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"Ewe and Me"
On-farm program for dairy sheep flocks

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SUMMARY - This paper describes "Ewe and Me" (E&M) - an "on-farm" program for managing dairy and mutton sheep flocks. E&M runs on IBM or IBM-compatible personal computers, using the Magic application generator, and the data base uses a Btrieve file-management system. E&M deals with ram, ewe and lamb populations within the flock and records details of inventory dynamics, matings and inseminations, pregnancy diagnoses, lambings, abortions, milk production, exits, semen quality for rams, and weights of lambs at birth, weaning and marketing. The 27 different reports produced by E&M summarize and analyse the reproduction and production activities of the flock and estimate the breeding value of the individuals in the flock.

Key words: Sheep, software, data processing.

RESUME - *"Ewe and Me" un logiciel en ferme pour la gestion de troupeaux ovins laitiers". Cet article décrit "Ewe and Me" (E&M) un logiciel utilisé "en ferme" pour gérer les troupeaux ovins lait ou viande. E&M fonctionne sur micro-ordinateurs IBM ou compatibles, utilisant le système "Magic". La base de données utilise un système Btrieve de traitement de dossiers. E&M traite des populations de béliers, brebis et agneaux dans le troupeau et enregistre les détails de dynamique des populations, les saillies et inséminations, les diagnostics de gestation, misesbas, avortements, la production laitière, les sorties du troupeau, la qualité de semence des béliers, les poids á la naissance, au sevrage et à la vente des agneaux. Les 27 différents rapports produits par E&M donnent un compte-rendu des résultats de reproduction et de production du troupeau et une estimation de la valeur génétique des individus dans le troupeau.*

Mots-clés : *Ovins, logiciels, traitement de données.*

Introduction

The use of personal computers for data recording and analysis has become an integral part of modern animal husbandry. While several software programs have been developed for dairy cattle, swine and poultry, no such autonomic "on-farm" software is available commercially for dairy sheep. At present, computerization in dairy sheep flocks is carried out predominantly in countries where data collection, handling and processing are carried out or supported by governmental or academic organizations.

The dairy sheep flocks in Israel contain about 500-1000 breeding ewes and they operate under highly intensive management, in which hormonal synchronization, insemination, ultrasonic pregnancy diagnosis, artificial rearing of lambs, and monthly milk recording are common practices. To enable the flock managers to run their flocks in a more efficient way, and to optimize their breeding work, a team comprising members from the research and extension units of the Israeli Ministry of Agriculture, the Sheep Breeders Association and Tadiran Ltd. Information Systems Company has developed an "on-farm" software which since its release in 1994 has been purchased and is being used now in 39 flocks.

The aim of the present communication is to describe the "Ewe and Me" (E&M, Mashkochit in Hebrew) program. This software deals with both management and breeding aspects of lamb and milk production. E&M was originally developed for dairy sheep, but it has also been successfully applied to meat-producing sheep and goat flocks.

General description

E&M software operates in a DOS environment, using the "Magic" application generator. The database uses a Btrieve file-management system. The software runs on IBM or IBM-compatible personal computers which have the following features: 386 processor or above, 4 MB of internal memory and a hard drive.

E&M is an "on-farm" program: data input and report production are all done on the farm level by the flock manager who needs only limited knowledge of computer operating. The program enables the user easily to monitor all or part of each of the three sub-populations within the flock: rams, ewes and lambs. Lambs are divided into crops, according to their lambing periods, as defined by the breeder. Once entered, all ram and ewe records are kept permanently in the database and the number of individuals recorded increases according to the annual replacement rate of the flock, which is usually 20-30%. As compared with those of the ewes and rams, the lamb data base grows much faster. Therefore, outdated lamb crop records can be deleted. The information stored in E&M can be exported as ASCII files for further analysis beyond the farm level. Several dairy and mutton flocks can be managed side by side by the same system. In mutton flocks, all issues concerning milk production are ignored in the operation of E&M.

According to E&M, the time a ewe spends in the flock is divided into "breeding cycles". The first breeding cycle starts when a hogget enters the flock and subsequent cycles are opened with each lambing. A mutton ewe breeding cycle is terminated with each new lambing or abortion and the last cycle ends when the ewe exits from the flock. In dairy flocks, breeding cycles are terminated as in mutton flocks, with the addition of ewes' drying off. Breeding cycles records include events that occur before lambing, such as matings and pregnancy diagnosis, the lambing event itself, and periodical milk records which are taken throughout the lactation. Ewes are classified according to three criteria: their production group (seven possible categories), experimental group, and assignment to either elite or culling groups.

System structure

The software is menu-driven, interactive and contains five entries (Fig. 1).

