessing the performance of the crosses, as it involves their ability to breed more than once/year, their prolificacy and lamb liveability. The main disadvantage of the crossbreds was the dramatic reduction in their fat-tail (except the Chios), which is not preferred by the breeders or consumer.
- Barki crosses has lower advantages compared to the Ossimi crosses in number of lambs weaned, where Rahmani crosses were of better performance than the Ossimi, either in station or under the breeders condition, and of better biological and economic efficiency.
- The prevailing system with the breeders can take care of the incidence of multiple births up to 30 %, anything higher than that, has to be matched by raising the management level.

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عرض مرجعي لبحوث وبرامج تطوير الأغنام والماعز في مصرمنذ الاربعينات :
1-ادخال السلالات الاوروبيه

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الملخص

تم استيراد عددمن سلالات الاغنام من المناطق المعتدلة الاروبيه إلى مصر لتحسين إنتاج الحملان والصوف في السلالات المحلية. تضمنت خطط التربية تقييم أداء السلالات الاوروبيه في ظل الظروف شبه الاستوائية المصرية. وخلطها مع السلالات المحلية الرئيسية (الاوسيمي ، البرقي ، الرحماني) . واظهرت الابحاث النتائج التالية : خليط الاغنام السفولك مع الاوسيمي ، كان أداؤها أفضل من كلا الابوين ، وكانت ميزتها الرئيسية في طول موسم التكاثر .خلطان السفولك منخفضة نسبة الخلط أكثر ملاءمة من تلك مرتفعه نسبه الخلط. لم يكن أداء سلالة الهامبشاير وهجينها مع الاوسيمي جيدًا في ظل الظروف المصرية ، ولم يوصى بها لتحسين إنتاج الحملان من الأغنام المحلية ، كان خلط فليش مرينو مع سلالتي الاوسيمي والبرقي أفضل من كلا الابوين . وساهمت قوه الهجين بشكل كبير في خليط الجيل الأول ، وساهمت قوه الهجين الأمويه في أداء الهجن الرجعية. كانت خلطان البرقي أقل تميزاً من خلطان الاوسيمي . وتزاوجت نعاج خلطان المرينو بنجاح كل 8 أشهر ، مع أداء أفضل في شهر مايو ، مما يتوافق مع نشاطها الشبقي. الخلط مع اغنام الفلندي رفع إنتاجية هجين الجيل الأول بنسبة 69 و 65٪ لخليط النصف رحماني,ونصف الاوسيمي ، على التوالي ، وبنصف هذه القيم في ربع الفلندي ،مع قدرته على التزاوج كل 8 أشهر ، وهو ما كان اداءا مرضيًا لدي المربين. خليط الرومانوف رفع الخصوبة بنسبة 25 ٪ لربع الرومانوف ، مع وجود تميز طفيف عن خليط الفلندي لدي المربين. كان هجين الكيوس مع الاوسيمي أفضل من متوسط الاباء وافضل في إنتاج الحليب.