



DIGESTATE FROM MANURE RECYCLING TECHNOLOGIES

Technical Conference in cooperation with DELOS project
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Paz Gómez. AINIA Technology Centre

Contract Nr. ECO/12/332882



Co-funded by the Eco-innovation
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Which is the bottle-neck of using digestate?

Considerably high costs of transport and application to the soil decrease the efficiency of the process of making digestate suitable as a cost-effective fertilizer.



DIGESMART solution aims to **reduce the environmental impact of European farms or biogas plants** by facilitating the market uptake of innovative solutions for the treatment, recycling and valorization of digestate.



French farmer uses digestate to fertilize

Source: www.bioenergie-promotion.fr



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- Validation and replication of ammoniumstripping/scrubbing.
- Investigating solar drying complementation
- Testing and validation of green fertilisers



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Objectives



The **specific objectives** of the project are summarized below.

- 01 To evaluate the regulatory context and energy costs relevant to the DIGESMART solution.
- 02 To test the digestate treatment solution at farm level.
- 03 To evaluate and compare the green fertilizer production system with existing technologies.
- 04 To develop the Life Cycle Analysis of the whole process.
- 05 To validate the solution developed and replicate it.
- 06 To facilitate the transfer of the results to European farmers.



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Partners



- DETRICON (Belgium). SME developing the stripping plant
- BIOGAS-E (Belgium)
- AINIA (Spain)
- UNITO (Italy)
- SATA (Italy)



Coordinator of the project:



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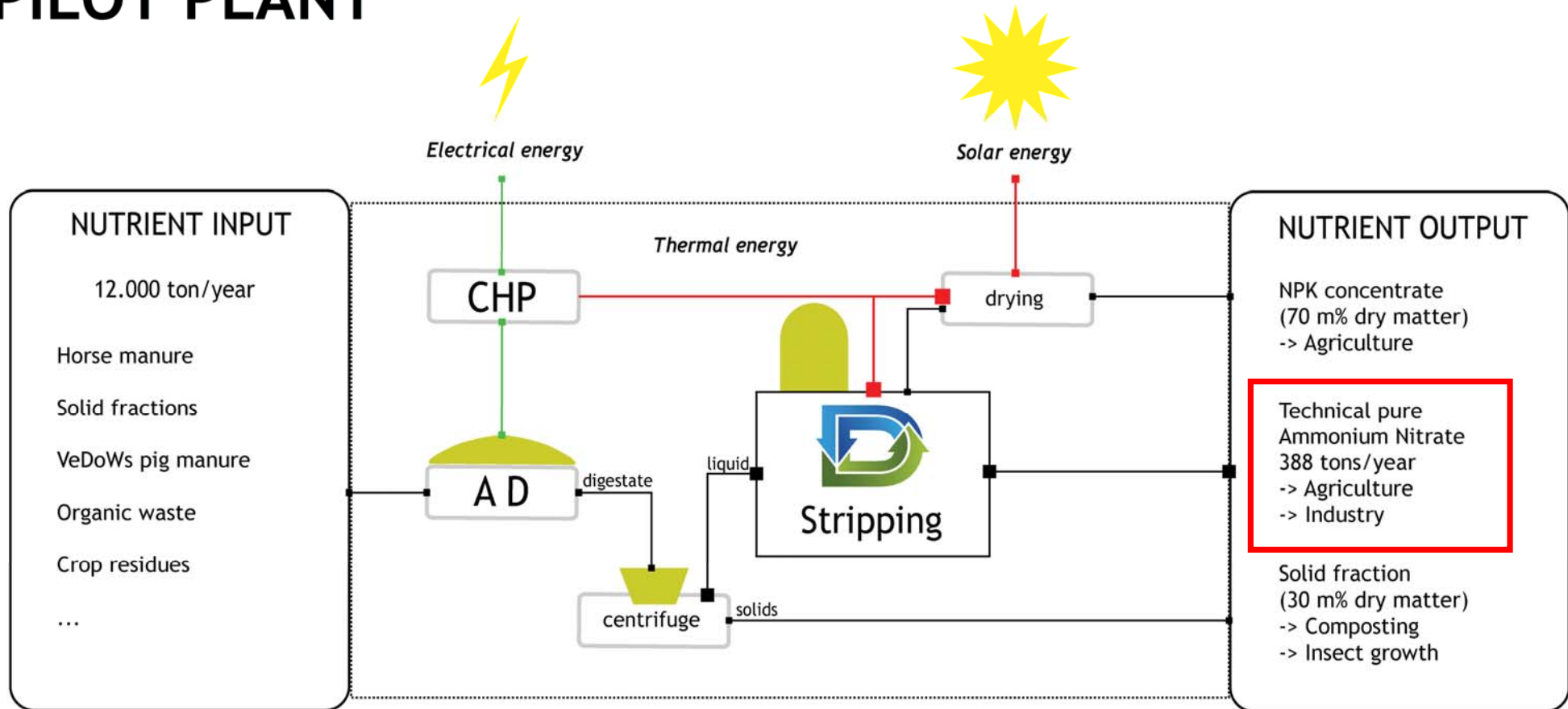
DETRICON is proposing a solution to produce green fertilizers with stripping technology and an optional module of solar drying

Digestate obtained at the end of the AD process is.

