The development and maintenance of animal recording systems in Greece: a case study

A. Georgoudis\textsuperscript{1} & A. Baltas\textsuperscript{2}

\textsuperscript{1}Aristotle University, Faculty of Agriculture, Dept. of Animal Science, GR-540 06, Thessaloniki, Greece
\textsuperscript{2}Ministry of Agriculture, Directorate of Inputs for Animal Production, GR-101 76 Athens, Greece

Summary

Animal performance recording and breeding in Greece aim at improving milk production of pure-bred cattle under intensive systems and of sheep and goats under semi-intensive or extensive production systems. Although milk recording was established in Greece by the Ministry of Agriculture in 1952, it is only since 1978 that it has been carried out more systematically on larger populations and in the frame of a more specific genetic improvement programme for each animal species and breed. For the application of this programme, close co-operation has been set up among the competent services of the Ministry of Agriculture, the Agricultural Universities of the country and the relevant farmers’ organisations which are in the process of being established. Milk is recorded on 61,867 dairy cows (29% of the total dairy population) in 1,425 herds (average herd size 43 cows), 31,611 dairy sheep (0.36% of the total sheep population) in 429 flocks (average flock size 72 ewes) and 3,296 goats (0.06% of the total goats population) in 36 flocks (average flock size 92). The procedures of performance recording and the future planning, aiming at increasing the number of animals and the recorded traits as well as the supporting of the farmers in managing their herds/flocks, are presented.

Résumé

En Grèce le contrôle laitier et l’élevage visent à l’amélioration de la production du lait de bovins de race pure sous des systèmes de production intensifs et des ovins et caprins sous des systèmes de production semi-intensifs ou extensifs. Quoique le contrôle laitier a été fondé en Grèce par le Ministère de l’Agriculture en 1952, seulement depuis 1978 celui-ci a été porté plus systématiquement sur des populations plus larges et dans le cadre d’un programme d’amélioration génétique pour chaque espèce et race animale plus spécifique. Pour l’application de ce programme, une co-opération étroite a été initié parmi les services compétents du Ministère de l’Agriculture, les Universités d’Agronomie du pays et les organisations des éleveurs pertinentes qui sont en cours d’être établies. Il existe 61,867 vaches laitières en contrôle (29% de la population laitière totale) dans 1,425 troupeaux (taille moyenne du troupeau 43,4 vaches), 31,611 brebis laitières (0,36% de la population ovine totale) dans 429 troupeaux (taille moyenne du troupeau 71,7 brebis) et 3,296 chèvres (taille moyenne du troupeau 92,5 chèvres). On présente le processus du contrôle de performance et les plans futurs ayant pour but d’augmenter le nombre des animaux et les caractéristiques.
Animal recording systems in Greece

contrôlées, ainsi que d’offrir aux éleveurs le soutien nécessaire pour la gestion de leurs troupeaux.

**Key words:** Recording schemes, Data processing, Computerisation.

**Brief Characterisation of the Animal Recording System**

**Species and breeds involved. Number of herds/flocks and animals recorded**

The bovine population in Greece has changed rapidly during the last 35 years. The number of cattle has decreased from 1 131 000 animals in 1965 to 608 000 in 1993. In 1996 the number of dairy cows is estimated at 216 000 head, 94% of them being Holstein-Friesian. Only 29% of these dairy cows are recorded (Table 1; Georgoudis, 1988; Baltas, 1995).

The present total sheep population is 10 069 million animals in 153 000 flocks. About 80% of this population consists of crossbred sheep and are found in every part of the country. Most of these animals are the result of a long-term and uncontrolled crossbreeding. The major segment of the sheep population belongs to the Zackel type, which is found all over the country and is characterised by the long tail and the coarse wool. A second segment of breeds belong to the Ruda type, with finer and more uniform wool and is found mainly in Macedonia, Thrace and on some Aegean islands. A third category consists of the so-called semi-fat-tailed type, found on East Aegean islands. Although all of the above breeds can be broadly classified as dual-purpose sheep (milk and meat), the second and third categories include breeds combining high prolificacy and milk yield (Table 1; Boyazoglu, 1991a and b; Zervas et al., 1991). 

The present goat population in Greece numbers 5 821 000 animals, of which 90% belong to various indigenous types. These local breeds represent about 4.5 million head in 200 000 flocks. The local goat is to be found over the entire country and derives its name from the particular region. Great interest is being attracted to the Skopelos goat (Table 1; Hatziminaoglou et al., 1985; Baltas, 1995).

