Vlaams Coördinatiecentrum Mestverwerking

Manure management in Flanders: state-of-art and future prospects

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DDP – FORUM 2016

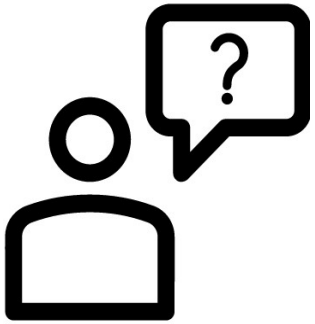
11 november 2016

Content

- VCM – what do we do?
- Livestock and manure production in Flanders
- Manure management today
- Current developments
- Future prospects

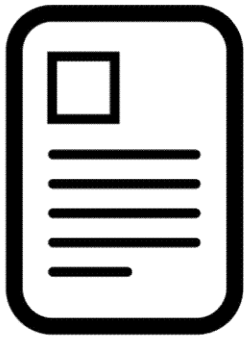
VCM – Flemish Coordination Centre for Manure Processing

Demonstrations for farmers



First line advice

Field trips for policy makers



Legislative bottlenecks

Internationalisation

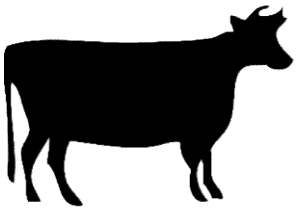
manu RE source

NORTH SEA
AMSTERDAM
DEN HAAG
THE NETHERLANDS
LONDON
DUSSELDORF
Antwerpen
Brugge
FLANDERS
Gent
Leuven
Hasselt
BRUSSEL
KOLN
BELGIUM
GERMANY
LILLE
Namur
WALLONIA
BONN
LUXEMBOURG
FRANCE
LUXEMBOURG
PARIS

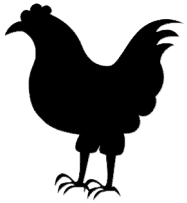
Flemish agriculture

Intensive pig- and poultry breeding (numbers 2014)

