Interreg
EUROPEAN UNION
North-West Europe
Phos4You
European Regional Development Fund

Thermo-chemical sludge treatment and P-recovery

First results of the EUPHORE pilot plant

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EUPHORE

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Catchment areas

	Area (km²)	Inhabitants (Mill.)	Inhabitants/ km²
Lippeverband	3,280	1.4	427
Emschergenossenschaft	865	2.4	2,775

MANDATORY P-RECOVERY IN GERMANY

… as defined by sewage sludge ordinance (AbfKlärV; 2017)

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Possible disposal pathway	wwtp > 100,000 PE from 2029 on	wwtp < 100,000 PE and > 50,000 PE from 2032 on	Wwtp < 50,000 PE
Land application	Prohibited		Permitted acc. fertiliser regulations
Co-incineration	Only if P-content < 20g/kg DM		
Mono-incineration with P-Recovery or SSA-disposal	If P-content > 20g/kg DM		

Including direct use of sewage sludge ashes as fertiliser / component

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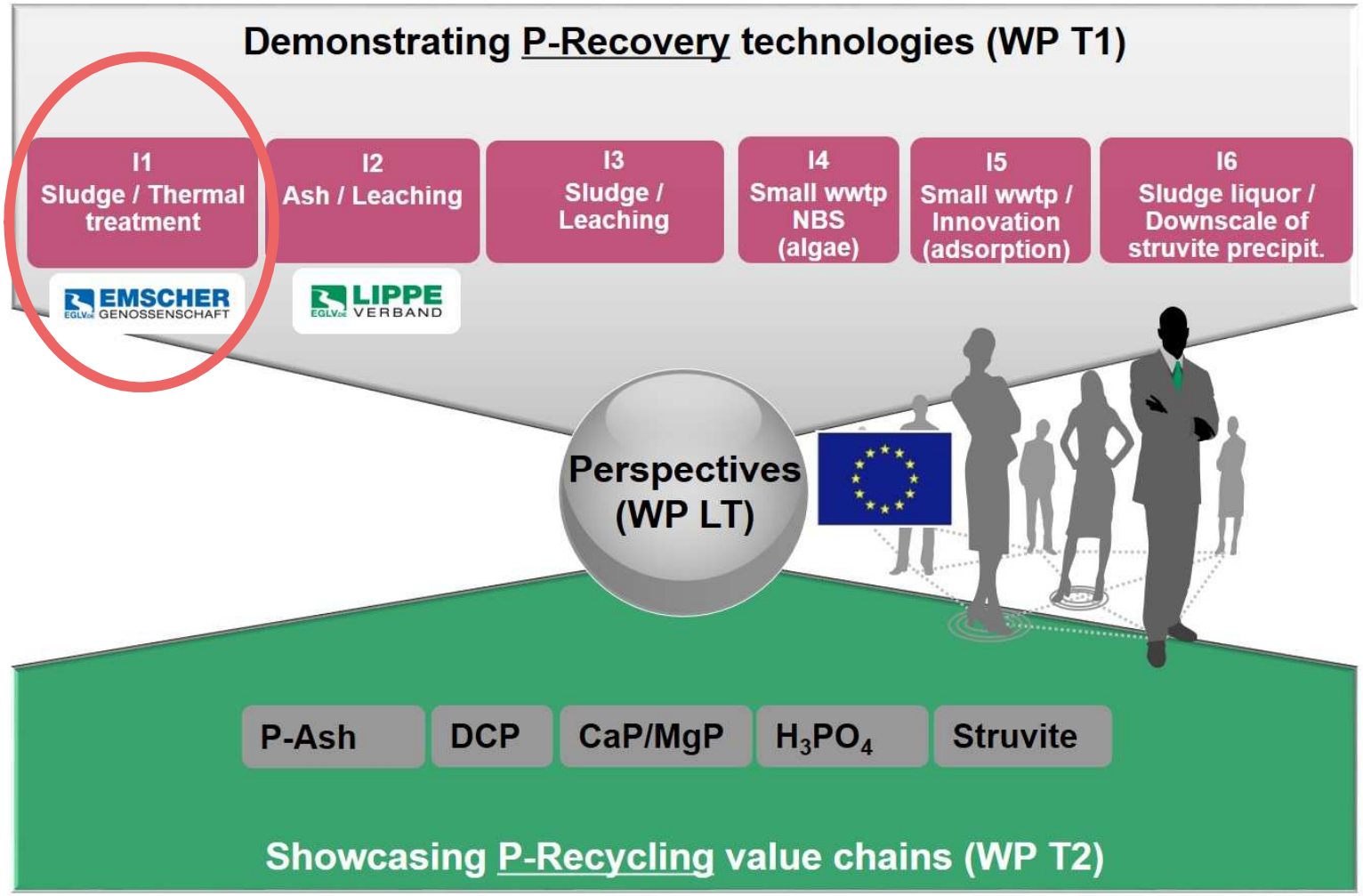
PROJECT PHOS4YOU



