

7. Flock book and computer registration and selection

Flock book/computer registration

Until a computer service evolved to embrace all milk-recorded ewes in Israel and replaced registration in the flock book, the flock book (kept jointly by the Sheep Breeders' Association and the Department of Sheep Husbandry of the Israeli Ministry of Agriculture) formed the basis for selection in Awassi flocks.

The flock book registered only milk-recorded flocks with mean lactation yields exceeding 250 kg, and from such flocks only those ewes whose breeding standard yield exceeded 350 kg, the breeding standard or maximum lactation yield in any one year being then regarded as the optimal genetic capacity of a ewe under the conditions of feeding and maintenance prevailing in her flock.

The flock book was established in 1943 with an initial registration of 362 ewes from 14 milk-recorded flocks. The ewes of these flocks had an average milk yield of 160 kg and above, while the registered ewes had a breeding standard yield of not less than 250 kg. In 1948/49 the minimum requirement for individual registration was raised to 275 kg, and in 1955/56 to 350 kg. The flock standard was increased to 200 kg in 1955/56, and to 250 kg a few years later.

The increase in flock book and individual requirements for registration affected the number of flocks and ewes eligible. Thus, in 1955/56 seven flocks that did not come up to the 200 kg standard were excluded from the flock book, with the result that the average breeding standard yield of all registered ewes rose from 258 to 280 kg of milk. On the other hand, a large increase in the number of flocks and milk-recorded ewes, such as occurred in 1949/50, reduced the average breeding standard milk yield for four consecutive years (see Table 4-3).

Flock rams are registered in the ram register of the flock book or computer administration on condition that they are sired by selected stud rams out of dams that are attested for ram breeding. Only such ewes are eligible for this purpose that have yielded not less than 900 kg of milk in their first two lactations, or 1 600 kg in three lactations, with a fat content of milk of not less than 6 percent.

Stud rams may be registered in the stud ram register of the flock book or computer administration on condition that they are sired by selected stud rams and that their dams have produced not less than 1 200 kg of milk with not less than 6 percent butterfat in the course of their first two lactations, or 1 900 kg during their first three lactations. Only progeny-tested rams of strong constitution and characteristic Awassi type are eligible.

The flock book or computer administration issues registration certificates for ewes and rams. A ewe's certificate furnishes information with regard to the breeder, owner, date of birth, ear number, colour of head and fleece, flock book or computer number, date of registration, pedigree chart with particulars on milk yields and conformation, body measurements and weight, a score card (milk, wool, conformation, fertility, health), photograph, lambings and progeny record.

A ram's certificate gives the names of the breeder and owner, the name and number of the ram, date of birth, grading in different years, colour, special features, score points for conformation, total score, pedigree chart over three generations with milk yields and score for conformation of ancestors, photograph and history of the ram.

Another ram certificate of the flock book or computer administration contains the numbers of the certificate and the ram, date of birth, breeder (farm), and pedigree chart over three ancestral

generations, with the milk yields of the female ancestors, specifying the year, lactation, days, and maximum annual and daily yields (Fig. 7-1).

Special pedigree certificates in English and Hebrew for stud rams and ewes are issued by the secretary of the Sheep Breeders' Association and the flock book or computer manager for export purposes. These contain the number of the ram or ewe, date of birth, name of breeder, and the pedigree of the animal for two ancestral generations, including the milk yields of the dam and grandams (Figs 7-2 and 7-3).

At one time the flock book management issued annual reports on all registered flocks. These were arranged according to the mean breeding standard milk yields of the flocks and, in addition, supplied information on the number of ewes in each flock, the record yield, the number and percentage of ewes classed according to milk yields (above 400 kg, 350-400 kg, 300-350 kg, 250-300 kg, 200-250 kg, 150-200 kg, and below 150 kg), and the mean annual milk yield of the ewes of each flock. Some annual reports also gave information on the quantity of milk marketed for each ewe and flock.

Since 1968/69 the flock book records have been replaced with computer records. The reports have since provided every flock account in the list with a mark indicating the distinction between flocks of pure-bred Awassi or cross-bred East Friesian-Awassi ewes, and also of the milking system practised in each of these two groups, namely, single milking or primary milking followed by secondary milking. This enables breeders not only to compare the absolute yields of their flocks with those of other flocks irrespective of breed and milking system, but also with the yields of ewes similar to their own in breed composition and milking arrangement. The computer reports do not include the mean breeding standard milk yields as did the flock book reports in the past.

