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ANNUAL REPORT FOR 1972

COOPERATIVE SHEEP AND FORAGE PROJECT

THE AGRICULTURE RESEARCH INSTITUTE & ALAD PROGRAM OF
THE FORD FOUNDATION

TERBOL RESEARCH STATION, LEBANON

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ANNUAL REPORT FOR 1972

1. Breeding and selection programs for increasing the reproductive efficiency within the Awassi and Crossbreeds.

(a) Percent of ewes lambing

Last year, 432 project ewes were exposed for mating and approximately 30% were mated by natural service and 70% by artificial insemination. Among the project ewes, 260 were mature ewes (over 3 years of age) and 162 were yearling ewes (18 months of age) being mated for their first time. The respective percent of ewes lambing was 96.2 and 95.6 with no significant difference between the two age groups. Also, between natural service and artificial insemination there was no significant difference for the percent of ewes lambing.

(b) Lambing rate for ewes

Mature ewes - For mature ewes the lambing rate (number of lambs born per ewe exposed) was 1.12 for Awassi ewes and 2.07 for Chios ewes. In each of the last three years the Awassi ewes have exhibited a slight increase for lambing rates from 0.98 to 1.08 and 1.12 for 1972. Likewise, for the same period of time the Chios ewes have gone from 1.63 to 2.22 and 2.07 for 1972. Also of importance was the difference for lambing rates between the Random Control line and the Twin line (selected for being twin born). The rate for the

Random Control was 1.07 compared with 1.45 for the Twin line. This difference between the unselected line and sheep selected for a specific characteristics is quite noteworthy, even though the number of ewes was quite small in the Twin line. Conception at the first estrus (after July 14) produced 10% more multiple births than conception at either the second or third periods of estrus. (Reproductive performance for the last three years is presented in table 1 of Appendix).

Two year old ewes - One of the original objectives of this cooperative project was to evaluate the reproductive performance between various Awassi lines and F-1 crossbred ewes which resulted from crossing Awassi ewes with selected rams of the Chios breeds. Therefore, the results in 1972 were very significant because it was the initial parturition for the F-1 ewes which were born at Terbol in 1970. The data in table 1 illustrate large differences for lambing rates between the various lines of ewes in their initial parturition at two years of age. (These three breeds are shown in figure 1 of the Appendix).

Table 1. Reproductive Performance for F-1, Awassi & Chios Ewes

Line of Ewe	F-1	Awassi Control	Awassi Twin	Chios
Number of ewes exposed	104	15	28	15
Number of ewes lambing	100	15	26	14
Percent of ewes lambing	96.2	100.	92.8	93.3
Percent of ewes producing multiple births $\frac{1}{2}$	36.5	6.7	14.3	60.0
Lambing rate $\frac{2}{2}$	1.36	1.07	1.07	1.80

1/ Based on number of ewes exposed at mating. The F-1 ewes produced 3 sets of triplets and the Chios ewes 4 sets.

2/ Based on the number of lamb born per ewe exposed at the mating period.

There was no significant difference for the percent of ewes lambing between the 4 groups. However, the F-1 ewes did exhibit a significantly higher lambing rate than Awassi ewes of the same age. This lambing rate of 1.36 for the F-1 ewes was also much higher than 1.12 for the mature Awassi ewes.

'If the F-1 ewes perform as expected, by 1974 and 1975 (3rd and 4th parturition) they should be producing 50% to 60% multiple births as compared with 15% to 20% for Awassi ewes of a comparable age. The preliminary results for reproductive performance are very encouraging, however, additional data will be needed to verify the results and also determine how the F-1 ewes will respond under different types of environment. This year a small number of the F-1 ewes are being evaluated under the environmental conditions at the experimental farm

of American University of Beirut. For next year plans are being made to expand evaluations of the F-1 ewes under different types of environment."

