Optimisation of the fertilisation plan for the Segre Valley in the Alt Urgell-Cerdanya area

Summary

The growing need for proper management of livestock manure generated in our regions has led the cooperative to invest in a comprehensive management system for livestock by-products, recovering them as organic fertilisers.
The key point is to concentrate the nitrogen and phosphorus in livestock manure into a solid product, which reduces transport costs. This would make our livestock farming more competitive and sustainable.

Objectives

- Establishing a joint management system for livestock waste from dairy and beef cattle belonging to members of the cooperative Pirenaica SCCL.
- Optimising the fertilisation of agricultural fields in the Alt Urgell-Cerdanya area carried out by Pirenaica, by implementing a pilot mobile decanting system.
- Carrying out a thorough characterisation of the soils and manure in L'Alt Urgell and La Cerdanya to provide fertilisation advisers with the necessary tools to make the most efficient decisions possible.
- Reducing transport costs and the carbon footprint in applying livestock manure.
- Assessing ammonia emissions from the entire livestock manure management chain at the farms included in the pilot project and soil nutrient dynamics.
- Revitalising local agriculture and livestock farming.

Description of the actions carried out in the project

Pirenaica SCCL is a cooperative that has been serving farmers and stockbreeders, mainly in L'Alt Urgell and La Cerdanya, since 1945. Its objective is to provide members with all the supplies and services needed to run their agricultural and livestock farms. It currently supplies raw materials to livestock farmers in the regions of L'Alt Urgell and La Cerdanya and has spread to other neighbouring regions such as El Pallars Jussà, El Pallars Sobirà and L'Alta Ribagorça (and other areas to a lesser extent). This is why it is considered the cooperative of the Pyrenees.

In addition to supplying raw materials such as seeds, animal feed and food supplements, one of the main activities of Pirenaica is the community unifeed. This stems from an initiative promoted in 1992 by a group of livestock farmers, which is still running today. In this way, the cooperative helps boost the rural and local economy, as it buys fodder from farmers and/or livestock breeders in the region, which it stores in silos at its own facilities and then manufactures the unifeed ration distributed daily to the dairy farms in L'Alt Urgell and La Cerdanya.

It is also stores with grain harvested in La Cerdanya, where most grain cereals are grown. This is used to

manufacture part of the feed the livestock farmers themselves produce and consume.

These last two examples show how the cooperative can boost the local economy and help local producers.

As a result of the latest changes in the livestock manure management regulations, which are more restrictive in terms of both the amount of nitrogen and phosphorus that can be applied to fields and the application periods, livestock farms need to have more land available for their manure plans and, at the same time, are forced to schedule manure application work more carefully with the advice of the new livestock manure advisers. This task is offered by the cooperative while it seeks further solutions.

Given the agricultural and livestock farming characteristics of the two regions, intensive livestock farms in L'Alt Urgell are having difficulties in finding land to manage their manure due to its high concentration, while extensive livestock farms and those in La Cerdanya have a shortage of manure for their land due to the low concentration of livestock. As mentioned above, a large part of this is used for extensive livestock farming.

Given this situation, a group of dairy cattle farmers, members of Pirenaica, commissioned the technical services of this cooperative to draw up a project to define the basis and viability of a joint manure management centre and find a way of transferring surplus manure from L'Alt Urgell to areas lacking manure in both L'Alt Urgell (mountain areas) and La Cerdanya.

The scope of this project was the regions of L'Alt Urgell and La Cerdanya. There are three distinguishable zones in this area:

- **L'Urgellet.** This area currently has the highest concentration of farms and the largest number of Pirenaica partners involved in the project. Its agriculture is mostly fodder crops such as alfalfa and pasture. It is an area with a surplus of livestock manure.

- **Oliana and Peramola.** The area has a lot of farms, where projects are being carried out to both expand and create new farms. Agriculture mainly consists of annual crops both for fodder and grain cereals.

- **Cerdanya.** This, together with the extensive mountain livestock farming in L'Alt Urgell, is where the lowest concentration of farms is to be found, causing a shortage of manure for application to existing agricultural land. It is used for meadows in irrigated areas, grain cereals in rain-fed areas and meadows in mountain areas.

The objective of the proposed strategy was to rent mobile equipment (a manure decanter) to concentrate nitrogen and phosphorus from livestock manure in the solid fraction of the manure and thus reduce transport costs by reducing the volumes transported and increasing their concentrations.

This decanted product has to reach farms with a deficit in livestock manure. This enriches the soils in these areas lacking nutrients, revitalising the extensive agricultural and livestock farms, which would otherwise tend to disappear, leading to the abandonment of pastures, meadows and cereal fields. This would have negative consequences in terms of loss of biodiversity and forest encroachment, increasing forest cover and the risk of forest fires. At the same time, all this also means a loss of cultural heritage and population in the area.

