

# Development of a technology for the monitoring of all the liquid manure from a farm on an annual basis in order to determine its nutrient content (N, P, K) using NIR (near-infrared) technology and its volume using sensors

## Summary

Sixty-four per cent of Catalonia's regions already have nitrate vulnerable zones, where more than 170 kg of N from livestock excrement per hectare and year cannot be applied. One of the tools implemented to monitor the application of N in soil is the incorporation of a remote control system (via GPS) in manure tanks to register location and application information. This system is connected to a web-based data reception platform that enables the real-time reception, verification and storage of data by the Ministry of Agriculture, Livestock, Fisheries and Food (DARP).

The new decree on livestock manure introduces a new improvement to the system for the monitoring and control of the application of manure through the incorporation of conductivity metres in the tanks to estimate the content of N and K that is applied, rather than using the traditional theoretical reference values.

Notwithstanding, conductivity is still not an exact or precise means of determining the concentration of nutrients (N, P, K) in liquid manure.

The development of a technology based on NIR (near-infrared spectroscopy) sensors linked to the GPS tank monitoring system that is currently in place would enable the complete monitoring and quantification of the distribution of the application of nutrients from livestock manure throughout Catalonia and especially the quantity of N, P, and K generated at each farm.

## Objectives

The main objective of the project is the development of a robust and adaptable system based on NIR technology to measure the N, P and K content of manure in real time and have precise information about the quantity of nutrients generated at each livestock farm and where it has been transported and applied.

Specific objectives:

- Measure the volume and fluctuations of farms' liquid manure storage reservoirs using level sensor.
- Create a mobile unit to measure the concentration of nutrients with NIR (near-infrared spectroscopy) coupled with a conductivity metre and an optical flow metre to monitor the manure volume and concentration and therefore the nutrients generated, exported and applied.
- Develop the data monitoring, control and registration system for each farm and create an online platform to monitor the parameters in real time.

## Description of the actions planned in the project

1. Identification and assessment of the IR sensors and optical flow metres available in the market to technically assess their viability.
2. Design, construction and validation of the system to quantify the nutrients in the manure reservoirs and implementation to analyse and validate its application during the tank filling process.

3. Construction of a real-time data transmission platform.
4. Determination of the technical and financial viability of the system in relation to the quality of the data obtained.

## Expected results and practical recommendations

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The expected results of the various actions described above are as follows:

1. Assessment of three different NIR sensors and their comparison with other available analysis systems.
2. Once the most suitable unit has been selected, positive validation in a real environment.
3. Good monitoring and registration of data associated with the DARP's current control platform.
4. A high degree of reliability in the nutrient content data provided by the NIR sensor.

## Task force leader

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Entity: **AGRÀRIA PLANA DE VIC I SECCIÓ DE CRÈDIT, SCCL**

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Typology of entity:

**Agri-food company**

## Task force coordinator

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## Other task force members (grant beneficiaries)

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## Other task force members

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Entity: **BALMES UNIVERSITY FOUNDATION**

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Typology of entity:

**University**

Entity: **GRUP SOLUCIONS MANRESA SLPU**

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Typology of entity:

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## Subject area(s) of application

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Farming equipment and machinery

Waste, by-products and residues man

## Geographical area(s) of application

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**Province(s)**

Barcelona

**Region(s)**

Osona

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

The results are to be presented at national and international congresses and work seminars on problems associated with the monitoring and balance of livestock excrement in Catalonia, proposing the project as a possible knowledge and management tool.

Cooperative:

- Online: the websites of the various centres involved in the project are to be used to present news about the execution status of the project. Moreover, social media will be used as a platform for the dissemination of activities, seminars, results, etc., mainly Twitter and Facebook.

- Offline: emails/letters will be sent to the partners. Press releases will also be issued to local media.

Finally, presentation events will be held at the cooperative's headquarters to disseminate the results to the partners and collaborators.

UVIC-UCC:

It will use all its communication channels (website and social media of the BETA Technology Centre and of the university) and provide the necessary dissemination resources to inform the public of the results of this project. Moreover, the BETA TC as a member of the TECNIO Network enjoys the full support of ACCIO and the TECNIO Network to disseminate successful projects and their innovative results. This support includes communication via ACCIO's national and international dissemination media.

At the regional level, the highest impact media will be contacted through the UVIC-UCC's communication office to assess the publication of newspaper articles, inclusion in radio and television programmes, etc.

## Project website

## More information on the project

### Project dates

Starting date (month-year): June 2018

Completion date (month-year):

Current status: *Underway*

### Budget approved

**Total budget: €195,625.00**

*DARP funding: €78,054.38*

*EU funding: €58,883.13*

*Own funding: €58,687.50*

### With funding from:



Generalitat de Catalunya  
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Ramaderia, Pesca i Alimentació**



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*Order ARP/133/2017, of 21 June, approving the regulatory bases of grants for cooperation for innovation through the promotion of the creation of European Association for Innovation task forces in terms of agricultural productivity and sustainability and the execution of innovative pilot projects by these groups.*

*Resolution ARP/1868/2017, of 20 July, calling for applications for grants for the year 2017.*

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