6,3 Mio



1,3 Mio



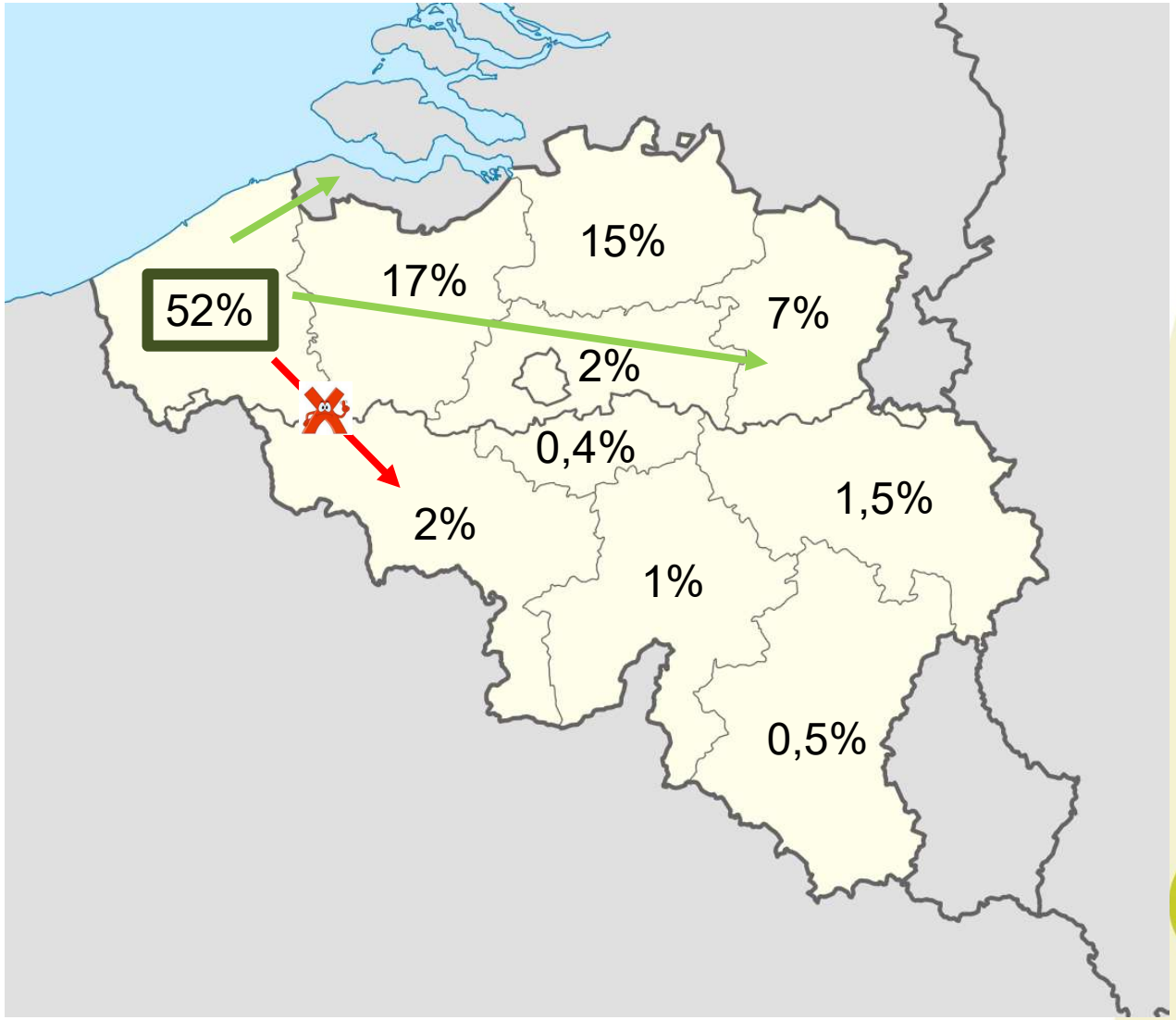
31 Mio

674 181 ha

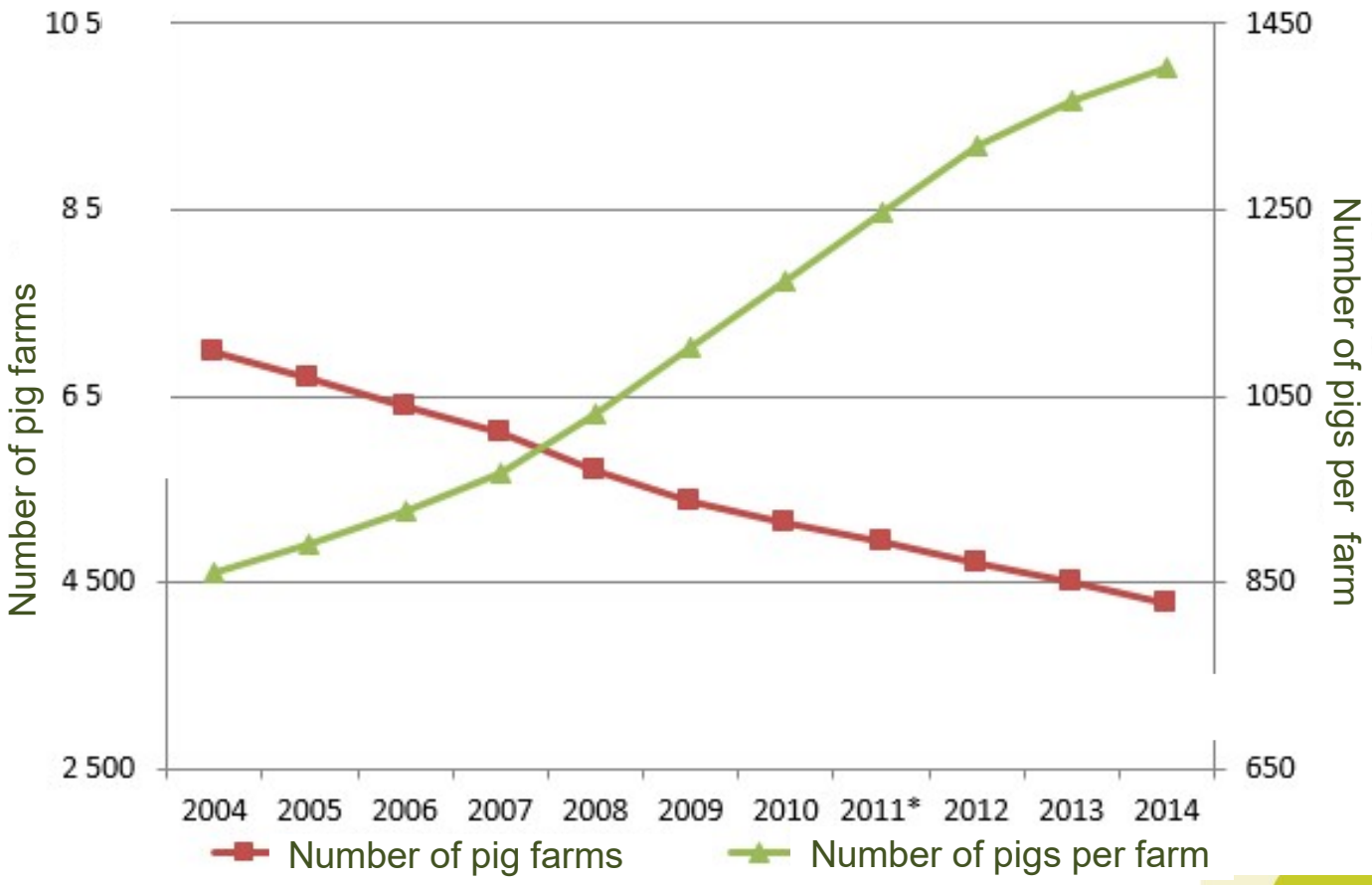
Net manure production > maximum manure disposal on Flemish land

	Net manure production (2014)	Maximum manure disposal (674 181 ha)
Million Kg N	159	116,2
Million Kg P2O5	71	53,3

Belgian pig industry



Flemish pig industry



Flemish Manure policy

implementation of the EU Nitrates Directive

1991: Manure Decree – general limits on manure application

1996: MAP I – focus areas + standstill livestock production

2000: MAP II – low-nutrient feed + judicious fertilisation + introduction manure treatment

2005: Flanders: NVZ → max.170 kg animal N/ha

2007: MAP III – **manure processing obligation**

2011: MAP IV – lower P application

2015 - 2018: MAP V – regional & individual approach

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Manure treatment obligation

What is manure treatment in FL?

