

COLLECTING AND MANAGING DATA EFFECTIVELY: A CASE STUDY FROM THE COMISANA BREED

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INTRODUCTION

An effective on farm animal identification and production recording systems are critically important for farm management and for genetic improvement of an animal population. A genetic improvement program and good management are essential components of a viable dairy sheep industry.

In the Mediterranean, variable and sometimes inaccurate production recording systems are implemented by the local farmers associations. Difficulties in creating an efficient system for data recording and management are partly due to factors related with the peculiarity of the dairy sheep production system, such as poor animal identification and lack of farm infrastructures for milk recording.

The Experimental Zootechnical Institute of Sicily (Italy), the Farmer Association of Matera Province (Italy) and Cornell University (USA) have developed a specific information system for complete management of data from the flocks in the nucleus created in conjunction with the implementation of the breeding program to improve milk production in Comisana dairy sheep in the region of Sicily.

This information system facilitates monitoring and management of the sheep population and supports all selection and breeding decisions needed for the genetic improvement program. The information system was designed and implemented to work efficiently in wide varieties of management systems: in intensive or extensive system using marginal land resources, with efficient or rudimentary farm housing, with milking parlor or milking by hand.

In this paper the different components of the information system developed to support the genetic improvement program for Comisana breed and its components addressing the collection of production and reproduction records, population management, genetic evaluation of animals and the mating program are presented.

ANIMAL IDENTIFICATION

Accurate identification of animals is a precondition for ensuring an efficient flock management and for implementing a genetic improvement program in the field. In the nucleus flocks enrolled in the Comisana breeding program the electronic identification was adopted by using the rumen bolus system. This system is the result of ten years of research projects supported by the European Community with the aim to promote the electronic identification of livestock. In Europe, the rumen bolus system is today utilized to identify over five million animals.

The animals are identified using individual tags and ear tattoos immediately after birth and at six months of age the lambs receive the rumen bolus (Figure 1), which is ingested orally (Figure 2) and will permanently lodge in the animals' reticulum. The rumen bolus is a ceramic capsule (cylindrical shape and weighting 70gr) containing an ISOHDX type transponder of 32 mm. The transponder is a passive battery less device functioning between - 25°C and + 85°C.

When it is stimulated by the Handheld Reader (Figure 3) emitting low frequencies electromagnetic waves, the microchip transmits a unique and inviolable number. The Stick Antenna (Figure 4) allows the production controller to identify each animal without having to closely approaching it as shown in Figure 5. The Handheld Reader is connected to the Records Keeper (Figure 6), in fact a field computer, which associates the microchip number with the animal identification and allows the operator to enter the production and reproduction records for each animal in the flock.



Figure 1. Rumen bolus microchip.



Figure 2. Ingestion of Rumen Bolus.



Figure 3. Handheld Reader.



Figure 4. Stick Antenna.



Figure 5. Reading animal identification in the field



Figure 6. Records Keeper.

THE DATABASE

The database to store production and reproduction data for dairy sheep or goats records was developed by the Farmer Association of Matera Province (Italy) and is named *Progecom* (Figure 7).