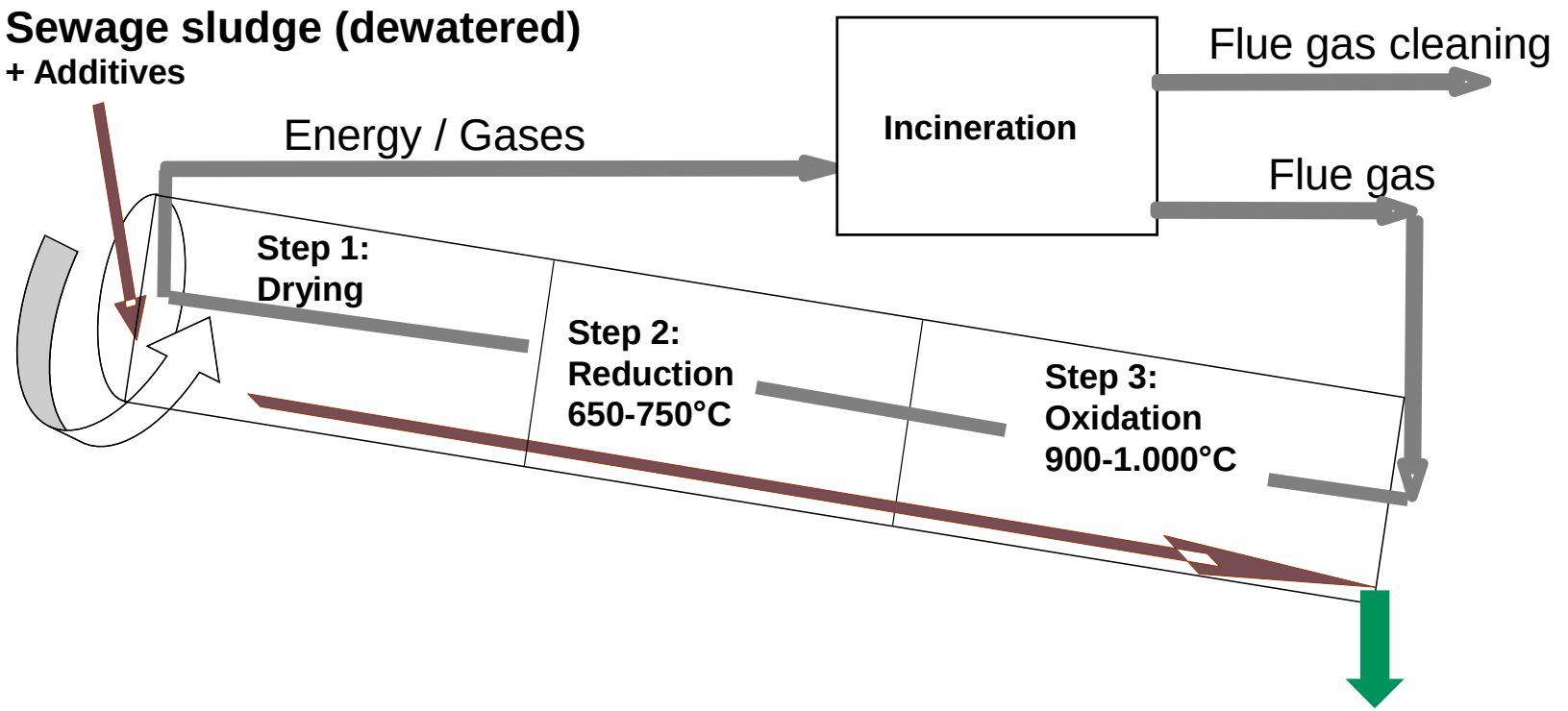
P:Phosphor WP: Work Package A: Activity I: Investment NBS: Nature Based Solutions