- Exporting poultry/horse manure (mainly to N-France)
- Exporting pig slurry to the NL (South-West NL)
- Exporting manure after pasteurisation (1h at 70°C)
- Biological conversion of N to N_2
- Chemical conversion of N to mineral fertiliser (e.g. chemical air washing systems→ $(NH_4)_2SO_4$)

N-based system

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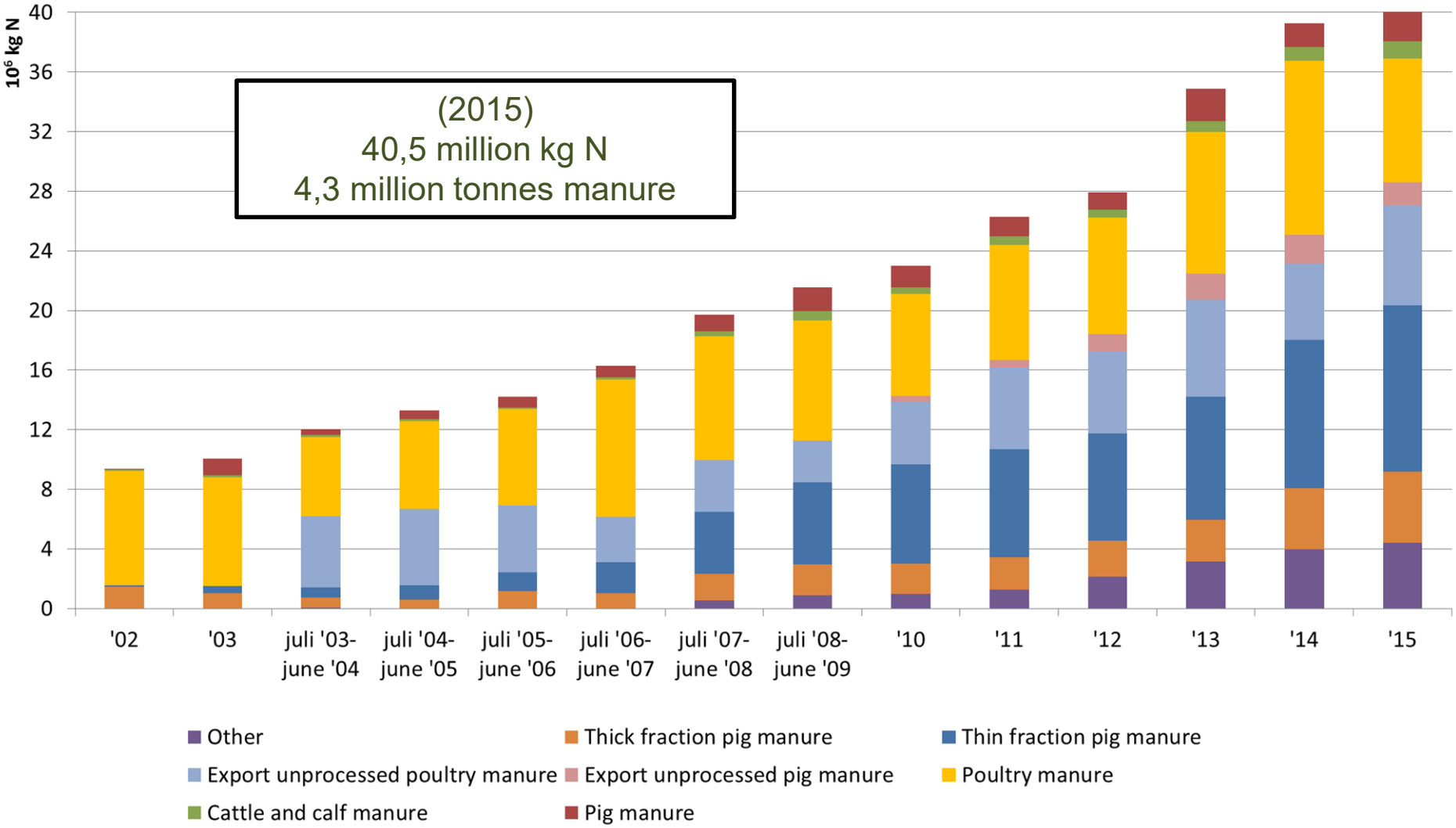
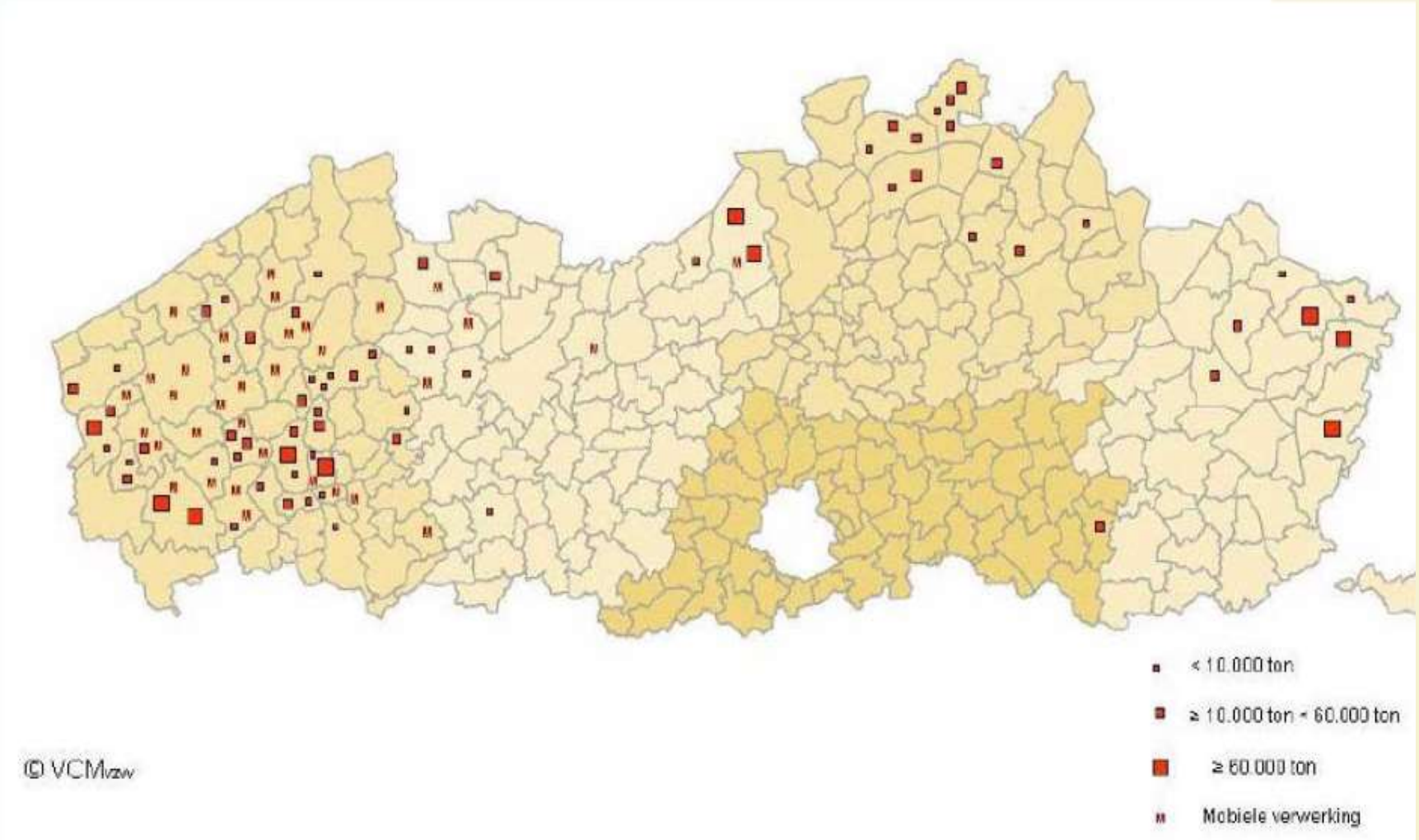
Data on manure treatment in Flanders