The difference between the Random Control and Twin line for percent of ewes producing multiple births (6.7% vs 14.3%) is noteworthy. The ewes in the Twin line were not necessarily born a twin but their sire and dam were born a twin. The higher percent of multiple births is encouraging for the Twin line but not significantly different from the Random Control.

For Chios ewes the percent of multiple births (60.0%) and lambing rate (1.80) are noteworthy and are higher than 51% and 1.63 for Chios ewes lambing at a similar age in 1970.

(c) Weaning weight for lambs

The lambs were weaned weekly and the average age and standard deviation were 89.6 and 3.2 days. During this period the lambs were allowed to suckle all the milk and also provided with a "creep feed". Every 28 days the lambs were separated from their dams for a period of 12 hours in order to hand milk the ewe and record her milk production.

The data in tables 2 and 3 indicate that the F-1 crossbred lambs (Chios x Awassi) were heavier for weaning weights than the straight-bred Awassi lambs. This advantage was 3.2 kg and 1.6 kg respectively

for single born male and female lambs. Similar results for 1970 and 1971 indicated the F-1 lambs were significantly heavier than Awassi lambs. The advantage for F-1 twin born lambs was only 1 kg per lamb. For either sex or type of birth the Chios lambs were the heaviest for weaning weights. However, the number of Chios lambs was quite limited. The weaning weights for single born F-2 lambs (F-1 x F-1) were only slightly heavier than for straightbred Awassi lambs.

Table 2. Average weaning weights at 90 days of age for single born lambs

Breed of ewe	Breed of lamb	N	Males kg	N	Females kg
Awassi	Awassi	36	25.4	40	24.0
Awassi	F-1	78	28.6	72	25.6
F-1	F-2	26	26.1	25	24.8
Chios	Chios	3	<u>28.7</u>	6	<u>24.9</u>
	Average:		27.3		25.0

Table 3. Average weaning weights at 90 days of age for twin born lambs

Breed of ewe	Breed of lamb	N	Males kg	N	Females kg
Awassi	Awassi	17	20.0	10	18.9
Awassi	F-1	23	21.0	31	20.3
F-1	F-2	27	20.0	34	18.9
Chios	Chios	11	<u>26.0</u>	3	<u>22.5</u>
	Average:		21.1		19.8

The major differences for weaning weights due to sex and type of birth were quite similar to the figures obtained during 1971. This year the single and twin born male lambs were 3.2 kg and 1.2 kg heavier than their respective females. Single born lambs were 5.8 kg heavier than twins.

(d) Survival rates for lambs

In a breeding flock one important factor influencing its productivity is the percentage of lambs weaned of those born. A high survival rate of lambs is very desirable for economic reasons and also for genetic programs through selection.

There were 525 lambs born (whether alive or dead) and 88.6% were weaned at 90 days of age. For mature ewes the survival rate for their lambs was 90.4% compared with 86% for lambs from the 2-year old ewes.

The respective survival rates for single born male and female lambs were 94% and 92%. For all types of multiple births the respective rates for males and females were 79% and 86%. Our data, for the last four years, have generally shown a slightly higher survival rate for females than for males.

(e) Estimations for milk production

Estimates for milk production were obtained by hand milking three times during the first 90 days of lactation, namely, at 28 days, 56 and when the lambs were weaned at 90 days.^{1/} Therefore, the results which follow apply only to these three periods of the lactation.

Mature ewes - The influence of age on lactation indicated the Awassi ewes produced 38% more milk in their third lactation (4 years of age) than in their first lactation (2 years of age).

The phenotypic correlation between weaning weight and total milk production for 90 days was 0.25 for 318 single born lambs from Awassi ewes.

There was no major difference between Awassi and Chios ewes for total milk production during their third lactation for the 90 day period. Compared with the quantity of milk recorded on day 28 there was a 22% decrease by day 56 and a 36% decrease by weaning at 90 days for the Awassi ewes. For a very small number of Chios ewes the decreases were 15% and 37% for the same period.