Auxiliary registers, in Hebrew, are issued by the Sheep Breeders' Association in different sizes for records of large flocks, most of which belong to communal settlements, and of smaller flocks belonging to village farmers. The auxiliary registers comprise lists for rams, ewes, yearlings, and female lambs for retention by the breeder or for disposal through the Sheep Breeders' Association; variations in annual milk yields between ewes; variations in maximum milk yields; and for sheep that left the flock during the year. Further, lists of mating or insemination, hormone applications, lambings, milk control records, and shed books are kept.

At the end of the year the information on the rams and ewes of a flock is transferred to two lists for the computer service, one for rams and the other one for ewes. At the head of the list for rams the flock number, year, and name of owner (farm) are stated. All data are inserted in figures specified for the computer. One line in the list is devoted to each ram, with space for the following data:

- | | |
|----------------------------------|------------------------------------|
| 1) current number, 1-20 | 8) name of breeder (farm) |
| 2) ram's number | 9-11) sickness or exit from flock: |
| 3) breed | 9) cause |
| 4) date of birth | 10) sickness |
| 5) number of sire | 11) month |
| 6) number of dam | 12) kind of change |
| 7) date of introduction to flock | 13) type of list |

At the head of the list for ewes the year, name of owner (farm), flock number, total quantity of marketed milk, quantity of milk used otherwise, and the monthly milk production from October to September are given. As in the list for rams, all data are inserted in figures specified for the computer. One line in the list is devoted to each ewe, with space for the following data:

- | | |
|-----------------------------------|------------------------------------------------|
| 1) current number, 1-20 | 13) lamb no. 1: history, sickness, month |
| 2) ear number of ewe | 14) lamb no. 2: history, sickness, month |
| 3) breed | 15) lamb no. 3: history, sickness, month |
| 4) date of birth | 16) first month of lactation |
| 5) number of sire | 17) monthly milk records, October to September |
| 6) number of dam | 18) date of end of lactation |
| 7) month of introduction to flock | 19-21) sickness or exit from flock: |
| 8) name of breeder (farm) | 19) cause |
| 9) date of lambing | 20) sickness |
| 10) number of lambings | 21) month |
| 11) number of lamb's sire | 22) kind of change |
| 12) number of lambs-male, female | 23) type of list |

SHEEP BREEDERS
ASSOCIATION IN ISRAEL
Haifa P.O.B. 1399

אגודת הנוקדים בישראל
חיפה ת.ד. 1399

FLOCK - BOOK OF THE AWASSI BREED OF SHEEP

ספר העדר של כבשת האוסי

CERTIFICATE NO.: תעודת מס'

RAM NO.: איל מס'

Date of birth: תאריך לידה:

Settlement: המסק:

PEDIGREE: ה מ ר צ א

| | | | | | | | |
|-----------------------------------|-----------|------------------------|-----------|-----------------------|---------|-----------------------|---------|
| DAM: :אם Milk-Yield:* תנובה | | SIRE: :אב | | | | | |
| DAM: :אם M-Y:* ת | SIRE: :אב | DAM: :אם M-Y:* ת | SIRE: :אב | | | | |
| D.: :אם M-Y:* ת | S.: :אב | D.: :אם M-Y:* ת | S.: :אב | D.: :אם M-Y:* ת | S.: :אב | D.: :אם M-Y:* ת | S.: :אב |

* The numbers indicate:

Year - Lactation - Days - Annual Maximum Yield - Daily Maximum Yield.

מפתח הנתונים: תנובה יומית מקסימלית/תנובה שנתית מקסימלית/תקופת החליבה / השנה.

Flock-Book Manager

Tel Aviv תל-אביב

מנהל ספר העדר:

Figure 7-1. Ram certificate from the flock book of the Awassi

SHEEP BREEDERS' ASSOCIATION IN ISRAEL

אגודה הנוקדים בישראל

CERTIFICATE OF PEDIGREE

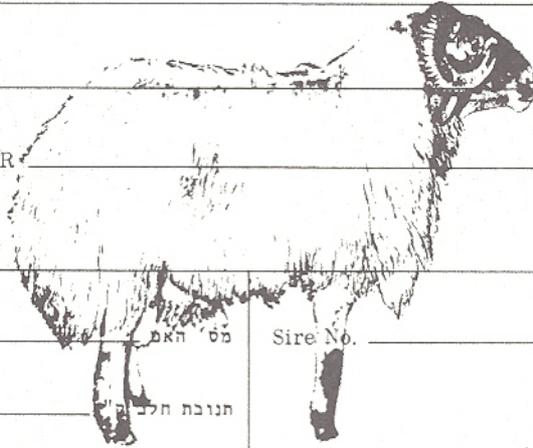
OF THE ISRAELI AWASSI SHEEP

תעודת מוצא לצאן אוסי ישראלי

RAM NO. _____ מס' האיל

DATE OF BIRTH _____ תאריך לידה

NAME OF BREEDER _____ שם המגדל



Dam No. _____ מס' האם

Sire No. _____ מס' האב

Milk Yield Kg. _____ תנובת חלב ק"ג

| Dam No. מס' האם | Sire No. מס' האב | Dam No. מס' האם | Sire No. מס' האב |
|---------------------------------|---------------------|---------------------------------|---------------------|
| _____ | _____ | _____ | _____ |
| Milk Yield Kg. תנובת חלב ק"ג | | Milk Yield kg. תנובת חלב ק"ג | |
| _____ | | _____ | |

Tel Aviv _____ חל-אביב

Secretary of the Sheep Breeders' Ass.
מזכיר אגודה הנוקדים

Flock-Book Manager
מנהל ספר העדר

Figure 7-2. Certificate of pedigree of the Israeli Awassi ram

Each year the flock book or computer administration sends the flock-master the last computerized reports on the state of his flock with particulars for every ram and ewe. Hence there is no need for the flock-master to repeat the different items concerning the animals included in previous reports. He has merely to add the last year's breeding history, milk records and other changes with the respective computer symbols in the empty spaces provided for every ram and ewe, and return the completed sheets to the flock book or computer administration.

SHEEP BREEDERS' ASSOCIATION IN ISRAEL
 אגודת הנוקדים בישראל

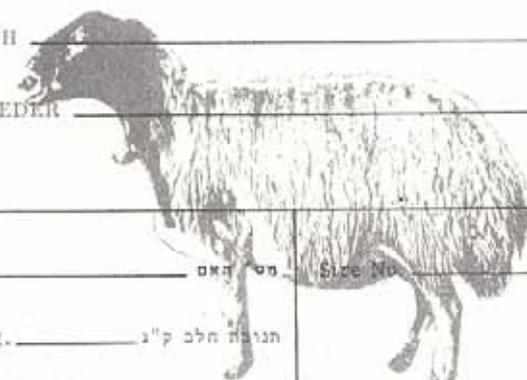
CERTIFICATE OF PEDIGREE
 OF THE ISRAELI AWASSI SHEEP

תעודת מוצא לצאן אוסי ישראלי

EWE NO. _____ מס' הרחלה

DATE OF BIRTH _____ תאריך לידה

NAME OF BREEDER _____ שם הסודל



| | | | |
|------------------------------------|--|------------------------|--|
| Dam No. _____ מס' האם | | Sire No. _____ מס' האב | |
| Milk Yield Kg. _____ תנובת חלב ק"ג | | | |

| | | | |
|------------------------------------------|------------------------------|------------------------------------------|------------------------------|
| Dam No. מס' האם _____ | Sire No. מס' האב _____ | Dam No. מס' האם _____ | Sire No. מס' האב _____ |
| Milk Yield Kg. תנובת חלב ק"ג _____ | | Milk Yield kg. תנובת חלב ק"ג _____ | |

Tel Aviv _____ תל-אביב

Secretary of the Sheep Breeders' Ass. Flock-Book Manager
 מזכיר אגודת הנוקדים מנהל ספר העדר

Figure 7-3. Certificate of pedigree of the Israeli Awassi ewe

Selection

Bedouin and fellahin select flock rams mainly based on size and development of the male lambs kept for breeding and their dams' milk yields. The latter criterion, in the course of centuries, has brought about a high genetic potential for Awassi milk, while the former has operated against twinning, for single lambs have an advantage over twins in birth weights and growth during the suckling period.

From the beginning of improvement of the Awassi sheep by Jewish shepherds in Palestine, selection of breeding stock has been based mainly on milk production. Type, conformation and colour were additional criteria, more especially in flocks producing stud rams. Owing to the insignificant part of the income derived from wool in the economy of improved Awassi breeding in Palestine and subsequently in Israel, the quantity and quality of the wool has been generally neglected, save for a single flock in which selection for a heavier fleece was practised at one time. In Iraq, however, wool is of major importance in the selection of Awassi breeding stock.

As regards type, shepherds have a particular image of the ideal Awassi in view and endeavour to select their breeding stock in conformity with this standard.

Conformation has played a considerable role in the selection of stud animals in Palestine, and all ewes and rams previously entered in the flock book had to be judged by a commission for conformation. Under computer administration in Israel, the maximum score for ewes continues to be 25 points, including height (4), length of body (4), heart girth (4), shank girth (3), udder (5), and general impression (5). Of the remaining 75 points in the 100-point-maximum score system for ewes, 50 are designated for milk production, 10 for health and fertility, and only 10 for pedigree and 5 for wool. For rams the maximum score of 25 points for body conformation includes 6 for height, 5 for length of body, 6 for heart girth, 3 for shank girth, and 5 for general impression.