Location of manure processing projects in Flanders



Manure surplus management

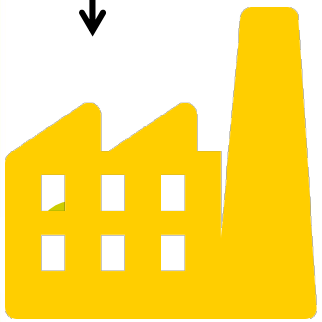
Neighbouring land

~4 €/T

Slurry

~10 €/T

~17 €/T



External processing installation

Long distance transport (to other parts of Flanders, to the South-West of NL (pig manure), or to the North of France (poultry)

Pasteurisation techniques: solid (fraction of) manure (export)

Biothermal drying/composting

Drying

Liming

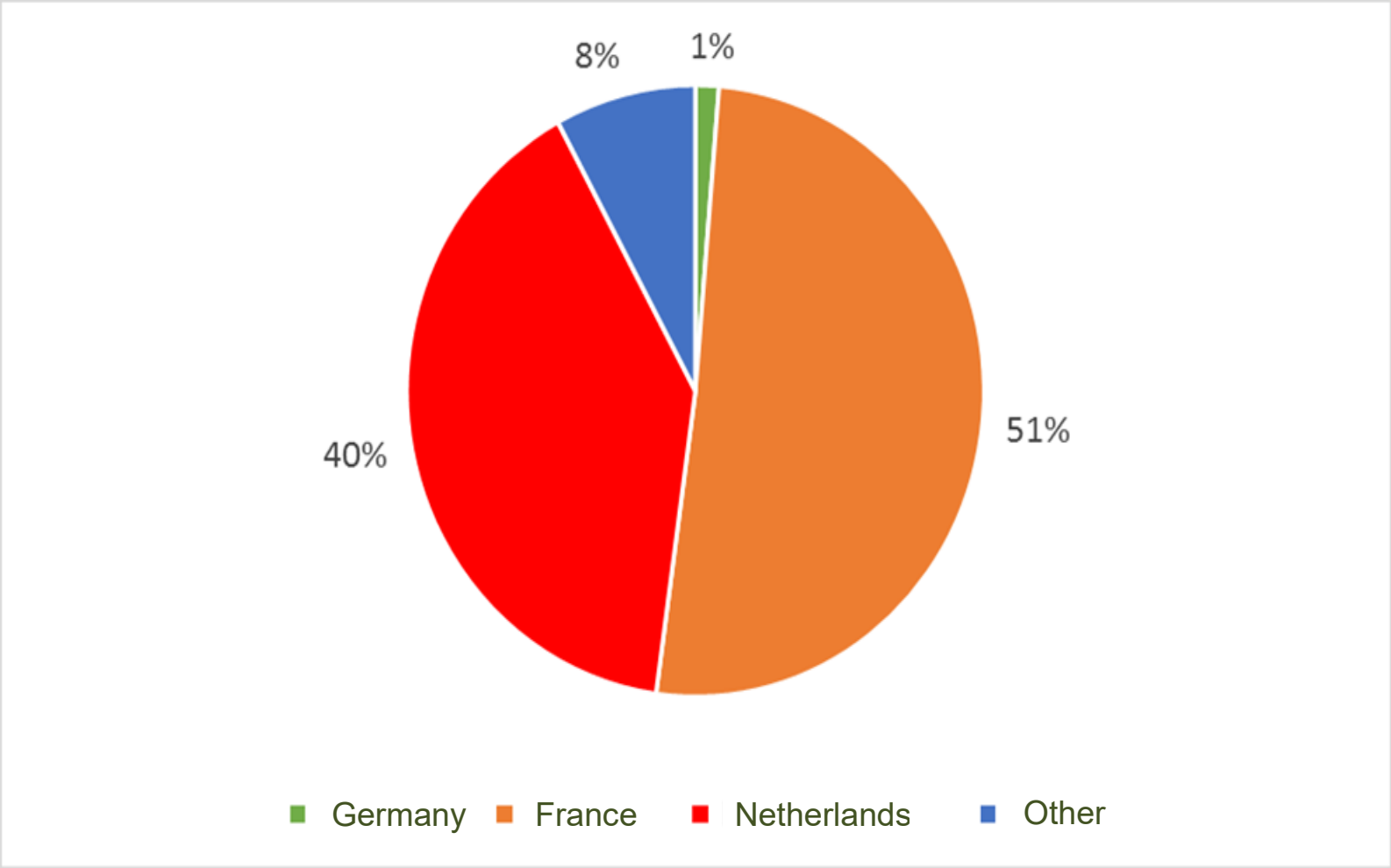
→ pelletizing

3 sites (2015)

11 sites (2015)

Export of treated (hygienised) manure products

(© inquiry VCM, 2015)



Biological treatment: liquid fraction of manure

Most used technique in Flanders

92 installations (2015)

Nitrification (aerobic)

$NH_4 \rightarrow NO_2^- \rightarrow NO_3^-$

Denitrification (anaerobic)

