ResAlliance

Type of Solution: Management, Technology Sector: Agroforestry

Good practice(s): Management alternatives, Financing, Protection against biotic and abiotic hazards

GPS collars: remote monitoring of mountain grazing

In Serra do Alvão, Portugal, the "Rebanhos +" project is using targeted grazing to manage the understorey, preventing fires and restoring degraded areas.

Pastoralism in Lameiro in Serra do Alvão.
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Projecto LIFE Maronesa team
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/// Context ///

Traditional pastoralism is falling into disuse in northern Portugal with the decline in the rural population. The role of the herds, combined with the use of fire to control the understorey, which is vital to the resilience of the landscape by reducing the impact of fires, has been lost.

> **Technologies to improve productivity of silvopastoralism, understorey management and livestock breeder/shepherds labour**

To improve grazing conditions, the “Rebanhos +” project has been launched, using guided grazing as a tool for managing natural spaces, preventing fires in a coordinated way between neighbouring areas and restoring degraded areas. It invests in geographical information system models that allow risk prevention and adaptation to climate change through a virtual platform.

The LIFE Maronesa project also appears, promoting governance and climate information to communities in the villages of Serra do Alvão. It provides Maronesa cattle breeders with technological tools and strategies to combat climate change, an economic incentive for the return of silvopastoralism to the mountain ecosystem.

One of the aims of these projects is to test the benefits of monitoring livestock using GPS technology applied to the animals’ collars. The position of the animals is recorded in real time and transmitted via the Digitanimal mobile phone application. This practice simplifies the tasks of breeders and shepherds: the animals, which graze in the baldios between April and November, are easy to find if they are far from the farm, go to other villages or cross paths with another herd, a task that used to take a lot of time. The efficiency in locating animals allows professionals to be away for other activities without worrying about losing them. The data collected from the devices is extremely useful for detecting and analysing spatio-temporal patterns of animal behaviour, vital information for improving mountain pasture management.

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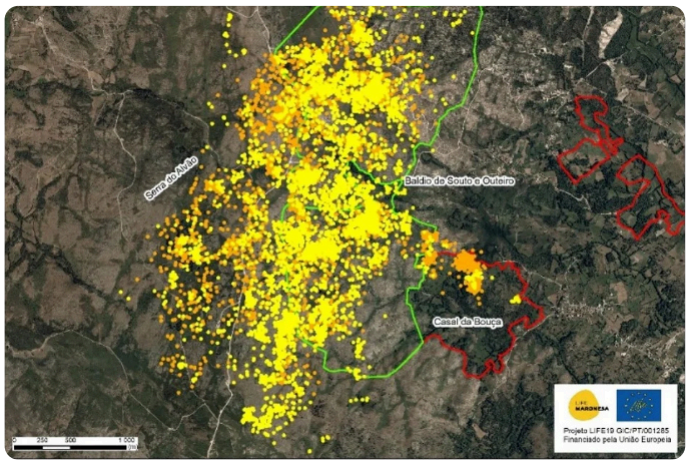
GPS collars are a success story with the potential to be widely used in the future. However, there are barriers to overcome, such as the difficulty of getting good network reception in the most remote areas of the mountains. This is being addressed by working with network distributors and placing relay units in identified areas with weak signal reception.



Mapping of animal behaviour with the Digitanimal application
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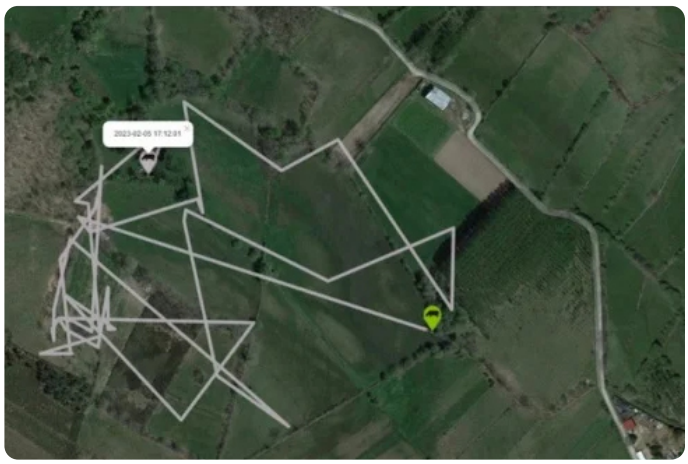

Route recorded by the Digitanimal application
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/// Solution for a Resilient Future ///

In the mountainous areas of northern Portugal, lameiros, private land for pasture and hay production, and baldios, collective land traditionally used for cattle grazing, are of great importance to local communities. The lameiros, which are arable land, are different from the baldios, which have no agricultural potential and are located at higher altitudes. Cattle have traditionally been key to the functioning of these lands, providing traction work and the transport of fertility. Grazing, low-intensity fires and removal of shrubs for animal bedding and fuel use controlled the shrub layer while maintaining a productive cover for grazing. The progressive depopulation of these areas, due to migration to urban centres and the ageing of the population, makes these practices less and less common. With the disappearance of grazing, animals intervene on the land, resulting in less management of the shrub cover and, consequently, more problems associated with the spread of fire.

A technology to control the location of grazing in real time and increase labour productivity.

The LIFE-Maronesa and “Rebanhos +” projects were set up to modernize and improve grazing conditions in the Alvão mountain range. “Rebanhos +” is the result of a consortium between AguiarFloresta, the Associação Nacional de Criadores de Cabra Bravia and the Associação Nacional de Caprinicultores da Raça Serrana. LIFE Maronesa, also coordinated by AguiarFloresta, brings together the Associação de Criadores do Maronês, the Instituto Politécnico de Bragança and the Casal da Bouça Livestock Farm.