- a) Centrifuged
- b) Liquid fraction will be treated through a high temperature stripping (thermal energy from the CHP)
- c) Optionally, the residue from the stripping could be further dried using solar energy



PILOT PLANT



The Green Fertilizer (Ammonium fertilizer)

The main product from the stripping plant is the ammonium nitrate which is a valuable ammonium fertilizer. The agricultural use of this product is similar to the ammonium fertilizer from non-renewable sources. The strong points are:

- Renewable origin of raw materials to produce it
- Marketable: possible to register as green fertilizer
- High nitrogen content: Ammonium nitrate 18m% N
- Liquid fertilizer: system of transport in trucks similar to synthetic fertilizers



The project is especially focusing on the **ammonium fertilizer: ammonium nitrate (18m%N)**



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First trials - stripping



First testing on thin fraction of digestate with following characteristics:

- 9% DM
- 6,7 kg N-NH₄/ton
- High viscosity (reason is a bad mechanical separation (screw press) without polymers)

Adding: 20 kg CaO/ton



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First results - stripping



Conclusions:

1. Bad separation gives higher CaO need. Possible impact on the carbonates buffer.
2. High viscosity gives a bad sedimentation of CaPO₄ flocs (only 0,6 kg free phosphates precipitated)
3. Further stripping can still lower the N-NH₄ content - see next testing.
4. For LCA and business plan- the CaO has the highest impact on carbon footprint and operational costs
5. The produced ammoniumnitrate (18m% N) is technical pure. No difference as the testings with manure.
6. New location uses a decanter with polymers - giving a thin fraction with 3-4% DM and less viscosity.



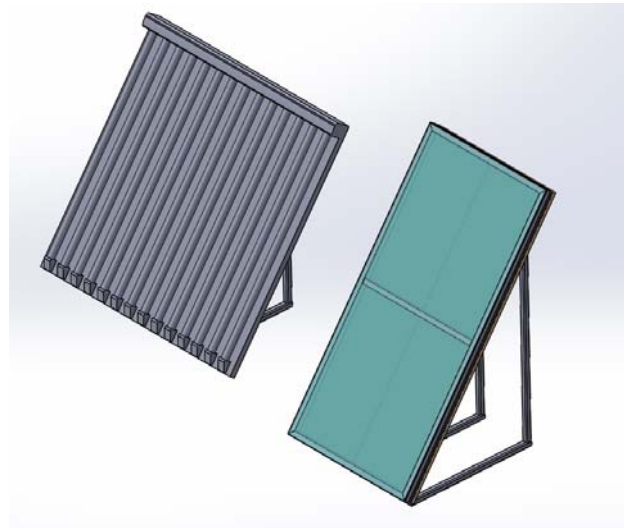
Solar drying (under development)



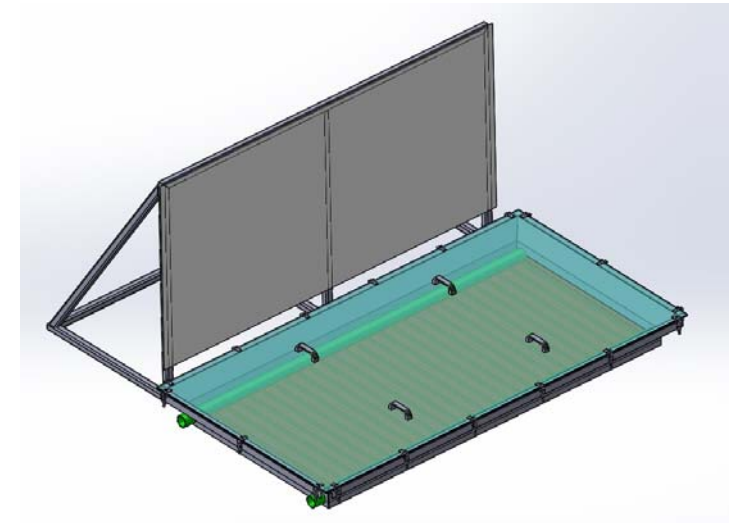
Solar evaporation and solar drying plant are under development

Elements:

- Solar thermal collectors
- Two air/liquid heat exchangers
- Evaporator
- Two condensers
- Heat pump
- Fan and air ducts



Solar modules



Evaporator



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Field trials



Compare the agronomical performance of the green fertilizer to chemical fertilizers available on the market
(Italy and Belgium trials)



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Field trials

EXPECTED DEVELOPMENTS OF THE FIELD TRIALS

(trials will end in October 2015)

- Estimate the price of the green fertilizer
- Test its use in the tested crop systems
- Assess the chemical stability of the green fertilizer
- Possible use of other by-products of the process (Potassium salt from the solar drying)



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Field trials. Materials and Methods



Set up:

- 3 trials
- Fertigation for lettuce in greenhouse(2 cycles: 1 in halfspring, 1 in autumn)
- Fertigation for grain maize in open field
- Foliar fertilization on soft wheat to increase grain quality
- Treatments: No liquid fertilizer application (Test), Conventional liquid fertilizer application as common practices (T1), Green fertilizer application replacing the conventional (T2).



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Materials and methods

- Assessments:
 - Plant toxicity
 - Plant growth
 - Yield
 - Overall quality of the product
 - Effects on disease
 - Soil analysis



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Conclusions

- Final cost is fundamental to understand the usability of the product especially if it has to «compete» against other products
- The green fertilizer should be usable by farmers according to their normal practices and uses





Who would be interested in the new technology developed in this Project?

Any livestock farm or food company which manages their organic waste (livestock waste, vegetable waste, etc.) in a agro-industrial biogas plant aiming to sustainably and economically optimize the exploitation of their digestate. Also, medium sized farms which want to improve the valorization of their livestock waste.

Which countries could be interested?

If your biogas plant or your farm is settled in a European country and you want to produce a green fertilizer with a high value on the market through a low cost technology, then you are interested in this Project.



Agenda updated in the website: www.digesmart.eu

Next dissemination activities:

Stand in SEPOR Fair (3-6 November 2015) in Murcia

Visit to the demonstration stripping plant in Belgium (January 2016)

For further details, please, contact with Paz Gómez

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