$NO_3^- \rightarrow NO_2^- \rightarrow NO \rightarrow N_2O \rightarrow N_2$

Biological treatment: liquid fraction of manure

Effluent

Land spreading as K-fertilizer
(salts (K, Cl, Na) are not removed)

After-treatment: for discharge into surface water/re-use

Constructed wetland

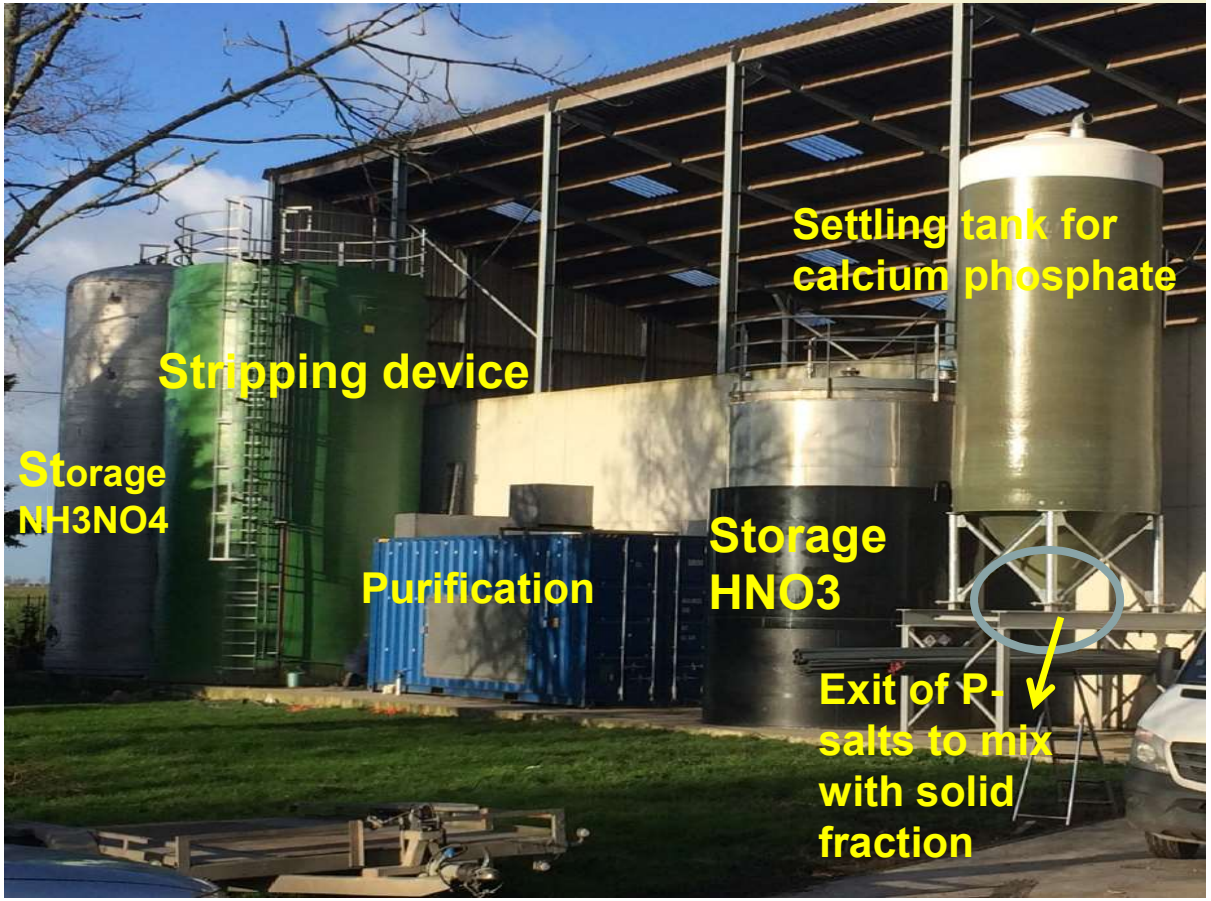
Membrane filtration

Current developments - techniques

Recovery of N: stripping/scrubbing of liquid fraction of manure/digestate

= circular economy
= mineral fertiliser production: production of $(NH_4)_2SO_4$ or NH_3NO_4

First operational installation in West-Flanders (BE) on digestate (pig manure)



digesmart project

Current developments – legislation for P

Objectives new Manure Action Plan (MAP5) (2015-2018):

WATER

No specific water quality objectives for P, but objectives of the Water Framework Directive needs to be realised on mid-term

