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force

A European Public-Private Partnership



EAAP

European Federation of Animal Science



2nd one-day symposium of the Animal Task Force & the EAAP Commission on Livestock Farming Systems

State of the art in Research and
Innovation – Manure management

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**Livestock emissions
and the COP26 targets**

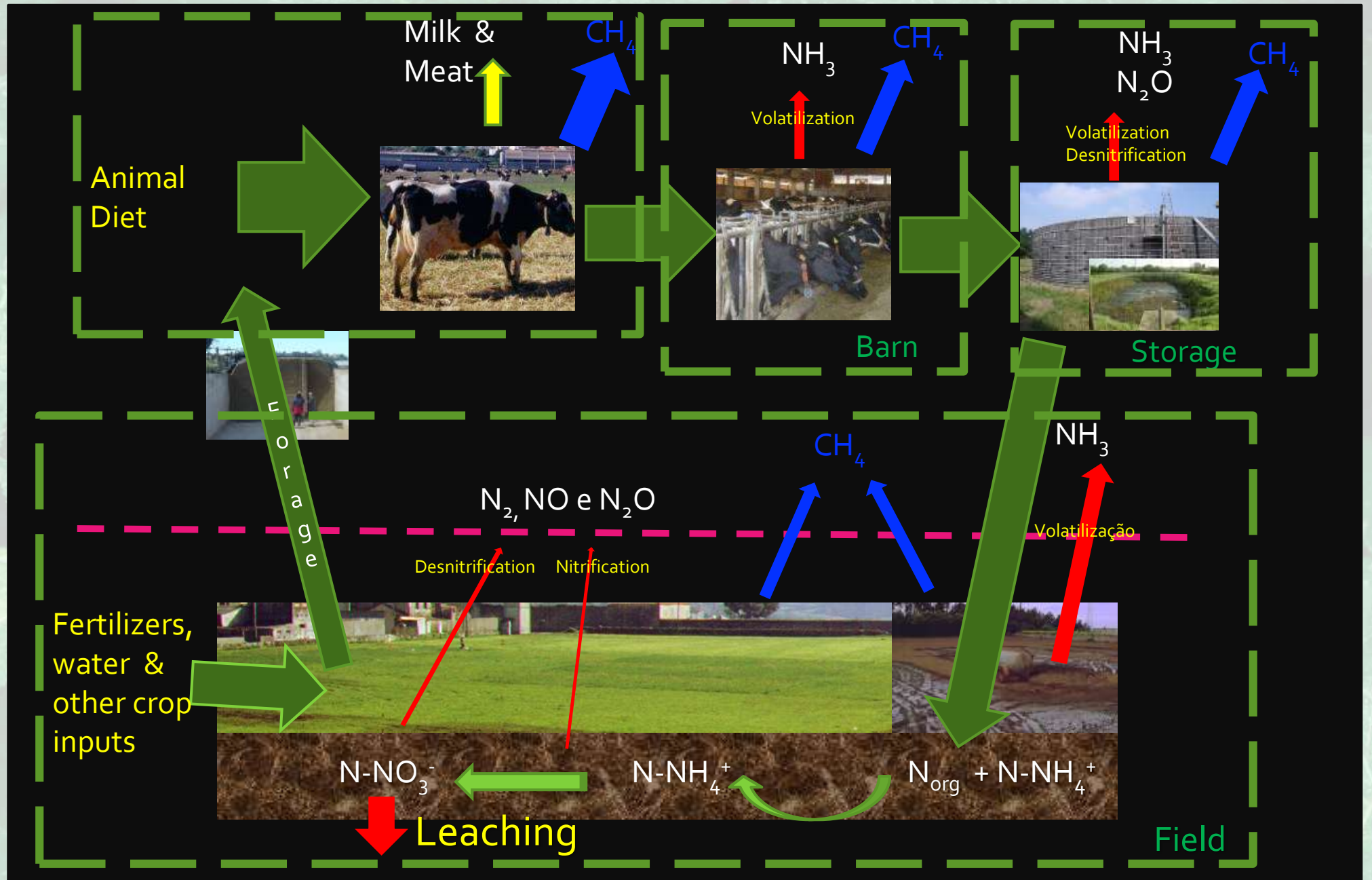
Photo credit: Volker Hartmann/Getty Images

