

Development of a slurry concentrator with continuous total nitrogen data collection

Summary

The pilot project aims to reduce the costs of management of livestock waste by applying a new process from which the slurry coming directly from the farm will be separated into two phases, a first semi-liquid phase with the most of the organic fraction, the nutrients and the larger particles and a second liquid phase with low nutrient concentration. The differentiated management of the two phases will allow to minimize transport costs as well as the optimization of the application of nutrients in the soil, both from an agronomic and environmental point of view

Objectives

- To implement the monitoring of the flow and concentration of nitrogen through an equipment / sensors that allow to know at all times the efficiency of the treatment and the distribution of nitrogen in the two phases.
- Minimize the costs of the setting up and operation (including energy consumption) of the new process / technology developed (concentrator)
- Ensure that the materials that make up the concentrator are resistant to the environments to which they are destined and that guarantee a high durability of the equipment.
- Evaluate the implementation of the concentrator in existing installations without substantially modifying the storage structures.
- To lower the cost of transportation of agricultural nutrients such as nitrogen, phosphorus, potassium and organic matter.
- Assessing environmental impacts through life analysis tools (LCA) and the economic viability of the process using tools of analysis of the cycle of costs (Life Cycle Costing-LCC).

Description of project activities

1. Design, construction and implementation of the new system of concentration of nutrients and organic matter in slurry storage ponds.
2. Monitoring the concentrations and characteristics of each of the fractions (diluted and concentrated).
3. Capture, transport and application of fractions produced.
4. Determination of the economic and environmental sustainability of the new system and the new management model.
- 5- Modifications and redesign of the system based on the results obtained in Action 4, to determine the economic and environmental sustainability of the new system and the new management model.

Final results and practical recommendations

The main conclusions drawn from this study are the following:

- The concentrator designed and built in this project presents satisfactory results. With both mothers and

fattening, it is possible to obtain a diluted effluent and another concentrate.

- Purines from mothers' farms have yielded better volumetric yields. In these it has been able to dilute between 73 and 88% of the volume treated. In contrast, with fattening slurry these yields are around 17%.
- The analytical results performed on the slurry storage ponds have shown the stratification that some components follow, such as organic nitrogen and phosphorus.
- Phosphorus and nitrogen have a greater separation efficiency than potassium, which is mainly retained in the concentrated phase due to its tendency to be retained in the sediments.
- The conductivity measurements of the samples of analyzed purines present good correlations with total nitrogen, ammoniacal and potassium, and are comparable to those presented by other authors.

$$N-NH_4 + = 0.148x - 0.09 \quad (r^2 = 0.752)$$

$$NT = 0.239x - 0.672 \quad (r^2 = 0.836)$$

$$K = 0.116x - 0.014 \quad (r^2 = 0.774)$$

- The rack monitoring system allows continuous monitoring of energy consumption and conductivity. However, the system must be improved in order to minimize the oscillations of the conductivity data.
- The energy consumption of the processes carried out is low, achieving the most unfavorable 0.227 kWh · m⁻³ tests.
- The joint analysis of the results obtained seems to demonstrate the technological and economic feasibility of the system.

Conclusions

The concentrated prototype developed in the project has yielded very satisfactory results: both diluted effluent and concentrated effluent are obtained in both slurries from mothers and from fattening pigs. The results are better for slurry from mothers. Phosphorus and nitrogen remain mostly retained in the concentrated phase. The system allows continuous monitoring of energy consumption and conductivity. Energy consumption of processes is low. The tasks carried out in the pilot project demonstrate the technological and economic viability of the proposal for its use for the benefit of the farms, and for the cooperative in its efficient management of the manure.

Operational Group Leader

Entitat: **AGRÀRIA PLANA DE VIC I SECCIÓ DE CRÈDIT**

E-mail de contacte:

smartin@planadevic.cat

Tipologia d'entitat:

Cooperativa

Operational Group Coordinator

Entitat: **FEDERACIÓ DE COOPERATIVES AGRÀRIES DE CATALUNYA (FCAC)**

E-mail de contacte:

marius.simon@fcac.coop

Tipologia d'entitat:

Associació o federació de cooperatives

Other Operational Group members (beneficiaries of aid)

Other Operational Group members

Entitat: **FUNDACIÓ UNIVERSITÀRIA BALMES (UNIVERSITAT DE VIC - UNIVERSITAT**

E-mail de contacte: **DE CATALUNYA)**

Tipologia d'entitat:

sergio.ponsa@uvic.cat

Universitat

Entitat: **GRUP SOLUCIONS MANRESA, SLUP**

E-mail de contacte:

mercemartinez@solucions.info

Tipologia d'entitat:

Entitat d'assessorament agrari

Keyword-category

Farming equipment and machinery
Fertilisation and nutrients management

Territorial scope

Province	County
Barcelona	Osona

Project dissemination *(publications, seminars, multimedia...)*

Pàgina web del projecte

Other project information

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