AGRICULTURAL SOIL

Further ‘mining’ of P-rich soils during MAP5

Current developments – legislation for P

MAP5 → soil categories according to plant-available P:

Class	Crop land (mg P/100 g dry soil)	Grass land (mg P/100 g dry soil)
Class I	<12	<19
Class II	12-18	19-25
Class III	19-40	26-50
Class IV	>41	>51

P-limits per soil category per crop

Crop	Class I	Class II	Class III	Class IV
All grassland	115	95	90	70
1st cut grassland/cut rye + maize	115	95	90	70
maize	100	80	70	55
Grain crops	95	75	70	55
Potatoes	95	75	70	55
Beets, vegetables, horticulture & forestry, strawberries, collards, crops with low N-need, legumes and other crops	85	65	55	45

Current developments – legislation for P

In practice, P is the limiting nutrient in the fertilisation

	N (kg/ton)	P_2O_5 (kg/ton)
Pig slurry	8,1	5
Cow slurry	4,8	1,4

Current developments - techniques

Separation

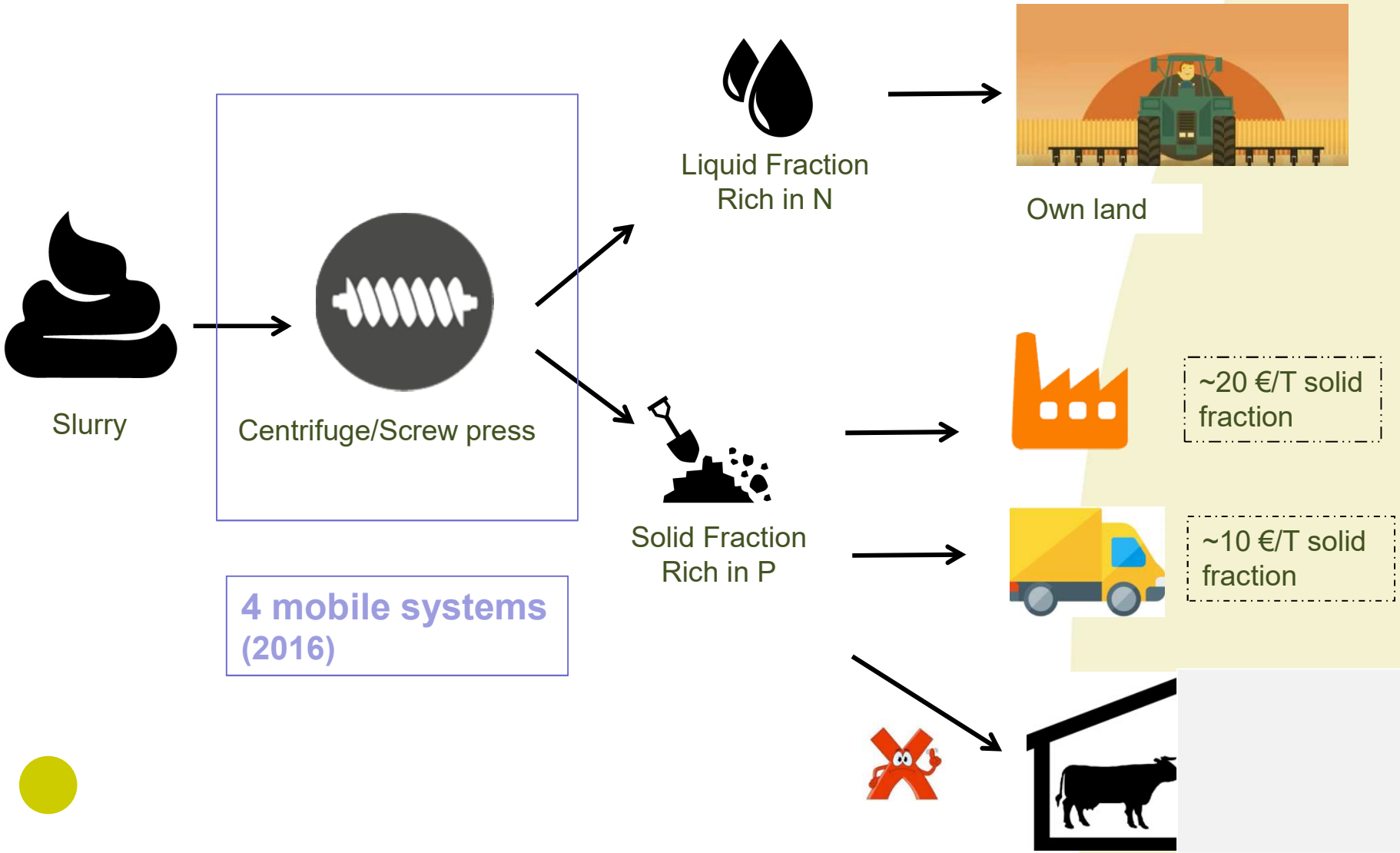
= reduction in transport (LF stays on the farm as NK-fertiliser)

= higher use of animal manure on Flemish land (higher N/P ratio of LF)