EUPHORE®-TECHNOLOGY

General information

- 2-stage thermo-chemical treatment of sewage sludge
- Drying, pyrolysis and incineration in a rotary kiln
- Using additives such as $MgCl_2$ and temperatures up to 1,100°C, heavy metals are transferred to the gas phase, thus ensuring heavy metal depletion of the ash
- Due to the thermo-chemical treatment, phosphates are plant available
- Since the ash can completely be used, only a small amount of waste to dispose of remains (flue gas ashes)

EUPHORE®-TECHNOLOGY
Schema



PILOT PLANT IN DINSLAKEN

Permission process

Permission process was coordinated / bundled by district council

First contact to authority incl. construction site visit already in 2016

Application according to water legislation (LWG)

Submission of application March / June 2018

Construction of pilot plant started summer 2018 (preliminary permission)

Final permission issued Jan / May 2019

<u>Monitoring:</u>

- Flue gas: “Full” analysis after commissioning; routine control measurements
- Input material: Analysis according to AbfKlärV
- Output material / ash: Regular analysis focusing on nutrients / P-availability and pollutants

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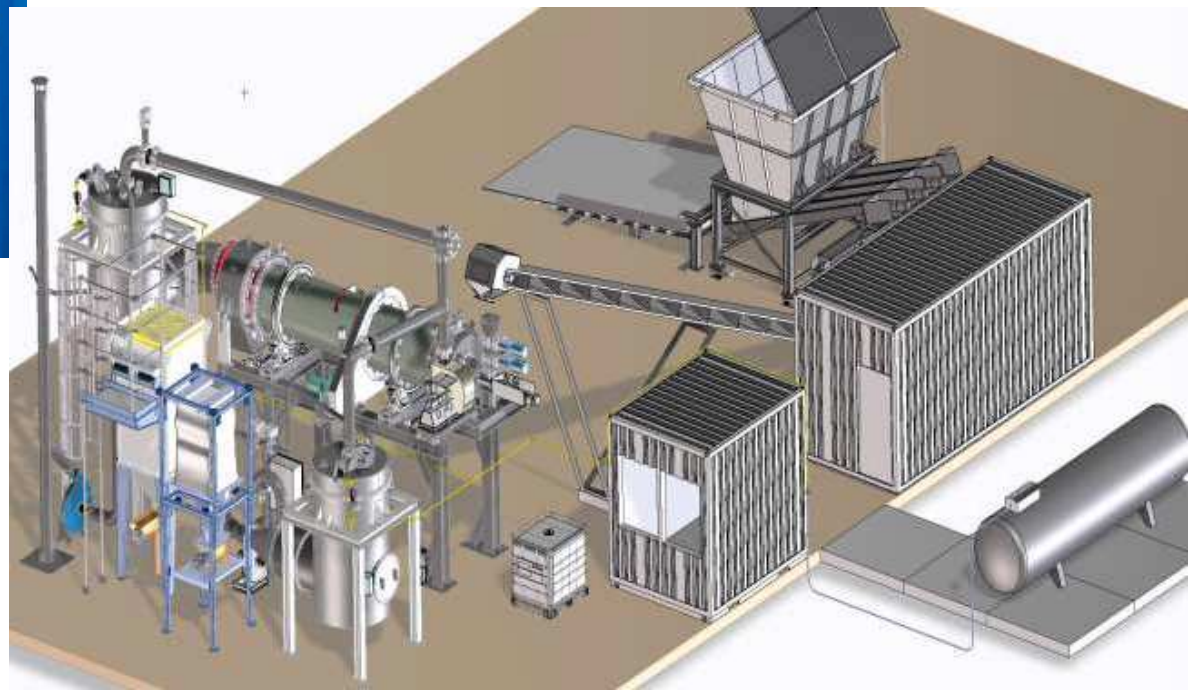

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Site: Dinslaken / Technikum of EGLV

Input: Sewage sludge; ca. 25 - 30 % DM

Capacity: approx. 100 kg sludge/h

Output: approx. 10 - 15 kg/h ash

PILOT PLANT IN DINSLAKEN

April 2019 – Plant is ready for operation

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July – Employee event / public open day

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PILOT PLANT IN DINSLAKEN

Experiences so far

- Operation of all components
- Matching of the components, optimisation of plant control etc.
- Operation of the whole chain conveyor belt – input lock – rotary kiln – ash production
- Continuous operation (2 days) incl. automated operation overnight

- Production of individual batches of ash

- Improvement of combustion and air system

RESULTS

Lab-scale results: Heavy metal depletion

(mg/kg)