^{1/} In the P. M. the lambs were separated from their dams, the ewes milked out and the next A. M. the quantity of milk was recorded by hand milking.

Two year old ewes - For ewes in their initial lactation the F-1 ewes produced 10% more milk than Awassi ewes of the Control line. This small difference may have been the result of F-1 ewes suckling more twins. For the same period of time the Chios ewes produced 37% more milk than Awassi ewes in the Control line and 25% more milk than F-1 ewes. As indicated before, these differences may have occurred because the Chios ewes were suckling more twins than Awassi or F-1 ewes.

There was no evidence to indicate any heterosis for milk production in the F-1 ewes when compared with the average production of the Awassi and Chios ewes.

(f) Artificial insemination

For 1972 the mating program was started on July 19 and 477 ewes were available for mating. Artificial insemination was used for 314 (67%). Natural service for 156 (33%) and 7 ewes failed to exhibit a detected estrus. Based upon ewes returning to a second estrus the respective conception rates were 83.5% and 88.5% for artificial insemination and natural service. For conception rates there was no significant difference between the two methods of mating. The average figure for all ewes was 84.1% for conception at first recorded estrus. The artificial insemination techniques which have been used so successfully for the past four years are shown in figures 2, 3 and 4 of the appendix.

2. A selection and breeding program for increasing the quantity of milk production within the Awassi breed

(a) Production for the Milk line

Ninety seven percent of the ewes lambed this year. Their lambing rate (number of lambs born per ewe exposed) was 1.20 which was higher than in 1971.

This year the average milk yield was 14% (28 kg) higher than in 1971. The average length of lactation was 188 days for both years. The average yield this year was 219 kg of milk for a lactation length of 188 days. The respective standard deviations were 73 kg and 18 days. Considering all age groups the highest average production was 274 kg from those ewes in their fourth lactation. These ewes averaged 1.42 kg of milk per day. One ewe of this group produced 593 kg with a daily yield of 2.8 kg. In addition, this ewe has produced 8 lambs and 1815 kg of milk during four lactations. The average production for each age group is presented in table 4.

Those ewes in their first lactation had the lowest yields followed by the 10 year old ewes. Ewes in their first lactation must produce at least 1 kg of milk per day or be eliminated from the Milk line.



Table 4. Average milk yield and length of lactation for 1972

Year born	Yield kg <u>1</u> /	Lactation days
1970	156	182
1969	228	193
1968	228	189
1967	274	193
1966	241	183
1965	244	185
1964	266	194
1963	245	184
1962	199	180
Average:	219	188

1/ Includes the quantity estimated to have been consumed by lambs during the first 30 to 45 days.

Ewes suckling twin lambs produced 17% (38 kg) more milk than ewes suckling single lambs for a comparable length of lactation.

The stud rams from the Milk line could be used to great advantage in other countries where not only milk production but also high fertility are major factors for increasing productivity. A significant contribution to the sheep industry could be made from the genetic potentials which the Milk line possesses. It might be advantageous if other governments and development agencies were made aware of the annual production being attained by the Milk line at Terbol.

(b) Genetic potentials of the Milk line

This year a special breeding program was completed for estimating the genetic potentials for high milking production within the Milk line. The Milk line ewes were randomly divided into two groups of equal size and the division was based upon age of ewe and the daily yield of milk during her first lactation. One group was mated with rams from the Milk line and the other group was mated with rams from selected flocks within Lebanon. The flock rams were selected on the basis of having sired daughters which were outstanding for high milk production. Beginning with their first lactation in 1975 and continuing for their life time the contemporary ewes (Terbol vs Flock rams) will be evaluated for milk production. The evaluation between contemporary ewes should indicate if there are major genetic differences for high milk production between the two groups of selected rams.