Farm level pasteurisation

= independancy of the farmer for export of manure outside Flanders

Separation of manure

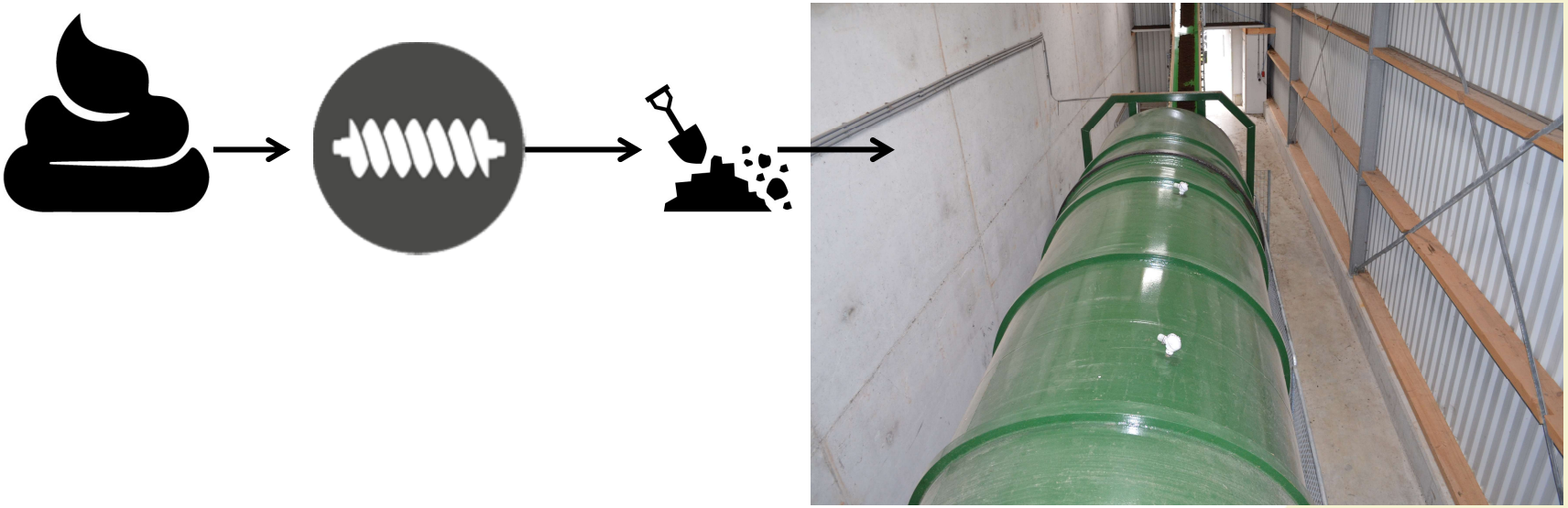


4 mobile systems (2016)

Farm level pasteurisation

Separation with screw press

Pasteurisation with aerated drum



= independancy of the farmer for export of manure outside Flanders

Main interest for farmers (pig/cow) near border with France

Future prospects – recovery of P

Recovery of P (bounded to carbon):

Maintenance of C in the soil:

- ✓ C-rich, but P-low fraction, can be used on Flemish agricultural land, instead of export: reduction transport
- ✓ Incentive in MAP5: ‘slow release fertilisers’:
  - certified VFG/green compost counted for 50% P;
  - farmyard manure counted for 50% P on soil class I and II.

P is a non-renewable essential nutrient (production of market-driven product)

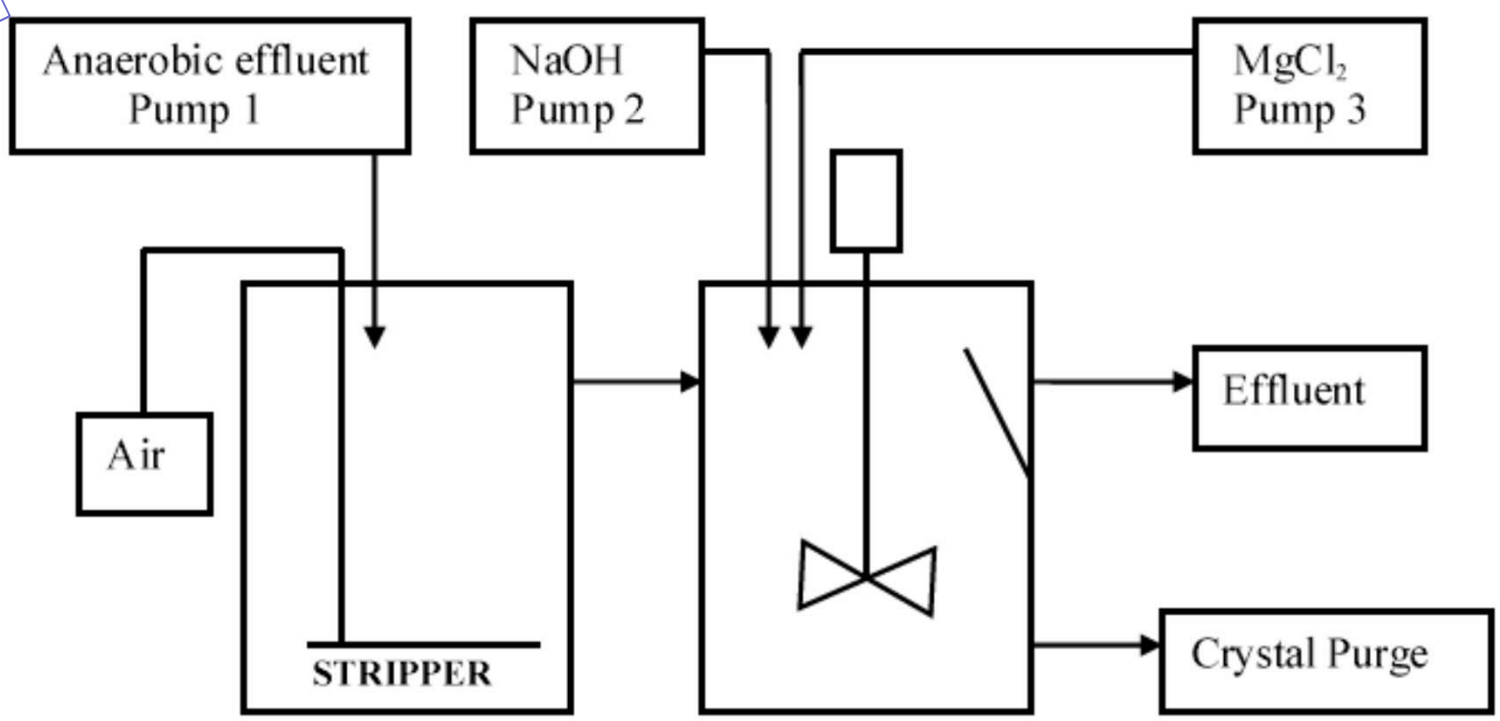
Recovery of P from agro-industry

Reduction cost of $FeCl_3$ (removal of P from wastewater)