Interreg
Atlantic Area
European Regional Development Fund

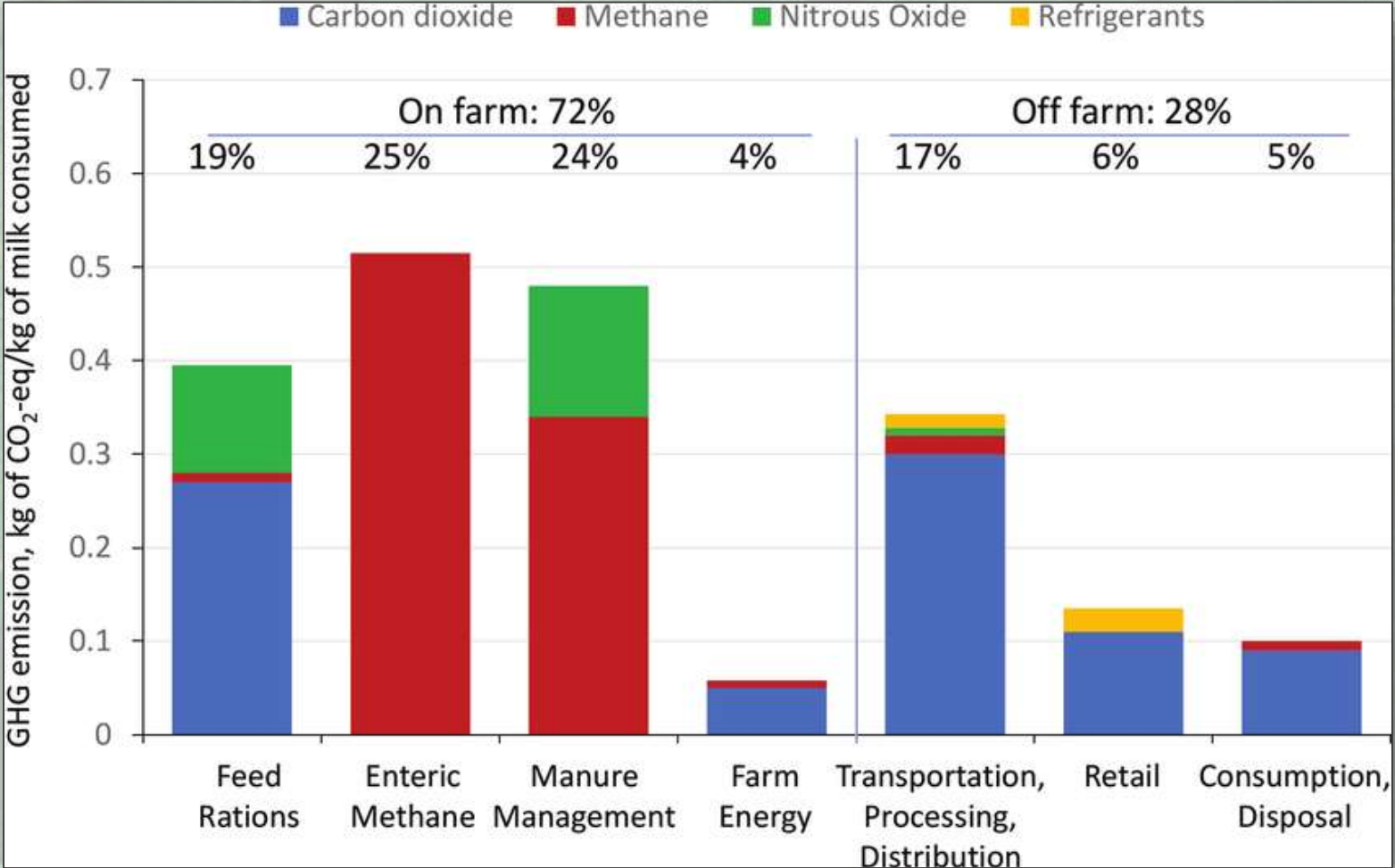


Dairy
4 future

Nutrient fluxes in a dairy farms, ammonia and GHG emissions



Major sources of greenhouse gases (GHG) from production and consumption of milk in the United States with emphasis on type of gas (carbon dioxide, methane, nitrous oxide, or refrigerants) produced on farm and off farm.



Source: Wattiaux, Michel & Uddin, Md & Letelier, Paulina & Jackson, Randall & Larson, Rebecca. (2019). INVITED REVIEW: Emission and mitigation of greenhouse gases from dairy farms: The cow, the manure, and the field. 10.15232/aas.2018-01803. (modified from Thoma et al., 2013, with permission from Elsevier).