(c) Literature review for milk production

A literature survey was made from available reports for obtaining additional information concerning the annual production of milk from different breeds of sheep. This survey covered research data from Spain, France, Italy, Greece, Turkey, Cyprus, Poland, Czechoslovakia, the Middle East and North Africa countries. In France the Lecaune

breed, famous for Roquefort cheese, has an average of about 92 kg for 150 days of milking. For the past 10 years the yearly production from the Milk line of Terbol is considerably higher than the figures quoted for other breeds with the exception of two breeds which are higher - the Improved Awassi and the Chios.

3. Artificial Rearing of Lambs

(a) Procedures

In recent years various techniques have been developed for the artificial raising of lambs. These techniques have produced results which are comparable with lambs raised naturally. These have been developed because many countries are emphasising the use of prolific crossbred ewes for intensive meat production and also in some countries a high price is paid for sheep's milk. All of the techniques utilize a dried milk replacer powder which is mixed with water and either heated or chilled for feeding.

In 1972 the milk replacer was "Ewelac"^{1/} and the method of feeding was through a "lambar". Both were developed in Great Britain and used successfully for feeding either a small number of lambs or for numbers exceeding 500 lambs.

^{1/} Milk replacer produced by Volac Ltd., Croydon Old Farm, Nr. Royston, Herts, England, and having the following composition in percent: Moisture, 3.50; fat, 30.00; MSNF, 66.25; Protein, 25.50; fiber less than 0.25.

The "Ewelac" powder was reconstituted with water and the liquid milk was then chilled to a temperature of approximately 5 °C. The cold milk was then placed in plastic buckets and fed to lambs through a "lambar". The milk was fed ad libitum and the daily quantity increased 10% over the consumption of the previous day. In addition, the lambs had access to sudax hay and a concentrate mixture.

Prior to placing newly born lambs on the "lambar" they were provided with colostrum milk for 24 to 48 hours. Due to the death of their mother or for other reasons a number of older lambs were also fed from the "lambar". For a period of 1 to 3 days all lambs were provided assistance for training them to suckle the rubber teats of the "lambar". (The methods used with the "lambar" are shown in figures 5 and 6 of the Appendix).

(b) Results

During the first week each lamb consumed an average of 1.99 kg of dried milk powder and by the end of the fifth week the quantity had increased to 4.64 kg. For the next 6 weeks the average weekly quantity was 4.25 kg per lamb. This slight decrease was probably related to the development of the lamb's digestive system and a greater dependency upon sudax hay and concentrate. During the 12 weeks an average of 47.3 kg was consumed by each lamb or about 560 g of dried milk powder per day. Also, each lamb consumed 5.8 kg of concentrate mix during the 12 weeks and an unknown quantity of sudax hay.

The average daily gain was 300 g per lamb for the first 30 days. For the 12 weeks it averaged 261 g per day.

The final weaning weight was 27.4 kg per lamb at 85 days of age. Each lamb gained an average of 22.2 kg during the 85 days. At this age the lambs on artificial milk were 3.3 kg heavier than lambs raised naturally. The feed conversion efficiency was calculated on the consumption of dry matter and excluding the sudax hay and concentrates.

$$\frac{\text{kg dry matter consumed "Ewelac"}}{\text{kg live weight gain}} = \text{Feed conversion efficiency}$$

During the first 30 days the feed efficiency was 1.21 kg of dry matter for each kg gain in liveweight. For the entire 85 days the conversion was 2.13 kg for each kg gain in live weight. This figure approaches the values obtained from poultry.

(c) Economic evaluations

In evaluating the economics for artificial raising of lambs these assumptions were made:

1. The quantity of milk consumed by artificially raised lambs is equal to that for lambs raised naturally. The same assumption is made for consumption of sudax hay and concentrates.
2. In Lebanon the cost of "Ewelac" is 1.85 LL per kg of dry matter
3. In Lebanon the sale price of ewe's milk is 0.80 LL per kg
4. Labor costs per lamb per day are 0.10 LL for feeding "Ewelac"

A profit of about 35 LL per ewe could be made by placing newly born lambs on "Ewelac" and selling the ewe's milk as compared with allowing the lamb to suckle all the milk for 42 days. If the normal period for weaning was 60 days then a profit of about 54 LL could be realized by raising the lamb on "Ewelac" and milking the ewe for these 60 days.