**Overall input level of the production environment**

Dairy cattle are kept in environments which range from the upper medium to high level of inputs. Nevertheless, in Greece the general purposes, procedures and conditions for recording are the same for all species and breeds (Georgoudis, 1988; Baltas, 1995).

Sheep population is characterised by specific breed structure and husbandry methods. A large number of sheep-producing units are composed of a small number of animals per flock. In fact, 60% of all flocks include ≤50 ewes, which shows that they are of complementary importance to other agricultural production activities. The major animal production activity is milking, followed by meat from young lambs slaughtered after early weaning at 40 to 60 days. Complementary feeding during the last part of pregnancy and the suckling period (with the exception of some semi-intensive or housekept flocks on the plains) and the application of a transhumance are characteristic of most of the major extensive flocks (Boyazoglu, 1991a and b; Zervas et al. 1991; Baltas, 1995; Ligda et al., 1997).

Goat production has always been practised, to a large extent, within a particular socio-economic and spatial context. It generally concerns infertile, mostly degraded areas, which only the forest could have eventually made economically viable. Very extensive husbandry systems are applied to the local breeds, which play a major role in the rural economy of the difficult mountainous and semi-mountainous regions of the country. Extensive grazing conditions are, thus, put to value, which would not otherwise be of use (Hatziminaoglou et al., 1985).
Table 1. Dairy, sheep and goats’ milk recording in Greece: Populations, number of recorded animals and herds/flocks.

<table>
<thead>
<tr>
<th>Species and breeds</th>
<th>Total population</th>
<th>Recorded animals (percent recorded)</th>
<th>Total herds/flocks</th>
<th>Recorded herds (%) recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dairy cow breeds</strong>&lt;br&gt;(data from 1996)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dairy cow breeds</td>
<td>216 000</td>
<td>61 867 (28.6%)</td>
<td>n.a.</td>
<td>1 425</td>
</tr>
<tr>
<td>Holstein Friesian</td>
<td>203 000</td>
<td>61 508 (30.3%)</td>
<td>n.a.</td>
<td>1 411</td>
</tr>
<tr>
<td>Brown Swiss</td>
<td>13 000</td>
<td>225 (1.7%)</td>
<td>n.a.</td>
<td>9</td>
</tr>
<tr>
<td>Simmental</td>
<td>n.a.</td>
<td>134</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td><strong>Sheep breeds</strong>&lt;br&gt;(data from 1994)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheep breeds</td>
<td>561 800</td>
<td>31 611 (5.6%)</td>
<td>8 645</td>
<td>429</td>
</tr>
<tr>
<td>Mountains of Epirus (Boutsiko)</td>
<td>28 700</td>
<td>2 450 (8.5%)</td>
<td>300</td>
<td>24</td>
</tr>
<tr>
<td>Sfakion</td>
<td>75 000</td>
<td>1 650 (2.2%)</td>
<td>1 050</td>
<td>20</td>
</tr>
<tr>
<td>Karagouniko</td>
<td>208 000</td>
<td>14 800 (7.1%)</td>
<td>1 650</td>
<td>210</td>
</tr>
<tr>
<td>Serres</td>
<td>38 000</td>
<td>2 200 (5.8%)</td>
<td>670</td>
<td>32</td>
</tr>
<tr>
<td>Frisarta</td>
<td>27 800</td>
<td>5 011 (18.0%)</td>
<td>835</td>
<td>73</td>
</tr>
<tr>
<td>Chios (purebred)</td>
<td>7 300</td>
<td>1 000 (13.7%)</td>
<td>350</td>
<td>10</td>
</tr>
<tr>
<td>Lesvos</td>
<td>177 000</td>
<td>4 500 (2.5%)</td>
<td>2 230</td>
<td>60</td>
</tr>
<tr>
<td><strong>Goat breed</strong>&lt;br&gt;(data from 1994)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skopelos</td>
<td>8 000</td>
<td>3 296</td>
<td>n.a.</td>
<td>36</td>
</tr>
</tbody>
</table>

* only for the breeds mentioned in the table. For the total sheep population see table 2.
** local goat populations are not controlled.