MOST PROMISING MANURE TREATMENT SOLUTIONS, MAINLY FOR MITIGATION OF NH₃ AND GHG EMISSIONS

- **Barn cleaning frequency**
- **Type of barn floors and separation of urine and faeces**
- **Indoor temperature and ventilation control**
- **Acidification**
- **Slurry storage covers**
- **Slurry solid-liquid separation**
- **Anaerobic digestion**
- **Field manure spreading techniques**
- **Use of inhibitors (nitrification and urease) and biochar**
- **Use of beneficial microorganisms**
- **Composting**

MEASURES AT BARN LEVEL

Cleaning frequency

- Important CH₄ emissions reduction can be achieved (>50% pork) and NH₃
- Health benefits for animals and reduction in the need to renew the barn indoor air can offset some of the extra costs
- Important when anaerobic digestion is adopted
- Applicability for new barns

Separation Urine and Faeces

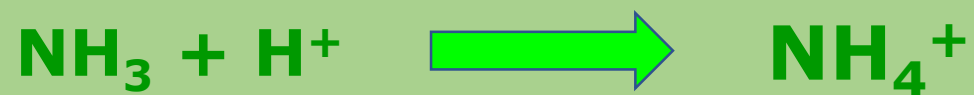


- Allows specific post treatment and valorisation of faeces and urine
- Solid floors are more favourable than slatted floors (NH₃)

MEASURES AT BARN-STORAGE-FIELD LEVEL

Acidification

- pH lowering of animal manure: logical and direct solution to minimize ammonia emissions

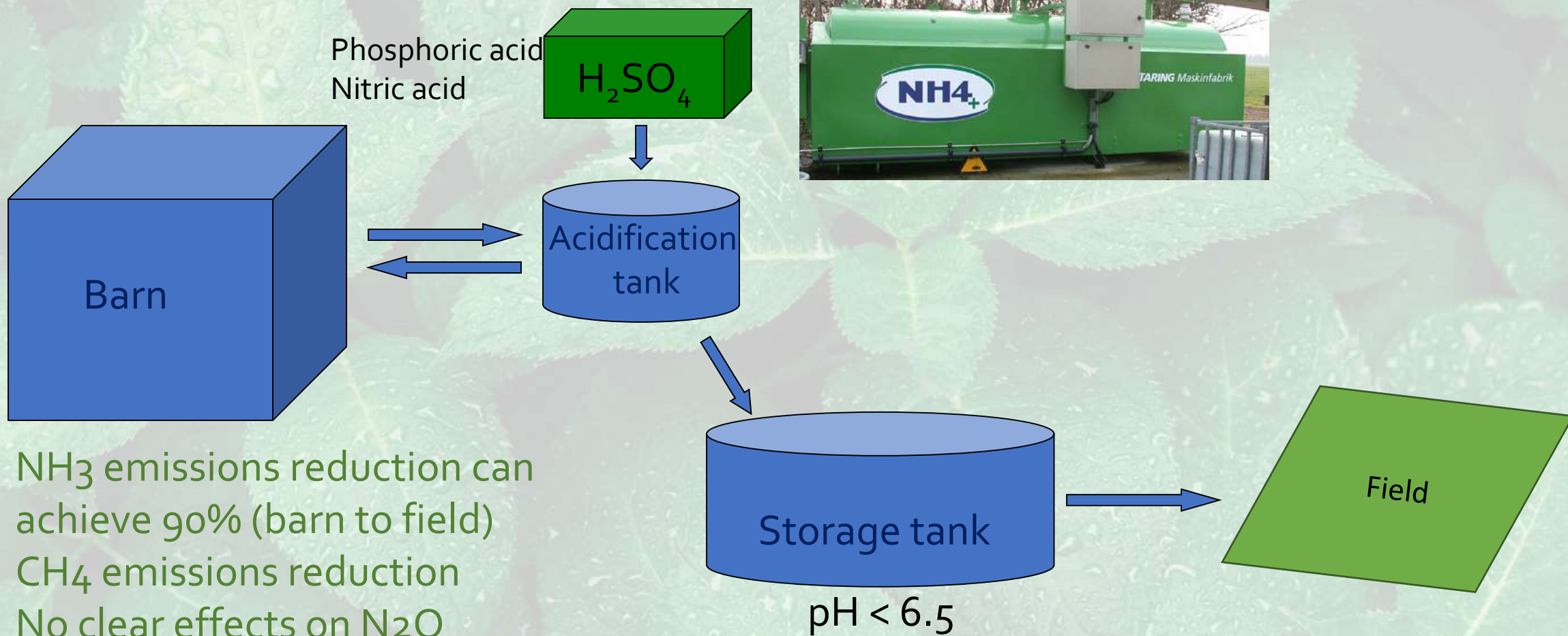


- Additives used: nitric and sulfuric acid with liquid manure and aluminium sulphate with solid manure; bioacidification
- Safe and efficient solutions proposed to farmers for slurry acidification in barn, in slurry store or immediately before soil



MEASURES AT BARN-STORAGE-FIELD LEVEL

Acidification



MEASURES AT STORAGE-FIELD LEVEL



Slurry separation



Anaerobic digestion

MEASURES AT BARN-STORAGE-FIELD LEVEL

Solid liquid-separation

Main techniques used:

- ✓ screw press
- ✓ centrifugation
- ✓ sieving
- ✓ decanting
- ✓ Sediment settling



- Led to a dry-matter rich fraction (Solid fraction) with high P concentration
- A dry-matter poor fraction (liquid fraction) with high concentrations in soluble elements, more adequate/balanced in terms of N/P ratio.