With the disappearance of grazing, animals intervene on the land, resulting in less management of the shrub cover and, consequently, more problems associated with the spread of fire.

One technological solution to these projects is the use of collars fitted with GPS receivers to monitor livestock. The GPS system emits a signal every 30 minutes that indicates the animal’s location. This position is sent to a central server, which the herders can access through an application installed on their mobile phones to see how their herds are moving in the mountains. The devices have an estimated autonomy of six months to a year. The cost per collar varies between €149.99 and €189.95, depending on the quantity purchased.

Monitoring is carried out using the Digitanimal application (https://digitanimal.pt/), which is renowned for its ease of use. It allows access to the general map showing the position of the collars, differentiated between “in good working order” and “with malfunction or lack of network coverage”. The route taken by the cattle is also recorded, making it possible to identify which areas they prefer to feed in and for how long. This type of knowledge is crucial for developing more appropriate grazing management methods. One example is information for the positioning of mobile mangers, a technical and logistical innovation also tested in LIFE-Maronesa. The monitoring is carried continuously, allowing the collection of a maximum of 17520 position data per animal per year. Such information is an opportunity to observe and study the temporal patterns in animal behavior, such as animal local preferences between day and night or during separate seasons.

Applying GPS collars on goats
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The benefits to herders' productivity are clear. Animals can stray from the herd, either by getting lost, falling asleep or being attacked. With this system, the shepherd spends much less time searching the mountains. This frees up time for other management tasks on the farm. During the hay harvest period, for example, it allows the breeder to fully focus on this activity of great importance for the future of the farm in the coldest months of the year, where the productivity of the meadows is not sufficient for a good diet for his herd, and the cold and bad weather makes the animals available to spend more time on the mountain. Between the end of spring and the beginning of summer, the farmer can control and evaluate the best time to cut the grass in his plots spread throughout the village and collect the hay before it loses its moisture and nutritional quality for the herd.

/// Always Moving Forward ///

The LIFE Maronesa and "Rebanho +" are part of the initiatives undertaken by the Terra Maronesa Community of Practice to promote the sustainability of extensive livestock farming, the improvement and conversion of mountain areas, while contributing to the economic valorisation of the activity and reducing the risk of forest fires. At the same time, these activities promote and publicise the indigenous breed of cattle "Maronesa", originating from the northern region of Portuga, whose meat is protected by the EU's Protected Designation of Origin (PDO) regime.

The proper functioning of the equipment requires a good signal distribution network in the mountains

The lack of mobile network coverage in the Serra do Alvão is being an obstacle to the implementation of the LIFE Maronesa project. Without a proper network coverage for the GPS equipment, the animal tracking is compromised. This coverage problem not only affects the efficient monitoring of the animals, but also causes the reduction on the autonomy of the devices by almost half in areas with poor coverage. Ideally, the devices should have a year of autonomy. Once the battery in the GPS device runs out, the professional has to find and capture the animal on his own, which can be dangerous considering these are animals used to living outdoors. One of the ways of solving this problem is to detect and delimit areas with a poor GPS signal and to place new sigFox network retransmitters to complement the existing network. The sigFox network was here chosen because 5G coverage in Serra do Alvão is very poor. The network is designed for low-speed communication, reducing the costs and energy consumption of connected devices. Because it is based on a very narrow band, it allows devices to have a high power to penetrate obstacles, facilitating communication over long distances.

The GPS collars are ultimately a tool that provides a

Applying GPS collars on cows
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considerable amount of information related to animal monitoring, which contribute to the future development of new methodologies in multiple areas related to silvopastoralism.

In the “Rebanhos +” project, the collars were used more in goat herding practice, focused to monitor the daily movements of wild and mountain goats. In this way, in addition to being able to locate the herd, the breeders were able to identify areas on their or the community’s land that their animals preferred. In this way, they improved the availability of pasture through mechanisation or the use of fire to renew it. Thus, the collars helped to increase the area under herd management and, consequently, the area protected against wildfires.

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In the LIFE Maronesa project, the collars in addition to identifying the most favoured areas for the herd in the communal areas, for management interventions similar to those of the the “Rebanhos +” project, such as the use of fire, they allowed for the quantification of grazing areas, which will be used for monitoring purposes for the calculation of the carbon sequestration area and for the future re-evaluation of grazing as an ecosystem management tool.

The LIFE Maronesa project is now halfway through and will continue until September 2025. It will continue to test and improve technological solutions to promote the practice of extensive silvopastoralism using the Maronesa breed of cattle, an autochthonous bovine breed perfectly adapted to the mountain ecosystem. To follow the latest news on these topics, visit the project website at https://www.lifemaronesa.eu/noticias/.

GPS collars are ultimately a tool that provides a considerable amount of information related to animal monitoring, contributing to the future development of new methodologies.

Further information

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- Nacional association of Criadores de Cabra Bravia (Ancabra). https://www.ancabra.pt (Accessed in 16 April 2024)
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Authors: Duarte Marques, Terra Maronesa; Henrique Mira Godinho, Terra Maronesa; Joana Paulo, ISA – Instituto Superior de Agronomia; Paulo Firmino, ISA – Instituto Superior de Agronomia

Partner: ISA – Instituto Superior De Agronomia

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