



FONDO EUROPEO AGRICOLO PER LO SVILUPPO RURALE: L'EUROPA INVESTE NELLE ZONE RURALI

## SHEEP AL.L. CHAIN: an APP for monitoring the breed

The objective of the SHEEP AL.L. CHAIN project is the valorisation of the limited diffusion sheep breeds in the Belluno area, the Alpagò and Lamon breeds, with computerised sharing of genealogical data and production traceability. This enhancement will be carried out both through more scientific aspects, as regards the computerised sharing of all data useful to safeguard the presence and continuity of these two breeds, thanks to the support of the University of Padua, and through territorial marketing actions, since the enhancement of the productions linked to the two breeds cannot take place without the enhancement of the territory. The improvement of the competitiveness of the farms of the autochthonous sheep breeds with limited diffusion in the province of Belluno, the Alpagò and Lamon breeds.

As part of the project, a smartphone application (APP) was developed in collaboration with the University of Padua - DAFNAE to support breeders in the ram rotation phase and for genetic selection.

### The aim of the JPA

The aim of this innovative tool in the breeding sector is to reduce the **risk of** inbreeding between breeders, maintain genetic variability in the two sheep breeds and encourage optimal use of genetic resources.

The first challenge that SHEEP AL.L. CHAIN wanted to address is that related to *inbreeding*, i.e. the level of consanguinity present in the population of the two sheep breeds. This phenomenon represents a significant problem in terms of the animal's adaptability to the environment and its ability to react to environmental stress. It could also be a factor that predisposes to the appearance of hereditary diseases with direct consequences on the animal's state of health. In fact, the inbred animal is weaker both in functional and reproductive terms, with negative repercussions on the performance of the farm and on the enhancement of the products and the link with the territory.

### Methodology

#### Data collection

In order to collect the information useful to build the APP, a **participatory and collaborative process with farmers** was promoted to identifying the type of usable data useful for the correct management of the Alpagò and Lamon sheep breed farms and useful for structuring the database needed to make the APP operational. For this reason, the meetings were attended not only by the project partners, but also by most of the farmers of the two sheep breeds.

During these meetings, the partners had the opportunity to get to know each other and begin to collaborate, focusing primarily on the type and usefulness of the data to be provided, in particular with reference to the number of rams available and broodmares, and on how to share them. **ARAV** was involved first and foremost, as well as the other bodies operating in the province and the region with databases useful for this purpose: **Veneto Agricoltura**, **IZSVe** (CREV department), **Regione Veneto**, **AVEPA**, the latter for georeferenced data on the areas declared by breeders. Where there were inconsistencies between the data provided, they were integrated during the various farm visits.



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The combination of these data made it possible to create the farm-side database which, integrated with the genetic data, allows the **choice of the best ram** for one's flock, as well as obtaining *benchmark* indicators for the evaluation of correct farm practices.

### The creation of the APP

From the database, a software with a mobile application was developed to meet the following requirements:

- encourage the exchange of data between project stakeholders, so that they can keep them constantly updated;
- provide decision support to breeders for sharing breed genealogical data;
- use the data collected to support territorial marketing activities.

The database also makes it possible to manage the list of farms with geo-referencing of farm centres and the management of herds.

Once the database from which the APP will collect information was structured, the user generation and central authentication system was defined, based on the following roles:

- **system coordinator:** access to all data, including management of genetic data
- **livestock farming:** access to the farm in order to access and modify the data for which they are responsible.

The development of the APP has been designed for both *smartphones* and *Android tablets* for simplified access to project data and to manage interactions between farms, agronomists and genetics experts.

### Access to the platform

The APP requires the user to be identified by means of a user ID and password provided by the operator in a unique manner, so that all the data of interest can be downloaded automatically. Through the APP, the company is able to collect the following information:

- coordinates of the business centre
- company name
- characteristic data of the flock: code, breed, other descriptive data
- possibility of carrying out simplified censuses of the animals in a flock on a given date (number of rams, ewes, lambs and ewe lambs)
- management of the master data of individual rams: date of birth, herd of origin, sire ram (if available), breed, ear tag and personalised farm code
- management of stud programming: by selecting a flock, the breeder can associate a given ram with a flock for a given period of time.

### Data processing

The main functions of the APP such as 'ram choice' were developed on the web side only, while individual companies can access this database via the APP.

Each ram surveyed by the farms and any genomic data are managed within this space: both the results of serology against the diseases tested (lentivirus and paratuberculosis) and the results of Illumina's Ovine 50k chip-tests on the animals; DAFNAE has created a compatibility matrix between the flock from which a ram is derived and a ram that can potentially be used as a breeding animal in that flock.



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Using the results of DNA extraction, a **genome-based matrix will** be developed that will identify distant relatives and allow mating by reducing inbreeding, while maintaining genetic variability. The APP used by the farmer will display the matrix data suggesting to the farms which ram is best suited to their flock.

### The result

The "**ram choice**" function is first developed as a matrix using genealogical data. Once all breeders have entered their data and recorded the movements of rams and ewe lambs, the system tracks the contacts between the different farms and calculates a genealogical relationship. In a second step, the "ram choice" function will be processed on a genomic basis, whereby, thanks to the data collection process and the analyses carried out, the degree of relationship between the rams and any offspring of the rams will be included in a matrix that will be inserted into the APP to enable the choice of the most genetically compatible ram.

Finally, the "**registry**" function was found to be performing well in terms of making the system communicate with the choice of ram and above all to benefit associations and breeders in the management of the annual census. This result could also allow the creation of an intermediate role to be assigned to subjects that group breeders such as associations, or to subjects and institutional bodies such as ARAV.

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