Animal categories involved in the recording process

In each controlled herd/flock, all females (cows/ewes/goats) and subsequently all their female progenies (calves/lambs/kids) which are maintained as replacements, are involved in the recording process. Performance recording on the Agricultural Research Stations involves all the animals in the flock (sheep, goats only), which are considered as breeding nucleus for the genetic improvement of the relevant breed.
Animal recording systems in Greece

The farmers who use it for selection. The AI bulls, which are all imported and progeny tested in other countries (USA, France, Germany, etc.), are chosen by the farmers according to their breeding value calculated abroad. Models for the calculation of the breeding value of the recorded cows and their progenies, by BLUP-Animal Model methodology are routinely prepared, but not yet fully utilised in the everyday practice (Georgoudis, 1988; Georgoudis et al., 1992).

Performance recording in the Agricultural Research Stations aims at collecting data for studying the various native sheep and goat breeds of the country and is carried on without the involvement of the livestock keepers. These institutions are supervised by the National Foundation for Agricultural Research.

Regarding sheep and goats which are recorded on field, the farmers also receive the calculation of the total lactation for each

Figure 1. A flock of milk-recorded Skopelos goat breed (Animal Genetic Improvement Centre of Karditsa).

Purpose(s) of the scheme

In general, cattle, sheep and goat performance recording aims at genetic improvement through mass selection milk production and estimating the necessary genetic parameters for milk yield, needed for the operation of the genetic improvement scheme. Two types of recording schemes are recognised. On-farm and on-station performance recording.

On-farm performance recording for dairy cattle, sheep and goats was conceived to provide, firstly, data for the genetic improvement of the animals and secondly, to supply management and technical information for the farmers.

For cattle, no progeny testing or family selection has been applied until now. The lactation data collected by the recorders are processed by computers and the information on the 305-day and total lactation is sent to the farmers who use it for selection. The AI bulls, which are all imported and progeny tested in other countries (USA, France, Germany, etc.), are chosen by the farmers according to their breeding value calculated abroad. Models for the calculation of the breeding value of the recorded cows and their progenies, by BLUP-Animal Model methodology are routinely prepared, but not yet fully utilised in the everyday practice (Georgoudis, 1988; Georgoudis et al., 1992).

Performance recording in the Agricultural Research Stations aims at collecting data for studying the various native sheep and goat breeds of the country and is carried on without the involvement of the livestock keepers. These institutions are supervised by the National Foundation for Agricultural Research.

Regarding sheep and goats which are recorded on field, the farmers also receive the calculation of the total lactation for each
animal, based on individual recordings. With these data the farmers can select only the best females, because there is no information on the males. There are two exceptions to this situation. Since 1986, an attempt has been made to implement a progeny testing scheme for the rams of the Karagouniko breed in Thessaly. Actually, this programme has not been applied continuously because of the lack of personnel (milk recorders) and the existence of serious problems regarding the organisation of the A1. The other exception is the performance recording of the Agricultural Research Station in Chalkidiki, where a programme has been recently started to utilise the Chios sheep of the Station as a nucleus for the breed, by applying an index selection and disseminating genetically superior male and female animals to commercial flocks (Gabrilidis, 1993; Baltas, 1995; Georgoudis et al., 1995; Ligda et al., 1997).

**Animal identification**

Identification is made by plastic eartags. This unique official number actually consists of two sets of digits, namely the herd number and the number of the animal made up of the year of birth and an in-herd running animal number. Identification for milk recording and A.I. applied for genetic improvement in cattle, are identical. Furthermore, the Greek Veterinary Service is using for all species a second plastic eartag aiming at the identification of the animals for health purposes.

**Traits measured**

The traits considered and the collected information are:
1. Individual identification of all animals.
2. Mating and lambing/kidding dates and consecutive number.
3. Type of birth, sex of the lambs or kids and litter size.
4. Monthly controls of milk yield (a.m. and p.m.) after the suckling period.
5. Fat, protein and lactose content of milk.
6. Live weight records of lambs at regular intervals (birth, before and after weaning).
7. Live weight records of ewes at mating and at lambing.

Actually, some of these traits (traits 5, 6 and 7) are not regularly recorded on the field (Georgoudis, 1988; Gabrilidis et al., 1993; Baltas, 1995; Ligda et al., 1997).