The project focuses on improving the management of livestock manure to achieve competitive and sustainable livestock farming throughout the operational group area of influence (L'Alt Urgell and La Cerdanya), where livestock manure is not an inconvenience or a waste product to be disposed of, but is recovered as a resource. This is also a necessary measure, so as to improve the yield from farms lacking livestock manure. The fact that manure is no longer a limiting factor for either surplus or deficient farms will attract future generations, who will inherit a sustainable and productive farm model.

The reason for choosing rental equipment was to test the technology and assess options for the future purchase of equipment with greater treatment capacity to cover most of the farms in the regions. As part of the project, the cost of waste management was assessed in order to rate the possibilities.

Given the geographic spread of the participating farms, the use of mobile equipment is indispensable, while it also optimises investment.

To execute the aforementioned project, a person working for the cooperative was assigned to work in the field and with the machinery, carrying out the tasks of monitoring ponds, taking samples of livestock manure on the farms and working with the research centre to provide the samples they needed, while also setting up and carrying out the operations of handling, cleaning and maintenance of the livestock manure treatment plant facilities contracted for the recovery of manure and by-products. In addition, another part-time person was hired for sampling and to provide support in the tasks of commissioning and developing the equipment. They also collaborated with the university in interpreting the results and observed and assessed the different machine operating dynamics to calibrate them on the farms.

One of the other tasks carried out from the outset was a study, together with the University of Lleida Soil and Water Research Group, involving the sampling, analysis and characterisation of a number of representative farms in the area, which form the agricultural base of the operational group and its soils. The study first selected representative farms, taking into account pH levels, fertility, soil texture types and current or future crops, after which the soil sampling was carried out.

The next step was to perform another study, again with the University of Lleida Soil and Water Research Group, involving an analysis of the crops on the farms, bearing in mind real yields and production for 2021, using data provided by Pirenaica SCCL, which are linked to the needs and contributions made in each of them.

Another aspect assessed with the technology centre was ammonia volatilisation, which varies greatly depending on the crop and the way in which subsequent application of liquid manure or the resulting liquid fractions is managed. This shows that the proposed manure treatment systems allow us to extract a greater amount of nitrogen from the liquid fraction.

One of the aspects given special emphasis with the mobile treatment equipment was adjusting the quantities of treated manure and flocculants and/or coagulants used to extract most of the dissolved solid particles in the slurry. This is a key point, as it determines the optimum performance of the equipment and the viability of the investment in a system of these characteristics.

Final results and practical recommendations

The first point to be determined was the need to look for alternatives that extract phosphorus and nitrogen in order to reduce the load of these elements on the farms in the Segre Valley.
Alternatives such as the tested technology that allow a large part of the N and P in the solid fraction to be extracted may provide a good solution, as long as the treatment costs are affordable.
Good prior characterisation of the slurry from each farm is needed to improve treatment efficiency and optimise the plant performance.
A mobile facility is a good solution, as individual investment would be too expensive due to the size of the farms in the study area.

Conclusions

The fact that the technology tested is mobile means farmers are aware of the existence of this livestock manure treatment plant in the regions of L'Alt Urgell and La Cerdanya. This provides an image of sustainability and movement in a sector that is constantly evolving.
Furthermore, the resulting product is a very good organic fertiliser that provides structure to the soil.

Further work and fine-tuning of the tested technology should continue in order to fully optimise the process.

Leader of the Operational Group

ORGANISATION: PIRENAICA, SCCL

Coordinator of the Operational Group

ORGANISATION: PIRENAICA, SCCL

Other members of the Operational Group (grant recipients)

ORGANISATION: SOIL AND WATER RESEARCH GROUP (UDL)

ORGANISATION:

ORGANISATION:

ORGANISATION:

Other members of the Operational Group (not recipients of the grant)

ORGANISATION: SOIL AND WATER RESEARCH GROUP (UDL)

ORGANISATION: SERVEIS CIFISAO, SL

ORGANISATION:

ORGANISATION:

Geographical area(s) of application

PROVINCE(S)	REGION(S)
Lleida and Girona	ALT URGELL AND CERDANYA

Dissemination of the project (publications, conferences, multimedia, etc.)

The project was publicised on the cooperative's Instagram (@coopirenaica) account and on the Pirenaica cooperative website.
An explanatory conference was also held for members of the cooperative and an information leaflet on the treatment system was published.
The project was also presented at IntercamBiom to compete for the 2022 best sustainable practice awards.
Further demonstration conferences are planned.

Project website

https://pirenaicasccl.com/optimitzacio-del-pla-de-fertilitzacio-de-la-vall-del-segre-a-la-zona-alt-urgell-cerdanya/

More information on the project

PROJECT DATES	TOTAL BUDGET
Start date (month-year): July 2020	Total budget: €114,100.00
Completion date (month-year): September 2022	DACC funding: €60,473.00
Current status: Completed	EU funding: €53,627.00
	Own funding: €48,900.00

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Order ARP/133/2017 of 21 June, approving the regulatory bases for grants for cooperation for innovation by promoting the creation of European Association for Innovation operational groups in the areas of agricultural productivity and sustainability and the execution of innovative pilot projects by those groups, and Resolution ARP/1531/2019, of 28 May, announcing the call for the grant.

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