In 'general impression' the shape of the head, horns and ears, which have no bearing on production but only on type, are included. The conformation of the fat tail is important because this has an influence on the facility of milking and the cleanliness of the milk. The strength and position of the legs are a major consideration in the scoring of the Awassi which has to obtain part of its feed from pasture.

The selection of flock ewes in Israel is left to the discretion of the breeders who may be guided by instructors of the Department of Agriculture or by officers appointed by the Sheep Breeders' Association.

Generally, breeders decide in autumn on how many ewes to replace by yearlings; commonly this is around 25 percent. In an experimental flock, over a period of five years, 23.2 percent of the number of ewes at the time of service were culled during the following year, in addition to an average annual mortality rate of 2.2 percent (Goot, 1966). Ewes with impaired or abnormal udders are culled first, to be followed by aged animals and those with milk records well below the average of the flock. Barren ewes are disposed of earlier in the year. If still breeding regularly, old ewes of high breeding value with regard to milk production and twinning are sometimes left in the flock for another year or two even if their milk yields have decreased. Lambs for replacement of the culls are selected in accordance with their dams' milk yields and their individual conformation and development. The culled ewes are sold for slaughter and the female lambs not required for replacement in their own flocks — about one-half of the total number reared — are sold to flocks that are in a stage of new establishment or enlargement. The majority of sales and purchases of breeding stock are arranged by the Sheep Breeders' Association.

For three decades, the selection for milk in the Awassi breed in Israel was based on the maximum or standard lactation record of ewes in any one year, a record that is markedly influenced by year-to-year changes in environmental conditions and the age of the animals. Contemporary comparisons are relatively free of these sources of error and show a higher heritability than the maximum lactation records. Soller *et al.* (1966) examined four selection criteria, one based on the maximum lactation yield and three on contemporary differences, in 20 rams and 731 dam-daughter pairs of three large Awassi flocks. The contemporary comparison criteria included: 1) first-lactation contemporary differences, which are of particular importance, as the end of the first lactation is the most efficient time for selection in Awassi flocks; 2) average contemporary differences in milk yields, defined as the average of the contemporary comparison values of the various total lactation records of ewes. Estimates of the heritability of this selection criterion are of particular importance in the pedigree selection of rams; 3) maximum contemporary comparison, defined as the highest of the contemporary comparison values obtained for the various total lactation records of a ewe. All ewes born in the same year and flock were considered to form a contemporary group, provided that this included at least 20 ewes. The average total lactation record of the contemporary group for each year, excluding very late lambings, was computed. The contemporary difference of each ewe for each of her total lactation records was computed by subtracting the average of her contemporary group for that year, including herself, from her own record for that year. The heritability estimates for these four selection criteria were used to compare relative efficiencies for selection and the annual genetic improvement that might be expected from breeding programmes based on the estimates (Table 7-1).

Most conspicuous is the extreme inefficiency of the maximum or standard lactation yield as a

criterion of selection. Maximum production on a contemporary difference basis is less efficient than either first-lactation or average-lactation records, but the difference is not great. Although average records are slightly superior to first-lactation contemporary comparisons, the authors hold that the use of the latter is justified for all breeding purposes. This would imply that, as far as selection is concerned, milk recording and testing could be limited to first lactations.

To ascertain the annual genetic improvement that may be expected from different breeding programmes, Soller *et al.* (1966) examined four possibilities, one based on selection without the progeny testing of rams, and three others based on progeny testing. The latter included a flock test, in which four rams are tested annually in a single flock on the basis of 20 daughters each; a 'master breeder' test, in which two groups of six rams each are tested in two cooperating flocks for two years, each ram on 30 daughters; an 'AI centre' test, in which eight rams are tested yearly on the basis of 40 daughters each. In each of the three progeny-testing plans, the best or the two best rams are to be retained for breeding (Table 7-2).