The method of milk recording is the official A1, once a month two milkings per day. The controller records for each ewe in his first visit after lambing/kidding, the identification number, the age in years, the data and the consecutive number of the lambing/kidding, the number and the sex of the lambs/kids born alive (after the first 24 hours). The visits are repeated once a month and the milk yield is measured in the first visit after the suckling period. Measurement takes place by a volumetric tube with markings of 1/100 lt. This is done until the end of the lactation period of each ewe/goat, that is when daily milk drops under 0.05 lt (~ 50 g). The collected data with a sample for measuring the milk contents is delivered immediately after the visit to the responsible body, the Animal Genetic Improvement Centre (Georgoudis, 1988; Baltas, 1995).

**Other information collected**

Information regarding feeding or health traits is not collected. Pedigree information derives, when properly registered, from the individual identification and lambing data. No efforts have been made until now to collect and analyse information related to herd/flock management.

**Types of analysis of samples and processing of data**

Analysis of samples and processing of data are not undertaken on the farms. Milk samples are analysed at the Animal Genetic Improvement Centres (Drama, Thessaloniki, Karditsa, Ioannina, Athens) with two MILKOSCAN apparatuses in each Centre (type 104 without printing and 133 with printing device), capable of measuring fat,
animal recording systems in Greece

protein, lactose and solids with and without fat, at the rate of 700 samples per hour. After milk content is determined, the results are matched with milk recording data and finally sent for processing to the central computer. The trend is moving towards storing and processing the collected data at local PC’s (in one Animal Genetic Improvement Centre it has already been done) (Baltas, 1995).

Computerisation and storing of the data

The processing of the data is accomplished centrally. At the beginning of the implementation of animal recording a small-scale computing centre was established in co-operation between the Ministry of Agriculture and the Department of Animal Husbandry - Laboratory of Animal Genetics and Breeding of the Aristotle University of Thessaloniki, at the University Farm.

This computing centre provides facilities for processing milk and reproduction control data collected in northern and central Greece, where the major part of the dairy cattle population is kept. In the meantime, part of the processing work is accomplished by personal computers in the Animal Genetic Improvement Centre using home made software (Georgoudis and Alifakiotis, 1985; Georgoudis, 1988).

The method applied for the calculation of marketable milk production of the ewes and goats controlled is the Fleischmann, modified to accomplish a 42, instead of 24 day suckling period.

Processing for the cattle recording data takes place every month and the results are sent back to the farmers. At the present time, processing for sheep and goats is accomplished once, at the end of the production period and the advice to the farmers is based on the results of the total lactation of each ewe/goat and the average production, as well as the standard deviation of the flock in relation to the average and standard deviation of the whole region for which the Animal Genetic Improvement Centre is responsible (Georgoudis, 1988).

Government and farmers’ involvement

The Greek Ministry of Agriculture is responsible for the proper implementation of the on-farm performance recording. A basic adverse factor for the promotion and improvement of the animal recording and the livestock structure in general, has been the absence of organised initiative on the part of the livestock breeders. As a consequence, there are no genealogical books belonging to farmers’ organisations.

The difficulties of the implementation of the recording system are not counterbalanced by an individual and collective interest in the results provided. Furthermore, a degree of breeders’ resistance to recording is noticed because of the tedious work involved in milk sampling and weighing. Also, the discussions for passing at least a part of the recording cost on to the farmers do not help its further development. To overcome these constraints, the current trend is to simplify the recording and to accelerate data turnaround (Baltas, 1995).

Who pays for the recording

The responsibility for the on-farm performance recording has been exclusively undertaken by the Ministry of Agriculture and the financial support comes from the Greek government. Performance recording on the Agricultural Research Stations is supervised by the National Foundation for Agricultural Research, which indirectly receives financial support from the Ministry of Agriculture.

Furthermore, during the previous periods (since 1993), the Ministry of Agriculture granted the farmers considerable premiums to join the recording and genetic improvement scheme (Baltas, 1995).
Type and nature of technical support

The recording and genetic improvement scheme is scientifically and technically supported by the Ministry of Agriculture and the Agricultural Universities.

The Directorate for Inputs to Animal Production which is responsible for the Animal Genetic Improvement in the Greek Ministry of Agriculture, operates five regional Animal Genetic Improvement Centres (Drama, Thessaloniki, Karditsa, Ioannina, Athens). These Centres monitor the milk recording and genetic improvement scheme, process and evaluate the collected data in collaboration with the Animal Production Department of the University of Thessaloniki, inform the producers on the relevant results and provide them with technical advice on selection, breeding and feeding. Further technical advice to farmers is also given by the Regional Agricultural Development offices of the Ministry of Agriculture (Georgoudis, 1988; Baltas, 1995).