	No additives	3% $MgCl_2$	6% $MgCl_2$	Limit DüMV
As	12,6	5,36	2,74	40
Pb	149,0	27,8	22,7	150
Cd	2,6	0,52	0,33	50 mg/kg P_2O_5
Cr	152	138	129	-
Ni	91,4	65,9	52,2	80
Hg	< 0,05	< 0,05	< 0,05	1
Ti	< 0,1	< 0,1	< 0,1	1
Cu	853	673	622	900
Zn	2220	940	547	5000

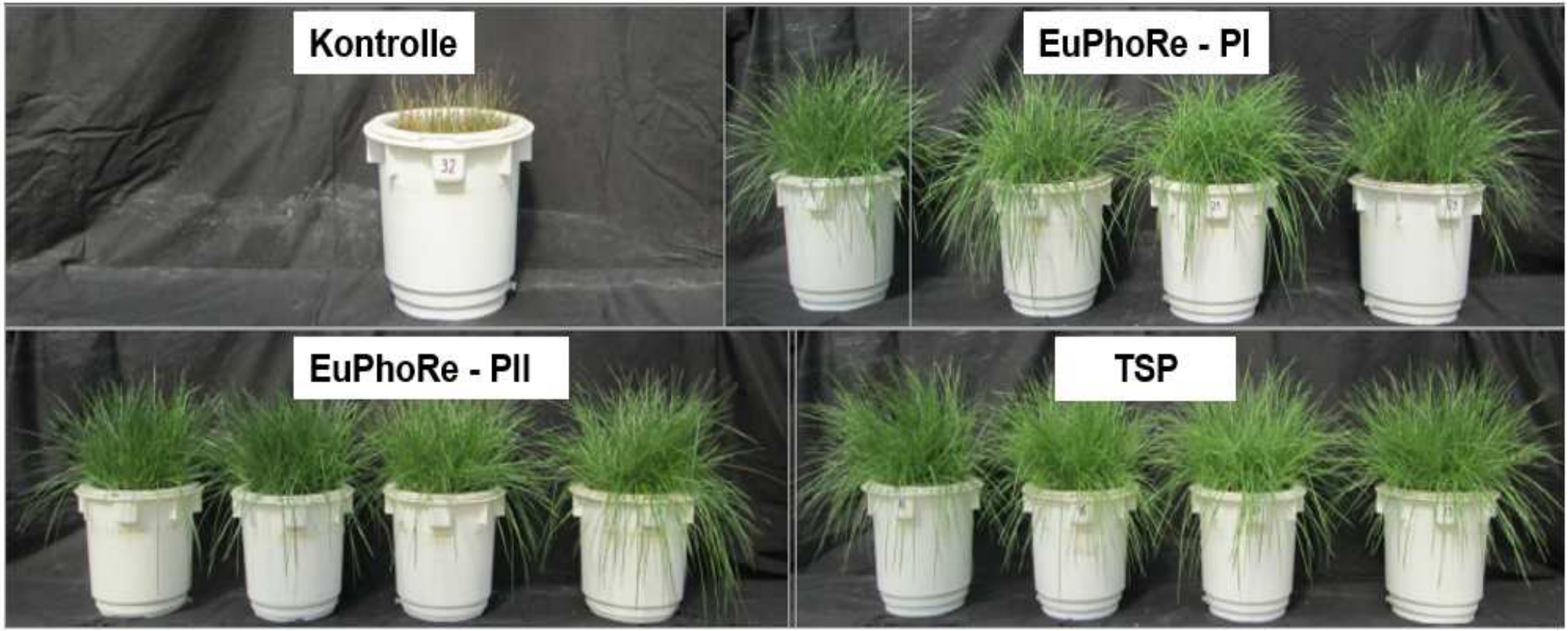
➡ In compliance with limits of German fertiliser regulation

Factors:

- Properties of sewage sludge (Input)
- Type and quantity of additives

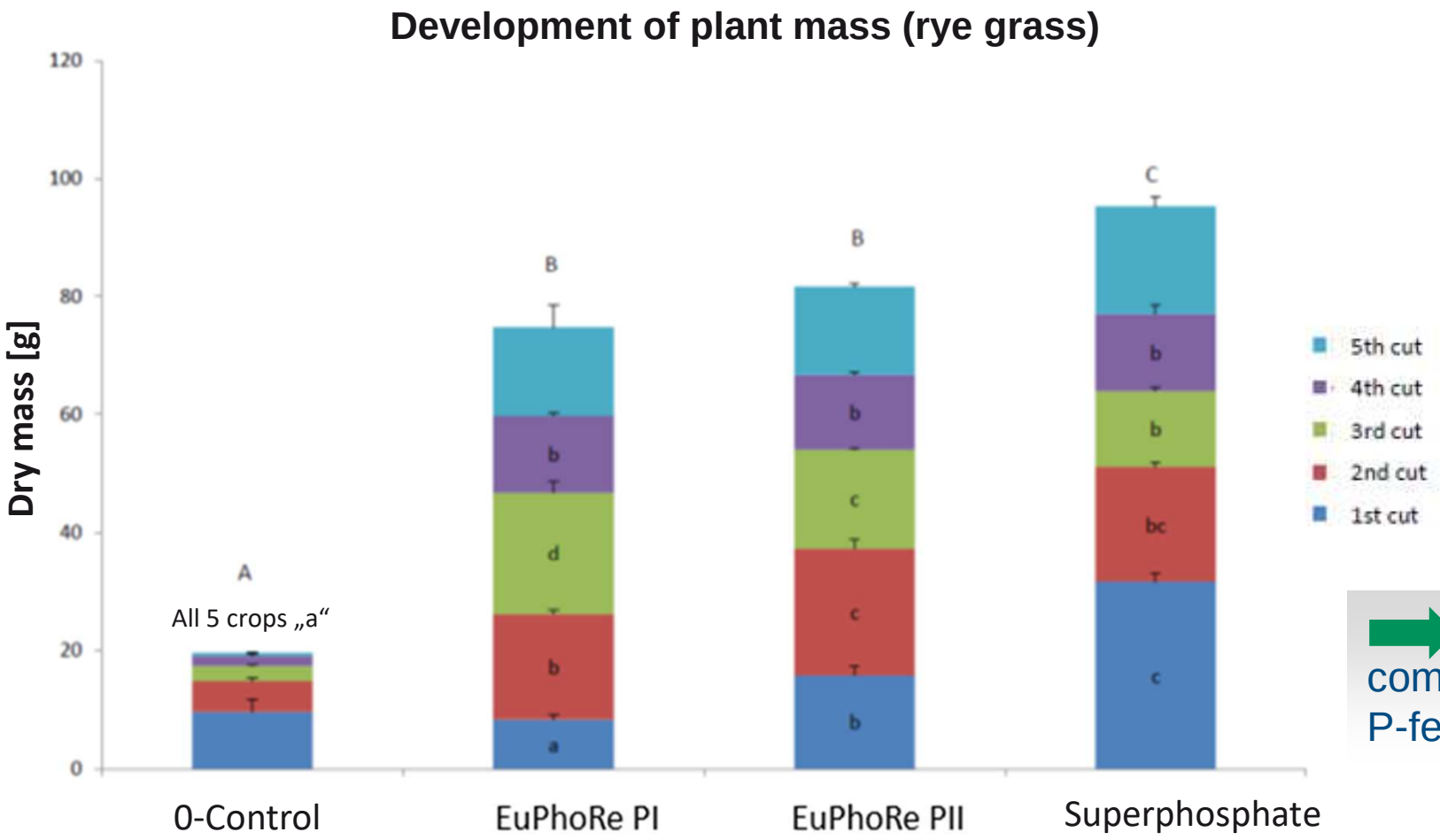
RESULTS

Lab-scale results: Fertilising effects



RESULTS

Lab-scale results: Fertilising effects



➡ biomass yield comparable to „standard“ P-fertiliser

OUTLOOK: USE OF ASH

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Intended full-scale use of Phos4You-EuPhoRe-ashes (scale: 15-20 t/batch) as component of mixed fertilisers)

OUTLOOK: PLANT OPERATION

- Final optimisations completed
  - Drag chain conveyor (August/Sept. 2019)

- Start of routine operation (next weeks)
- Optimisation of operation + dosing of additives
- Routine analyses of sewage sludge and ash; monitoring of flue gas quality
- Assessment of the relationship between input- and output-quality

- Assessment of external sludges (Phos4You-partners)

CONCLUSION
Advantages of the technology

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Only a small amount of waste (flue gas ash)

Drying, incineration and production of a fertiliser component in one step

Ash can directly be used as a fertiliser component

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THANK YOU FOR YOUR ATTENTION