TABLE 7-1. Correlation of some selection criteria in dams with the average contemporary difference of their daughters

| Selection criterion in dam | Correlation | Heritability |
|-----------------------------------------|-------------|--------------|
| Maximum total lactation yield | -0.005 | 0.00 |
| First-lactation contemporary difference | 0.119 | 0.24 |
| Average contemporary difference | 0.134 | 0.27 |
| Maximum contemporary difference | 0.101 | 0.20 |

TABLE 7-2. Annual genetic improvement expected as a result of four breeding programmes

| Breeding programme | Expected improvement (kg milk per year) |
|-------------------------------------------------------|--------------------------------------------|
| Mass selection of ewes and pedigree selection of rams | 3.17 |
| Mass selection of ewes and progeny testing of rams | |
| Flock test | 4.01 |
| Master breeder test | 5.52 |
| AI centre test | 5.17 |

The expected annual genetic improvement for the four programmes ranges from 3.2 to 5.5 kg or 1.1-1.8 percent. The master breeder and AI centre programmes promise about the same rate of annual improvement, which is considerably larger than that based on the selection of ewes only on progeny testing within a single flock.

In view of the inefficiency of the standard or maximum lactation yield for genetic improvement of milk yields, this system was discarded in Awassi flocks in Israel toward the end of the 1960s and replaced by the country-wide progeny testing of all stud and flock rams employed in milk-recorded Awassi flocks. All farms under milk control are required to use only such rams for breeding as are approved and distributed by the Sheep Breeders' Association.

Male lambs may be reared for service as future flock rams if each of their parents has a score for conformation of not less than 16 points and if their dams are eligible for flock ram breeding by virtue of their milk and butterfat yields (see p. 226). The dams must also be approved for flock ram breeding by a commission composed of the flock book manager, the head of the breeding committee and a geneticist. The milk and butterfat tests of such ewes must have been carried out by a special milk tester appointed by the flock book administration. Flock rams must be replaced every three years.

In the case of lambs from very high-yielding dams, an exception is sometimes made with regard to the latters' conformation score. Lambs from such dams may be reared as reserve rams even if their dams have scored less than 16 points. The sire of such lambs, however, must be a selected stud ram.

Stud rams must be the progeny of stud rams and selected dams and be approved by a commission similar in composition to that required for the approval of flock rams. A stud ram's dam must be distinguished by a very high milk yield (see p. 226) and his sire have a high score for conformation, show strength and true type, and have been progeny tested. The progeny test for stud rams comprises four times the number of daughters required for the progeny testing of flock rams, and of the total

number of rams tested for stud ram approval only the best 25 percent are eligible .Stud rams must be replaced every two years in the flock in which they are stationed.

Since the introduction of the computer service by the flock book or computer administration, the progeny testing of rams used in milk-recorded flocks includes all of their milk-recorded daughters in three separate groups, namely, after their first lambing as yearlings or as two-year-olds, and their second lambing at the age of two years. It gives information on their mean milk yields during the current year and the total mean of the current and previous years, and further, on the number of daughters tested, the number of lambings or abortions, the percentage of pregnancies, the age of lambing, the number of lambs, the percentage of mortality, the mean number of milking days a year, the mean milk yield a year, the number of full lactations (minimum 150 days), the mean length of lactation, the mean milk yield for each lactation, the plus or minus deviation from the mean, the number of daughters culled from the flock, and the total percentage and causes of culling (such as low milk yield or udder trouble).

During the last few years the vast majority of the stud and flock rams employed in the Awassi flocks of Israel has been supplied by the 'Eyn Harod flock. This flock comprises approximately 1 000 breeding ewes, including yearlings. In the breeding of rams it is self-contained. One ram was brought in in 1964, and another one in 1955. Twice new blood was introduced into the flock through the female line. In 1945/46 ten ewes were purchased from a bedouin flock and were mated with 'Eyn Harod rams. Of their progeny, two male lambs were retained in the flock for stud breeding. Again, in 1956/57,200 female lambs, the majority of which had been sired by 'Eyn Harod rams, were introduced into 'Eyn Harod from other improved Awassi flocks. During the years 1970-75 one ram, sired by a ram from 'Eyn Harod, was obtained from another well-bred Awassi flock. In 1977, a large, highly improved Awassi flock, situated in the northern part of Israel, was disbanded, and the pick of the flock, consisting of one yearling ram and 35 young ewes, was taken over by 'Eyn Harod, which for many years had provided the stud rams for the flock.

So far close inbreeding has been avoided. In none of the pedigrees of the 25 stud rams employed at 'Eyn Harod for natural service in 1973/74 does a ram or a ewe appear twice in the parental, grandparental and great-grandparental generations, and only in one pedigree are the great-grandsire on the dam'side and the great-great-grandsire on the sire's side of the stud ram identical.

The 25 stud rams have 13 different sires. In their pedigrees two rams appear twice each, two other rams three times each, and one ram four times as sires. Two ewes appear twice each as dams in the pedigrees of the 25 stud rams, but in every pair the sires differ, showing that the breeder has avoided having full brothers among the stud rams of his flock.