4. Performance testing of Awassi, F-1 and F-2 ram lambs

Three groups of 20 ram lambs from the Awassi, F-1 and F-2 were performance tested for 112 days. The groups were penned separately and fed twice daily a ration composed of dehydrated alfalfa pellets and ground concentrate mixture. Also, 3 lambs from each group were slaughtered for carcass evaluations where they attained live weights of 40 and 50 kg.

(a) Daily gain

The average age on test for the respective Awassi, F-1 and F-2 lambs was 104, 104 and 105 days with a standard deviation of 3.7 days (table 5).

Table 5. Average daily gain and feed efficiency for 112 days

Breed of ram	Awassi	F-1	F-2
Initial age days	104	104	105
Initial weights kg <u>1/</u>	26.0	28.4	26.24
Final weight kg <u>1/</u>	47.97	48.47	45.72
Daily gain kg	.197	.178	.178
Feed efficiency kg <u>2/</u>	7.3	8.3	8.5

1/ Weights recorded following 12 hour period of fasting

2/ $\frac{\text{Kg feed consumed}}{\text{Kg live weight gain}} = \text{Feed efficiency}$

The respective initial body weights were 26.0, 28.4 and 26.2 kg with no significant difference between groups. After 112 days the final weights were 48.0, 48.3 and 46.1 kg and the daily gains were 197, 178 and 178 grams for the respective Awassi, F-1 and F-2 rams with no significant difference between groups. There were large variations for daily gain between rams within each group indicating an opportunity for the selection of rams with a high growth rate.

(b) Feed efficiency

The Awassi lambs which exhibited a higher daily gain required 7.3 kg of feed per kg of gain as compared with 8.3 kg for the F-1 and 8.5 kg for the F-2. The daily feed consumption averaged 1.6 kg per lamb with alfalfa pellets making up 53% of this quantity.

5. Carcass evaluations for Awassi, F-1 and F-2 ram lambs

These evaluations were made to obtain additional information about the carcass components when slaughtered at live weights of 40 and 50 kg. Also, no F-2 sheep were available for evaluations prior to this year.

(a) Procedures

Three ram lambs from each group being performance tested were slaughtered at a live weight of 40 kg and 9 more lambs at a live weight of 50 kg. Each weight group was slaughtered during one day and the carcasses placed in a cooler (5°C) for approximately 48 hours. A

standard cutting procedure was followed for processing all carcasses. Each carcass was processed into 6 major cuts namely, fat tail, breast flank and shank, 5 rib shoulder and neck, 7 rib rack, loin and legs (American style). Each cut was expressed as a percentage of the weight of the chilled carcass in order to make comparisons between the 3 groups. Therefore, the weight of the chilled carcass represents 100%. The leg bones, kidney plus kidney fat and testicles were weighed separately. All evaluations made for each of the 3 groups at live weights of 40 and 50 kg are presented in tables 2, 3, 4 and 5 of the appendix. (Figures 7 and 8 of the appendix shows Awassi, F-1 and F-2 ram lambs).

(b) Results

For lambs slaughtered at the respective weights of 40 and 50 kg the average age was 149 and 222 days with gains being 265 and 226 kg per day (presented in tables 2 and 4 of the appendix). Considering both weights the Awassi lambs have a higher dressing percentage (52.1%) followed by the F-2 (51.4%) and then F-1's (49.6%). The F-1 lambs also had a slightly small percentage of kidney and kidney fat than the other two groups. For each live weight the carcass length and cannon bone lengths were longer in F-1 lambs followed by F-2 and then Awassi.

Both F-1 and F-2 lambs had a higher percentage of leg bones than the Awassi. At 40 kg the actual weight and percentage of testicles were less for Awassi lambs than for either of the crossbreds. This difference was not so noticable at a live weight of 50 kg. There were no consistent trends for either fat thickness or rib eye area among the 3 groups but the two traits did increase between 40 and 50 kg live weight.