Registration: This entry is used when the flock information is entered into E&M for the first time. Later, it is used when ewes or rams, not already listed as lambs in the flock, are added to the inventory. When a ewe is registered for the first time, details regarding her last mating and lambing, and milk production records since the last lambing can be recorded. In addition, litter size and total milk yields from previous parities can be stored.

Inputs: This entry covers all flock activities. Its use and operation is designed for the user's convenience, with defaults installed to minimize typing. On entry, all records are first stored in temporary data files and the validity of each input data item is tested. A warning note appears at the bottom of the screen whenever a forbidden value is identified by the software, as defined by a set of predetermined conditions. To assist with solving ambiguities, ewe cards can be viewed directly from the "Input" entry. Thus, corrections can be made during the data entry process. Only after approval are inputs transferred to the E&M database.

Report: This entry provides access to 27 different reports which are divided into seven categories as described below. For every report the user can select a particular search option such as: all individuals, only those individuals present in the flock, ewes belonging to a certain experimental group, elite ewes, progeny of a particular sire, or other cross-sections. Reports are displayed on the screen and can be printed. The report categories are:

Animal cards: By specifying the identification number of a ram, ewe or lamb the user can obtain all of its information. A ewe card is spread over several screens which open one from another.

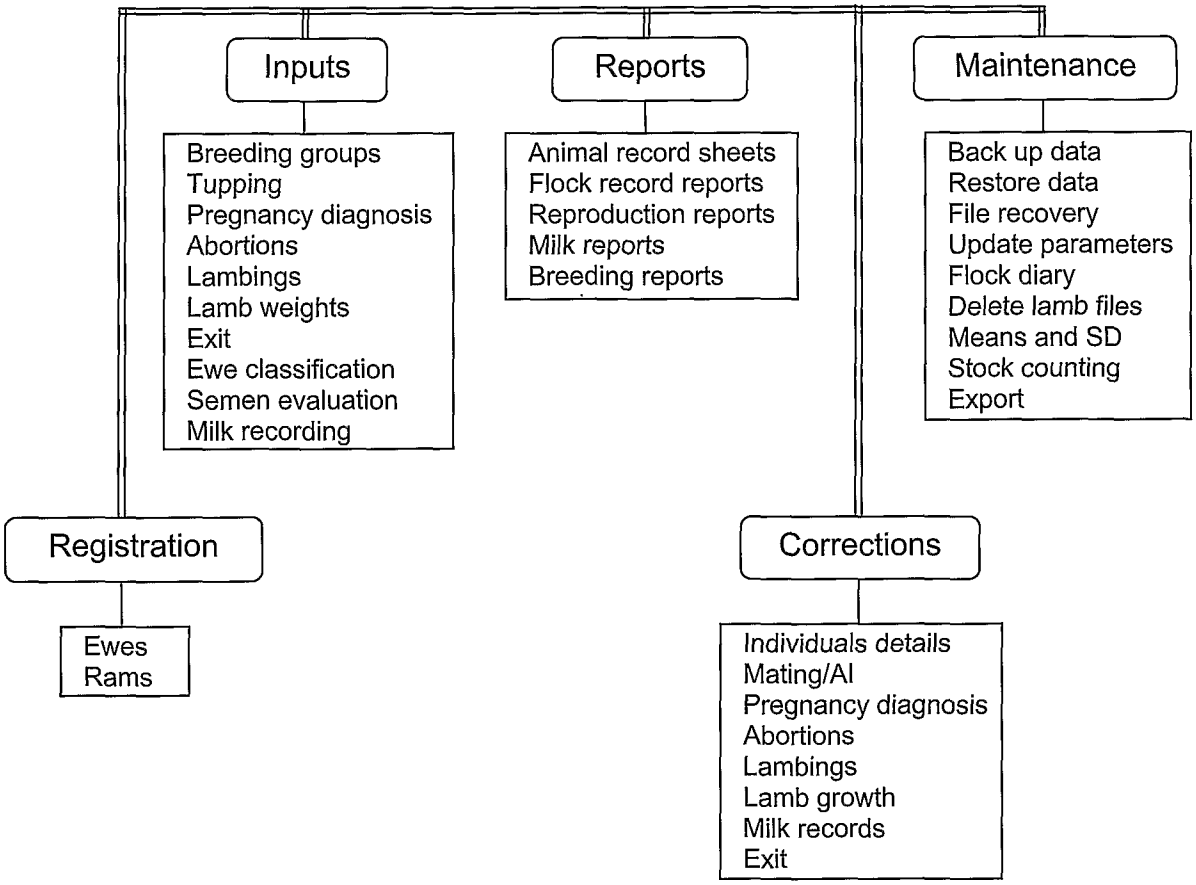

Fig. 1. "Ewe and Me" main menu.