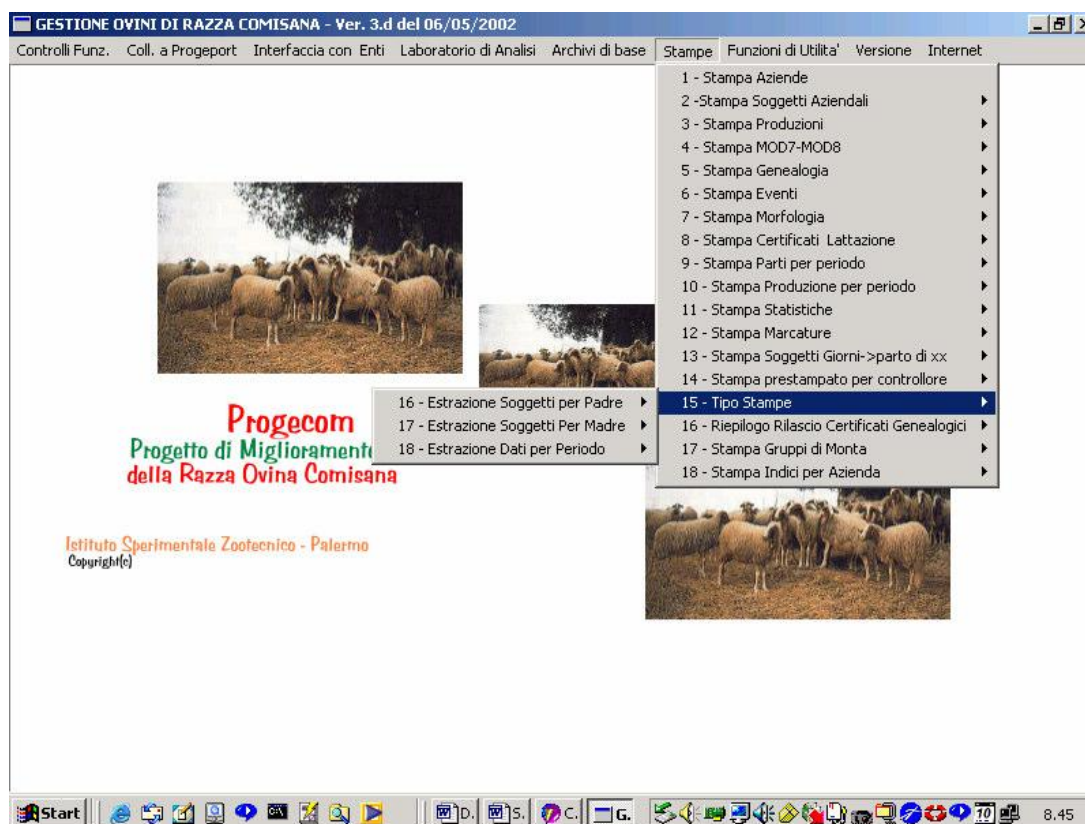


Figure 7. Progecom opening screen.

The program works on PC with a Windows 95/98/NT/2000 operating system. The general structure and the main functions of the Progecom database are:

1. **Farm identification and storage.** This function of the database stores various information related with the farm, such as name, location, tel. number, type of farm etc. Each farm has an unique code, which allows for fast and easy search of database. The date of the last milk control is also automatically reported.
2. **Animal identification and storage.** The animal identification is associated with a unique microchip number. All information related with the individual animal, such as sex, date of birth, sire and dam, farm, last event status code, lactation number, etc., are stored. The database allows for easy retrieval of productive and reproductive career of each individual animal.
3. **Record collector identification.** The names of the technicians of the breed or farmer association who are responsible with the collection of records on each farm are recorded.
4. **Productive and reproductive data management.** This function of the database allows the operator to store the productive and reproductive data collected in the field such as date and type of lambing, milk yield, other events like date of dry, animal sale or elimination, etc.. A number of editing filters are built into the system to ensure high accuracy of collected records. The lactation curve is also constructed for each ewe if requested.
5. **Breeding groups management.** This procedure assigns a ram to a single ewe or a group of ewes, either with natural mating or with artificial insemination. The operator enters the starting date and the last breeding date for each group as well as the result of the pregnancy diagnosis. When the lamb date of birth is entered, the program automatically assigns the sire according to the time interval between the breeding dates of the group and the birth date of the lamb.
6. **Milk composition storage.** The database can import the milk components, such as fat, protein, SCC, urea, lactose, total dry matter, etc., which will be associated to the milk yield records for the corresponding test day.

7. **Building the dataset for the genetic analysis.** A specific function of the program extracts the dataset used by the genetic evaluation program to estimate the genetic merit of all animals.
8. **Genetic indexes storage.** The estimated genetic merit (breeding values) can be automatically imported and stored in the database.
9. **Interrogating the database via screen reports.** The database provides a number of reports that have a direct application to the flock management. Some of them are: the list of the farm animals (the entire flock, the males, the lambs, etc.), milk productions for each farm in each control, milk productions in a predefined time interval for each farm, the list of animals that have performed higher than a predefined amount of milk, the productive and reproductive career of each individual, the breeding groups, the morphological evaluation of each animal, the list of ewes that have lambed in a predefined time interval, the main statistic parameters. An image of the database that highlights the list of screen reports is in Figure 7.

COLLECTING RECORDS IN THE FIELD

In dairy sheep, the collection of milk records on farm is particularly laborious and typically subjected to bias due to poor identification of individual animals. This is the reason why a specific field interface program has been implemented for the flocks involved in the Comisana breeding project. The field interface program consists of two software components named *Proport* and *Ovichip*.

Proport works on a Portable Personal Computer and is designed to manage the productive and reproductive data on farm. The software imports the records collected on farm and provides the farmer with all information related to the milking.

Ovichip works on the portable Keeper and has two important functions: it associates the microchip number with the animal identification and allows the operator to enter the individual milk production measured in the field.

This program allows the Records Keeper to interrogate the identification of animals and greatly facilitates the collection of records on farm and their transfer to the data-base, while maximizing the accuracy of the records. Figure 6 shows a phase of the milk recording.

THE GENETIC EVALUATION PROGRAM

The *Genetic Evaluation Program* is an important component of the information system. The first function of the program is to edit the data coming from *Progecom* database and structure it in a format required by the genetic evaluation program.

The genetic evaluation program uses an autoregressive test day animal model (TDAM) developed by J. Carvalho *et al.* (1998). The computer software is based on a series of programs that build the incidence matrices according to the structure of the data, and compute the inverse of the genetic additive relationship matrices to be incorporated into the coefficient matrix of the BLUP mixed model equations.

The variance components, heritability and repeatability are estimated and used as inputs for subsequent genetic evaluation analysis in which the genetic ranking of all individuals in the data set is determined. In the second stage of the analysis the breeding values (EBV) and accuracy of EBV are estimated for all animals in the data set after adjusting for the effect of environmental factors such as of farm, age, parity and days in milk.

THE MATING PROGRAM

This component of the program allows the formation of breeding groups for progeny testing of young rams or for matching of available rams and ewes for breeding using a set of criteria chosen by the operator. The matching can be done based on age, production, location, genetic merit, etc, while controlling for the level of inbreeding of the future offspring.

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