One major difference between the 3 groups was in the weights and percentages for the fat tails. (See figures 8 and 9 of the appendix). For Awassi, F-1 and F-2 the respective averages were 3.62 kg, 1.66 kg and 1.50 kg which represents 15.5%, 7.4% and 6.6% of the carcass weights.

The percents presented in table 6 indicate that the other 5 major cuts represent 86.1% and 87.3% of the respective carcass weights for F-1 and F-2 lambs as compared with only 79% for the Awassi. In comparing crossbreds with Awassi the crossbred carcasses have a higher percent of legs, shoulder plus neck and a slightly higher percent of racks and loins. It was not determined how much of these higher percentages could be due to additional protein, fat, bone or water. There were no indications that the crossbred carcasses were fatter but they did appear to contain a slightly higher percentage of bone. Since the fat tails of

the crossbreds make up a smaller percent of the carcass weights it may be that the crossbred carcasses will yield a higher percentage of meat than the Awassi even with slightly more bone in the crossbred carcasses. Future studies will help clarify these points.

Table 6. Average percents for the 6 major carcass cuts

Breed of ram	1/	2/	Awassi	F-1	F-2
Fat tail			15.5%	7.4%	6.6%
Breast, flank and shank			11.6%	11.6%	11.9%
Shoulder and neck			22.2%	26.1%	26.5%
Rack, 7-rib			9.0%	9.5%	9.7%
Loin			9.6%	10.8%	11.0%
Legs			26.6%	28.1%	28.2%

1/ The average is based on 6 rams for each group.

2/ Refer to tables 2, 3, 4 and 5 of the appendix for explanation of the footnotes.

It could be mentioned, however, that preliminary results from cooking tests indicated Awassi ram had a higher percent for fat loss (6.2%) than did F-1 rams (4.6%). The respective total losses in weight due to cooking were 20.8% and 18.6%. These cooking tests were made on 7-rib rack roasts from an equal number (6) of Awassi and F-1 rams averaging 430 days of age.



6. Forage Production

(a) Work underway

Work is continuing at the Terbol Station on the production of forage under a double-cropping system. Corn for silage and/or Sudax (a sudangrass-sorghum hybrid) for hay is grown under irrigation during the summer. A mixture of barley and vetch, which is harvested in the spring as hay or silage, is grown on the same land during the winter. A winter crop of barley and vetch is also grown on all land at the Tel Amara and Kfardan stations which would otherwise be out of production. These plantings serve as a demonstration and partial evaluation of the use of winter forage in rainfed situations as an alternative to fallow in a cereal-fallow rotation. They also provide considerable forage to support the sheep improvement project.

A Coastal bermudagrass pasture over-seeded with a reseeding clover has been established at Terbol. The 1973-74 season will be the first productive year for this pasture.

A small introductory nursery for observing the adaptability of various grasses and legumes has been established.

Work on an annual forage legume-crop rotation system was initiated in the fall of 1972. Present activities include: (1) the seeding of seven selected varieties of annual legumes (3 subclovers and 4 medics) each

with and without rhizobia inoculation, at 3 levels of phosphate fertilizer, at two locations (Kfardan and Terbol); (2) a mini-rotation involving 6 treatments, viz. a medic-wheat rotation and a fallow-wheat rotation begun in each of 3 successive years, and (3) a comparison of the following rotations: fallow-wheat, vetch/barley-wheat, and medic-wheat.

(b) Some average results

Per hectare yields of 50 to 70 tons of corn silage and 10 to 15 tons of Sudax hay have been obtained under irrigation. Barley and vetch has yielded between 5 and 6 tons of hay per hectare. If sold on the local market this quantity of hay would give a gross return per hectare of between LL. 1200 and 1500, This is considerably above the present income realized from a hectare of wheat grown under rainfed conditions. The double cropping of barley-vetch and corn has yielded an average of 2117 kg of dry matter per dunum at an estimated cost of approximately 10 piasters per kilogram. The amount of feed which can be produced per hectare under such a cropping system is sufficient to fatten roughly 200 lambs. The methods of harvesting sudax for hay and corn for silage are shown in figures 10 and 11 of the appendix.