Mechanical separation - main message

- The technique used for solid-liquid separation strongly affect the composition of the resulting fractions and nutrients availability for plants;
- In specific conditions, treated slurry application to soil can fully substitute mineral fertilizers applications;
- In terms of NH_3 emissions, LF is not efficient as expected
- Relative to GHG emissions, separation alone might not be the best option.

MEASURES AT BARN-STORAGE-FIELD LEVEL

Storage covers and Anaerobic digestion (AD)

- Slurry tank covers:

- Natural or enhanced crust - \searrow NH₃ \searrow CH₄ N₂O \nearrow
- Fixed covers (no crust) - \searrow NH₃ \searrow CH₄ \searrow N₂O
- Cost effective together with barn removal frequency and acidification immediately before soil



- AD previous to storage - \nearrow NH₃ \searrow GHG (CH₄)
- Suitable for big farms or regions with high livestock densities
- Cost effectiveness of mitigation depends;
 - Barn (& storage) emissions
 - CH₄ leakage of the digester

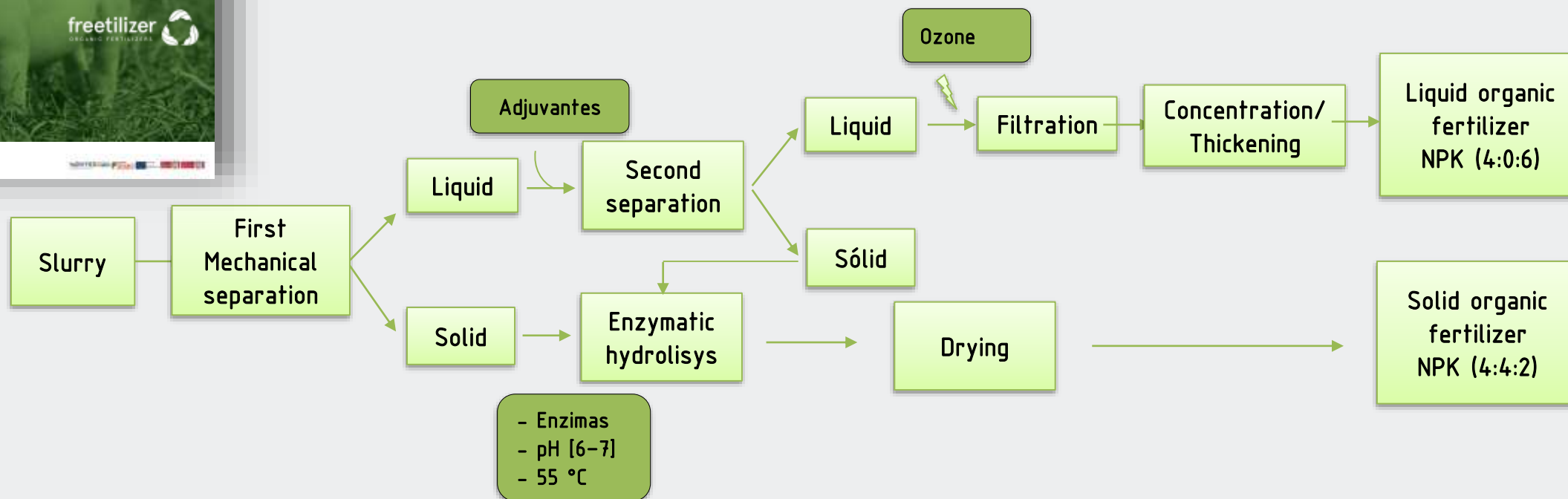


TREND: COMPLEX MANURE TREATMENT SYSTEMS



New Technology for Treatment and Valorization of Swine Effluent

Freetilizer: Process Diagram



24 Hours



LAST MESSAGES

- ✓ Important to check cost effectiveness of manure treatment options in different animal production systems - Different solutions to different production systems and ambient conditions
- ✓ Care to avoid pollution swapping
- ✓ Effects of manure treatments on the mitigation of different emissions processes should change from a single stage approach to include farm-scale studies with a manure whole-life-cycle assessment
- ✓ Several solutions available, but in many regions/countries it is important to use political/economic stimuli for their implementation

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Thanks for listening
Obrigado pela atenção