Flock reports: Each line contains the most important information on each individual. For ewes, reproduction and milk production are addressed; for rams, the number of daughters and results of semen quality tests are listed; and for lambs, the birth weight and growth rate till weaning (GR1), growth rate from weaning to marketing (GR2) and growth rate from birth to marketing (GR3) are presented. In the ewes flock summary means and standard deviations (SD) for each parity are calculated for lambs born/ewe lambing, lambs born alive/ewe lambing, age at lambing, open days, lactation length and milk production. The lamb flock summary includes means and SD for growth rates, mortality, age and weight at marketing, grouped according to sex and litter size. Lists of stock inventory and inventory dynamics can also be viewed via the flock reports entry.

Reproduction reports: These summarize tupping, pregnancy diagnoses and lambing events, and detect ewes with poor reproduction performances, all according to the specifications of the farmer.

Milk production reports: Daily milk yield calculations in E&M take into consideration that in dairy flocks there are usually ewes that are milked once daily and others that are milked twice daily and that, in some flocks, milk recording is performed twice - in the evening and the morning - while in others, it may be performed only once. In the latter case, a correction for twice-daily-milked ewes has to be applied to obtain the daily milk yield. This correction is done by using a constant factor or a factor which depends on the volume of milk produced by the whole flock in the evening and in the morning. E&M compares the sum of the ewes' records with the actual bulk of milk in the tank and uses the ratio to correct individual records, to overcome common sampling bias. Total milk yield (TMY) per lactation is calculated as follows:

$$TMY = (T_1 - T_0)M_1 + \sum_{i=2}^{n} \frac{(T_i - T_{i-1})(M_i + M_{i-1})}{2}$$

where T_0 is the date of lambing, T_i is the date of the monthly milk recording i since the lactation was started, and M_i is the daily milk recorded on T_i.

Besides summarizing milk production at each milk recording day, milk reports offer recommendations for re-grouping ewes according to their last milk yield record.

Breeding reports: Ewes are ranked for prolificacy and milk production by comparing the averages of adjusted records. Each record of litter size or total milk yield per lactation is adjusted to the third parity or the third lactation by means of fixed correction factors. Different adjustment factors can be applied for different genotypes within the flock. This ranking system is more suitable for small flocks or flocks with limited data bases.

A second and more precise way of ranking ewes is based on contemporary comparisons. For each litter size record or lactation record, its deviation from the flock mean of the relevant breeding cycle is calculated and expressed in units of SD. The flock means are obtained through activating the "Mean and SD" option in the Maintenance entry. Records both of ewes present in the flock and of ewes already removed from the flock are considered when parity or lactation means are calculated. Ranking ewes in this way is according to their average SD value multiplied by a factor F which takes into consideration the number of lambings or lactations of the ewe. This F factor is calculated as follows:

$$F = \frac{nr}{1 + (n-1)r}$$

where n is the number of parities or lambings and r is a fixed repeatability coefficient.

Using SD of litter size in contemporary comparisons may be inappropriate, as litter size is not a continuous variable. To overcome this difficulty, lambing records are treated by means of a threshold model.

Lambs are ranked according to their growth rates and the deviation of individual growth rate from the mean of the sex-litter-size group within a crop, is presented in g/day.

Progeny testing for rams is carried out for milk yield, litter size and growth rate. Progeny testing for litter size or milk production is based on the daughters' ranking values and, in the progeny testing report, the breeding value for each ram in milk or lamb production is calculated, taking into consideration the number of records available for each ram. Progeny testing for lamb growth rate is done separately for each crop.

For simplicity and because of the limitations of the computing power of a PC, year and season effects are not considered in ranking ewes and rams on the farm level.

Maintenance: This entry is used for backing up and restoring data as well as exporting files in ASCII format. Recalculating flock means and SD, updating correction factors and codes, and deleting lamb-crop files are also done via the maintenance entry.

Corrections: This final entry enables the user to correct any data-item.

Discussion

Data recording in dairy sheep flocks can be done at several levels: from recording tag numbers only, which may help in stock inventory management, up to parent identification and recording of litter sizes and milk yields, for use in genetic breeding. E&M is designed to support this wide range of possible data collecting options and its goal is to optimize data recording and analysis rather than to force the producer to operate in a way which may not meet his demands.

Since the release of E&M in 1994, the owners of 26 dairy sheep and goat flocks with a total of about 15,000 head and of 14 meat flocks totaling some 9,000 head have purchased E&M and have

used the system successfully. The fact that the data accumulated by E&M can be easily down-loaded as ASCII files to be used for further analysis, is an important step towards developing national flock books.

Further improvement of data recording by E&M will be achieved through automation of animal identification and loading of input files into E&M directly from portable terminals.

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