7. Cooperation with other agencies

- (a) Fifteen Chios sheep were donated to the Ministry of Agriculture in Algeria to establish a research project involving the crossing of Chios sheep with the 3 indigenous breeds of Algeria.
- (b) The experimental farm of the American University of Beirut has received 25 F-1 ewes in order to research their productivity under the environmental conditions of the farm. These research studies will continue for several years.
- (c) A new project for sheep breeding and forage production has been started in Syria and Jordan under the direction of The Arab League. The Director, Dr. Y.S. Ghanem, is asking for close cooperation between this project and Terbol for the exchange of sheep for genetic studies and research information. This project is interested in obtaining F-1 crossbred ewes and stud rams from the Milk Line.
- (d) The King Faisal Project at Haradh, Saudi Arabia, is also interested in obtaining some F-1 crossbred ewes to compare their production against the indigenous Najdi breed.
- (e) Two graduate students of American University of Beirut are using some of the sheep data from Terbol for thesis problem as a partial requirement for a Masters of Science degree.

8. Publications issued

During 1972 the staff of Terbol station prepared three research papers which were presented to the Fourth Annual Science Meeting sponsored by the Lebanese Association for the Advancement of Science.

The title and authors are:

1. Milk Production for a selected flock of Awassi Sheep,
K. Khalil, E. Choueiri, C.W.Fox, S.Badawi, W.A.Hardison
and A. Matar.
2. Performance testing and carcass evaluations for Awassi and
Crossbred rams.
S.Badawi, C.W.Fox, E.Choueiri and W.A.Hardison.
3. Reproductive performance for Awassi, Chios and F-1 Yearling
ewes.
C.W.Fox, S.Badawi, E.Choueiri, W.A.Hardison, R.Chaaban
and M. Maalouf.

9. Appendix

(a) Feeding Program 1/ 2/

The nutritional requirements for the breeding ewes can be divided into 4 periods, namely, the flushing and breeding period, the latter stages of pregnancy, lactation and the period when the ewe is producing little or no milk.

Late June, July and August - Flushing and breeding season.

Some grazing of nature pastures

300 - 600 g. Concentrate mixture
Barley and vetch hay once daily
Chopped wheat straw once daily

September and October - Early stages of pregnancy.

Some grazing of corn stubble fields

500 g. Concentrate mixture
2000 g. Corn silage
Barley and vetch hay once daily
Chopped wheat straw once daily

November and December - Latter stages of pregnancy

700 g. Concentrate mixture
2500 g. Corn silage
Sudax or alfalfa hay once daily

January, February, March and April - Lactation

1000 g. Concentrate mixture
2500 g. Corn silage
Sudax or alfalfa hay once daily

Grazing of native pastures starts in late March.

April - Weaning of lambs

Lambs are given a creep feed from 2 weeks of age and until they are weaned in March or April. They also have alfalfa or sudax hay free choice.

Early May and June - Non-lactating period

Some grazing of native pastures and barley and vetch stubble fields.

Barley and vetch hay once daily.

1/ Daily feed per ewe.

2/ The composition of the concentrate mixture changes during the year due to the availability and price fluctuations of the local cereal grains and protein supplements. The protein level of the concentrate ration varies between 10 to 14% depending upon the requirements of the breeding flock. One percent of a trace element mixture is added per ton of concentrate mixture and salt and bone meal is offered free choice. The concentrate mixture usually contains yellow corn, barley, wheat bran, dried sugar beet pulp, protein supplement and minerals.