Principal people involved in the development and maintenance of the scheme

The Ministry of Agriculture, Directorate for Inputs to Animal Production with five regional Animal Genetic Improvement Centres. The Agricultural Universities (Thessaloniki and Athens) have been involved in the development and continue to support the scheme with computer facilities, software for processing the collected data and scientific methodology for the genetic evaluation of the recorded populations (Georgoudis, 1988; Baltas, 1995).

Figure 2. A flock of milk recorded Karagouniko sheep breed (Animal Genetic Improvement Centre of Karditsa).
Main Reason for Introducing and Maintaining the Scheme

The official animal performance and especially milk recording has been applied in Greece for about 50 years and it can be divided in four periods.

The first period, which could be characterised as an introductory one, covers the years between 1952 and 1962, when milk recording was planned by the regional services of the Ministry of Agriculture and intended to identify only the variability of milk yield of sheep raised in farms, without being an integral part in the framework of a genetic improvement programme of the known breeds. Generally, this period could be characterised as an introductory one, without a well-founded organisation and with a lot of omissions in milk recording and data processing. An exception to this was the recording applied in a considerable number of the Chios breed sheep on the homonymous island. Related activities have also taken place in livestock research Institutes, though these Institutes did not and still do not participate in the official recording and genetic improvement scheme.

The second period covers the years from 1963 to 1977 and is characterised by the issuing by the Ministry of Agriculture of the relevant decisions and regulations for the organisation and operation of the herd book and milk recording of the common cattle, sheep and goat dairy breeds. Milk recorders were employed by the regional services of the Ministry of Agriculture in order to carry out milk and fat content recording, body conformation measurements, collection of feed intake information and processing of the data. Generally, the performance recording scheme was well and systematically organised, but the number of recorded animals was limited and the collected data were not being evaluated and used properly, mainly due to the lack of scientific and technical personnel.
The third period covers the years from 1978 to 1992 and is characterised by the establishment in the Ministry of Agriculture of the Directorate of Animal Genetic Improvement (later renamed Directorate for Inputs to Animal Production) and of five regional Animal Genetic Improvement Centres (Drama, Thessaloniki, Karditsa, Ioannina, Athens), which monitored the milk recording and genetic improvement scheme, processed and evaluated the collected data. In 1978 and 1982 the regulation of animal milk recording of 1963 was amended, as well as the relevant decision concerning the organisation and operation of herd book (Giossis, 1988).

The genetic improvement scheme, which has been introduced since 1978 and also applied during the period that followed, was based on the use of imported frozen semen from progeny tested bulls. This semen is used by the AI to service only cows participating in the milk recording scheme. Bulls, born by the best of these recorded cows, are bought by the AI service in order to cover the frozen semen needs for the rest of the dairy cow population. In 1987 the Department of Animal Production of the Faculty of Agriculture of the Aristotle University of Thessaloniki started to evaluate the imported progeny-tested sires with a BLUP model. In 1992 the evaluations extended to cover also the recorded cow population with an Individual Animal Model based solely on milk yield and performed twice yearly (Georgoudis and Alifakiotis, 1985; Georgoudis, 1988; Georgoudis et al., 1992).

The fourth period, which is a continuation of the previous period, started in 1993 and has not yet concluded. In this period, the Ministry of Agriculture is also still in charge of the organisation and operation of milk recording and herd book keeping, but the intention is to totally involve the co-operative organisations, under the supervision of the Ministry (Baltas, 1995; Georgoudis, 1988).

**Most Significant Activities and Design Peculiarities That Have Enabled the Scheme**

**Initiation**

The genetic improvement scheme, which has been introduced since 1978 and with minor modification being carried out until today, is characterised by the establishment in the Ministry of Agriculture of the Directorate of Animal Genetic Improvement and of five regional Animal Genetic Improvement Centres. These Centres monitor the milk recording, process and evaluate the collected data in collaboration with the Animal Production Department of the University of Thessaloniki and informed the producers on the relevant results. The Ministry of Agriculture is still in charge of the organisation and operation of milk recording and herd book keeping, but there is the intention to totally involve the co-operative organisations, under the supervision of the Ministry (Baltas, 1995; Georgoudis, 1988).