Struvite crystallisation (MgNH4PO4*6H2O of MgKPO4*6H2O)

Application in potato processing industry/waste water industry

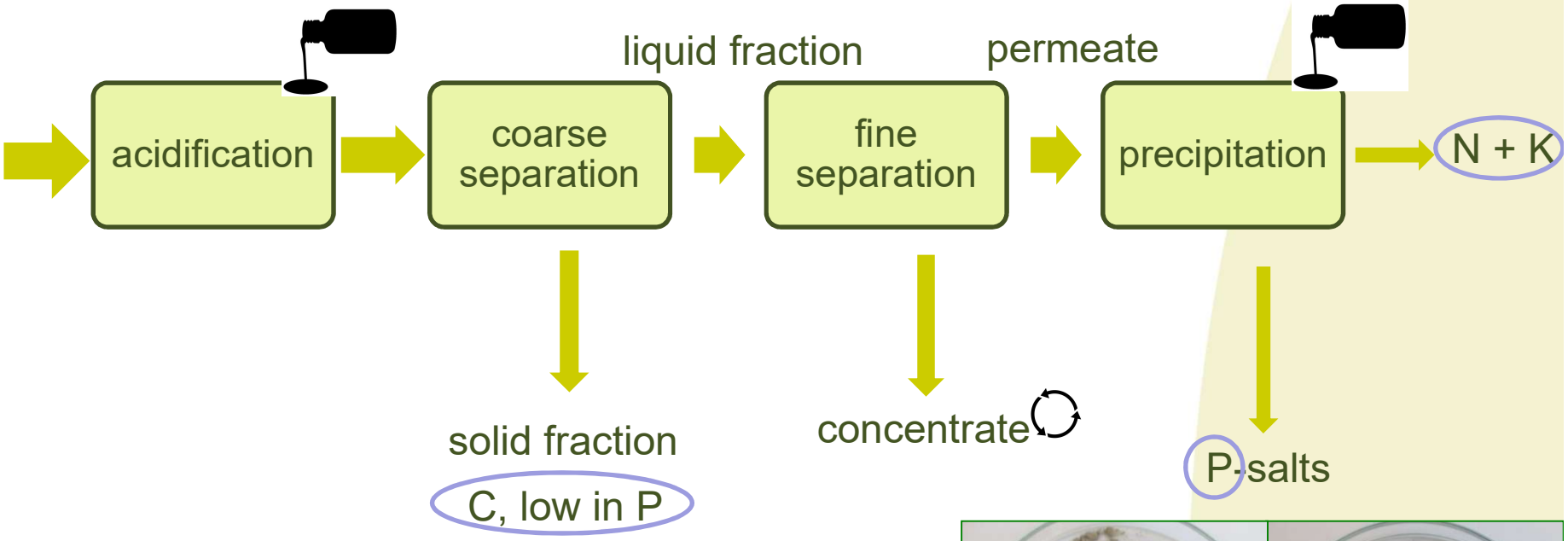
4 sites



Recovery of P from manure/digestate

First trial with German technology:

Fraunhofer IGB



Mass balance (manure)

(© Bilbao, 2015, presentation ManuREsource, Ghent)

- 49 kg of H_2SO_4 (60%) per tonne of manure for acidification
- 9 kg NaOH (45%) per tonne of manure for precipitation

- 35% of the mass can be removed as solid fraction
- 10 kg P-salts can be recovered per tonne of manure
  - 63% of the P could be recovered as P-fertiliser
- Liquid fraction is rich in N and K and can be used as NK-fertiliser

First Cost-Benefit Calculation

(© Bilbao, 2015, presentation ManuREsource, Ghent)

	Worst case	Best case
Solid fraction	Without further treatment – application on Flemish agricultural land **€5/tonne**	
Concentrate	Recirculation in biogas plant	
P-salt	Can be sold as P-fertiliser **€50/tonne**	Can be sold as P-fertilizer **€200/tonne**
Particle-free liquid fraction	Application on Flemish agricultural land: **no financial value**	Application on Flemish agricultural land: **€5/tonne** (liquid NK-fertiliser)
Current disposal costs	**€20/tonne manure**	

Other assumptions

- 100% loan funding model -> 5% interest
- Maintenance 3% of capital costs
- Depression 12 years

Results for a plant of 20 000 tonnes/y

Specific net cost €5 to €10/tonne

- Savings per year from 191 to 285k€
- Return of invest 2 to 3 years

Recovery of P from manure/digestate

First results on Flemish pig manure and digestate:

- ✓ Technical feasible
- ✓ Cost-effective (worst case scenario) at current disposal cost

Solution for manure management in Flanders:

- ✓ P-low fractions can be used on Flemish agricultural land (instead of export)
- ✓ C can be used on Flemish agricultural land

Need for pilots and demonstration → market introduction

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Thank you for your attention

Questions?

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