Appendix

Table 1. Reproductive Performance for Breed and Age of Ewe

Breed of ewe	Age of ewe	Year	Number of ewes lambing	Percent of ewes lambing	Percent of multiple births	Lambing rates	S	Birth type of lambs born						
								1/	2/	3/	4/	5/		
Awassi	4	1972	255	96%	16.1%	1.12	204	41	TT	TTT	TT	TTT	TT	TTT
"	3	1971	390	97%	8.5%	1.05	344	33	TT	TTT	TT	TTT	TT	TTT
"	2	1970	389	91%	2.8%	0.93	340	11	TT	TTT	TT	TTT	TT	TTT
Chios	4	1972	15	100%	66.7%	2.07	5	7	TT	TTT	TT	TTT	TT	TTT
"	3	1971	27	93%	74.0%	2.22	5	11	TT	TTT	TT	TTT	TT	TTT
"	2	1970	27	89%	51.8%	1.63	10	8	TT	TTT	TT	TTT	TT	TTT
Awassi(RC)	2	1972	15	100%	6.7%	1.07	14	1	TT	TTT	TT	TTT	TT	TTT
Awassi(T)	2	1972	28	93%	14.3%	1.07	22	4	TT	TTT	TT	TTT	TT	TTT
F-1 (CxA)	2	1972	104	96%	36.5%	1.36	62	35	TT	TTT	TT	TTT	TT	TTT
Chios	2	1972	15	93%	60.0%	1.80	5	5	TT	TTT	TT	TTT	TT	TTT

1/ Age of ewe at lambing
 2/ Excludes any which died between mating and lambing
 3/ Based on number of ewes exposed at mating
 4/ Ratio of lambs born of ewes exposed at mating
 5/ S = Single; TT = Twin; TTT = Triplet; TTTT = Quadruplet; TTTTT Quintuplet; TTTTTT = Sextuplet.

Table 2. Evaluations for ram lambs slaughtered at 40 kg

Breed of ram <u>1/</u>	Awassi	F-1	F-2
Age at slaughter - days	147.3	148.7	150.7
Bodyweight, kg <u>2/</u>	39.5	40.2	38.7
Carcass weight, kg <u>2/</u>	21.0	20.51	20.3
Dressing percent <u>2/</u>	53.2%	51.0%	52.6%
Carcass length, cm <u>3/</u>	58.7	63.0	61.8
Rib-eye area, cm ² <u>4/</u>	9.99	10.12	8.96
Fat thickness, mm <u>4/</u>	3.13	1.87	2.57

- 1/ The averages are based on 3 rams for each group.
2/ Body weight obtained following a 12 hour period of fasting, carcass weight obtained following 48 hours in a 5°C cooler.
3/ Measured from anterior of first rib to aitch bone.
4/ Measured at 12th rib, fat thickness the average of 3 measurements.

Table 3. Carcass evaluations for ram lambs slaughtered at 40 kg

Breed of ram <u>1/</u>	Awassi <u>2/</u>	F-1 <u>2/</u>	F-2 <u>2/</u>
Fat tail	3.25 kg (15.5)	1.47 kg (7.2)	1.54 kg (7.6)
B, F & S <u>3/</u>	2.37 kg (11.3)	2.33 kg (11.4)	2.28 kg (11.2)
Shoulder & neck <u>3/</u>	4.69 kg (22.3)	5.67 kg (27.6)	5.45 kg (26.8)
Rack, 7 rib	1.94 kg (9.2)	1.99 kg (9.7)	1.90 kg (9.4)
Loin <u>3/</u>	1.83 kg (8.7)	2.05 kg (10.0)	1.98 kg (9.8)
Legs <u>3/</u>	5.82 kg (27.7)	5.67 kg (27.6)	5.81 kg (28.6)

- 1/ The averages are based on 3 rams for each group.
2/ Figure in brackets is percent each carcass cut is of carcass weight.
3/ Breast, flank, shank; shoulder with 5 ribs; loin excludes kidney plus fat; legs exclude metatarsal bone.