**Maintenance**

During the recent period milk recording was carried out more systematically, on a larger scale and in the framework of a more specific genetic improvement programme for each animal species and breed. A number of milk recorders has been employed, but they were not enough to cover the needs of the milk recording programme. Furthermore, a close co-operation has been established between the competent services of the Ministry of Agriculture and the Animal Production Department of the University of Thessaloniki. The use of computers has been started and as a result, the whole programme has improved, as far as the collection, evaluation and use of all the relevant data by the farmers and the responsible scientists are concerned. In addition to the milk yield, data on milk composition and those related to artificial insemination and parturition are being collected (Baltas, 1995).
Animal recording systems in Greece

Problems and Short Comings

The controllers’ working conditions are very hard, especially when they are working with small ruminant producers, because the installations are very little improved or primitive. The identification of the animals has proved to be very difficult in flocks with a very large number of animals.

The Animal Recording and Genetic Improvement Centres are staffed with a small number of scientists and supporting personnel, resulting in a small proportion compared to the number of controlled animals. Taking into account that the production units are spread out over long distances, it is understandable that monitoring the controllers’ work is difficult and the farmers are very often not consulted.

Accuracy of the collected data is crucial for animal recording schemes and great efforts have been made in order to secure this. For this to be accomplished, it is very important to hire controllers through an appropriate procedure. In Greece, the animal recording scheme does not dispose of vehicles, so the controllers are obliged to use their own cars, taking a reimbursement per kilometre covered. The applied recording scheme implies that the controller visits twice (in the evening and the morning of the next day) each farm, having as a consequence very high travel costs and dead hours between these visits.

The actual computer processing is mostly the easiest part today as computers are generally sufficiently powerful. Efficient organisation of input to the computer, building up sophisticated databases and designing useful output to the farmers are, however, difficult problems.

Very few sheep and goat keepers do realise the economic benefits resulting from the genetic improvement of their flocks. Nevertheless, they are applying to participate in the existing animal recording schemes, aiming at getting financial subsistence coming from national or EU resources.
Under these circumstances, a large part of livestock keepers have no interest in the monthly recording results nor do they welcome the controllers in their units. It is reported that some of them force the controller to fill out the official sheets arbitrarily or complete the milking before the controller’s visit because, in this way, they avoid, in their opinion, the stressing of the animals as a result of the control process.

These reactions of livestock keepers result in the controllers’ disappointment, which leads them to laziness and indifference. The personnel involved in animal recording have attempted to improve this situation with personal contracts, written instructions, seminars and even threatening them with exclusion from the scheme. The general opinion is that year-by-year all the above practices have yielded positive results, e.g. the better general education of the new-comers in the recording scheme and the increase of the production yield of the recorded populations (Baltas, 1995).

Future Directions and Changes to the Design and Operation of the Scheme

According to a recent resolution of the Ministry of Agriculture, the foundation of independent co-operatives or non-profit organisations has been proposed, in an attempt to spread out the animal performance recording and apply specific genetic improvement projects more systematically. Furthermore, attempts will be made for the farmers to financially contribute to the milk recording programme, while during the previous periods the Ministry of Agriculture granted them considerable premiums to join the recording and genetic improvement scheme.

The farmers’ organisations will be responsible for the identification of the new-born calves/lambs/kids, the application of milk recording and analysis of the milk samples for fat and protein content, the
collection of reproduction data and the keeping of a database for production and pedigree. For these activities, the establishment of separate organisations for cattle, sheep and goats are underway. Especially, sheep and goat breeding will be carried out in collaboration with several research institutions, which may have a breeding nucleus. Progeny testing, estimation of genetic merit and evaluation of secondary traits, will be carried out by the regional Animal Genetic Improvement Centres, in collaboration with the Agricultural Universities of the country (Baltas, 1995).

Decentralising of the production records by region (input and output) would give more flexibility to the recording programme and would allow the farmers to have the relevant records sooner.

Other planned applications are the introduction of simplified recording methods appropriate for low to medium input production systems and the introduction of computers in managing the dairy herds and flocks. Furthermore, the development of communications with the use of modems between the computing centre and the on-farm personal computers of the co-operative members will allow them to interact directly with the databases.

References


