



Recycled Nutrients and Organic Food
Brussels 12th december 2017

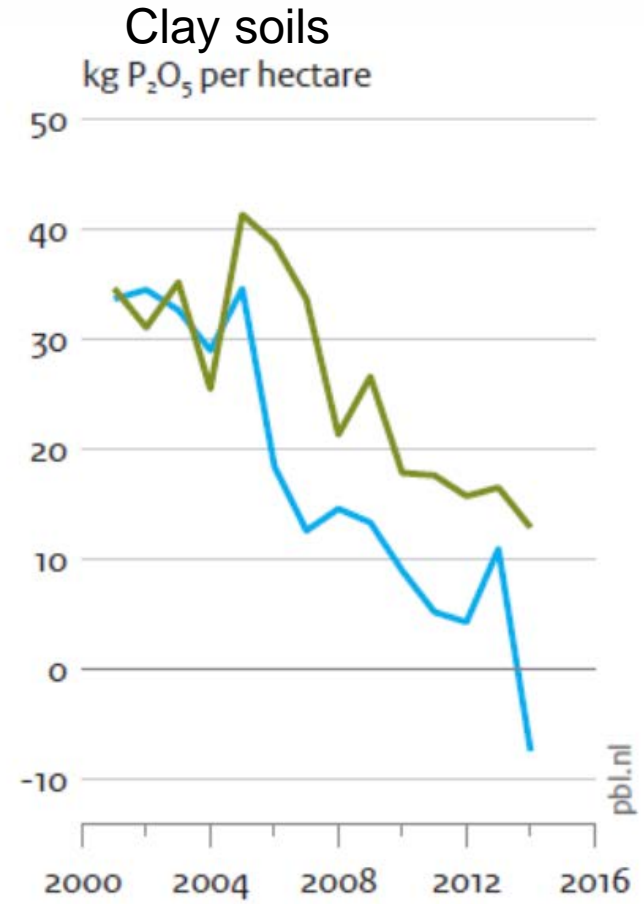
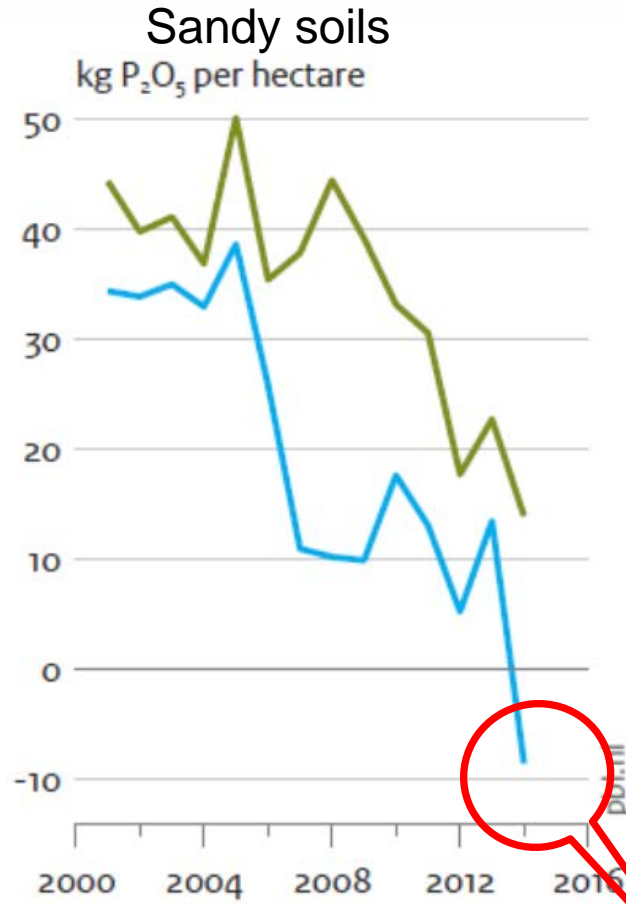


“Precision fertilization with renewable phosphorus sources for sustainable farming systems”

*Michel Raaphorst
Product & Development Plant Nutrition Manager
Timac Agro NL/Groupe Roullier*



P-surplus over 2000-2014

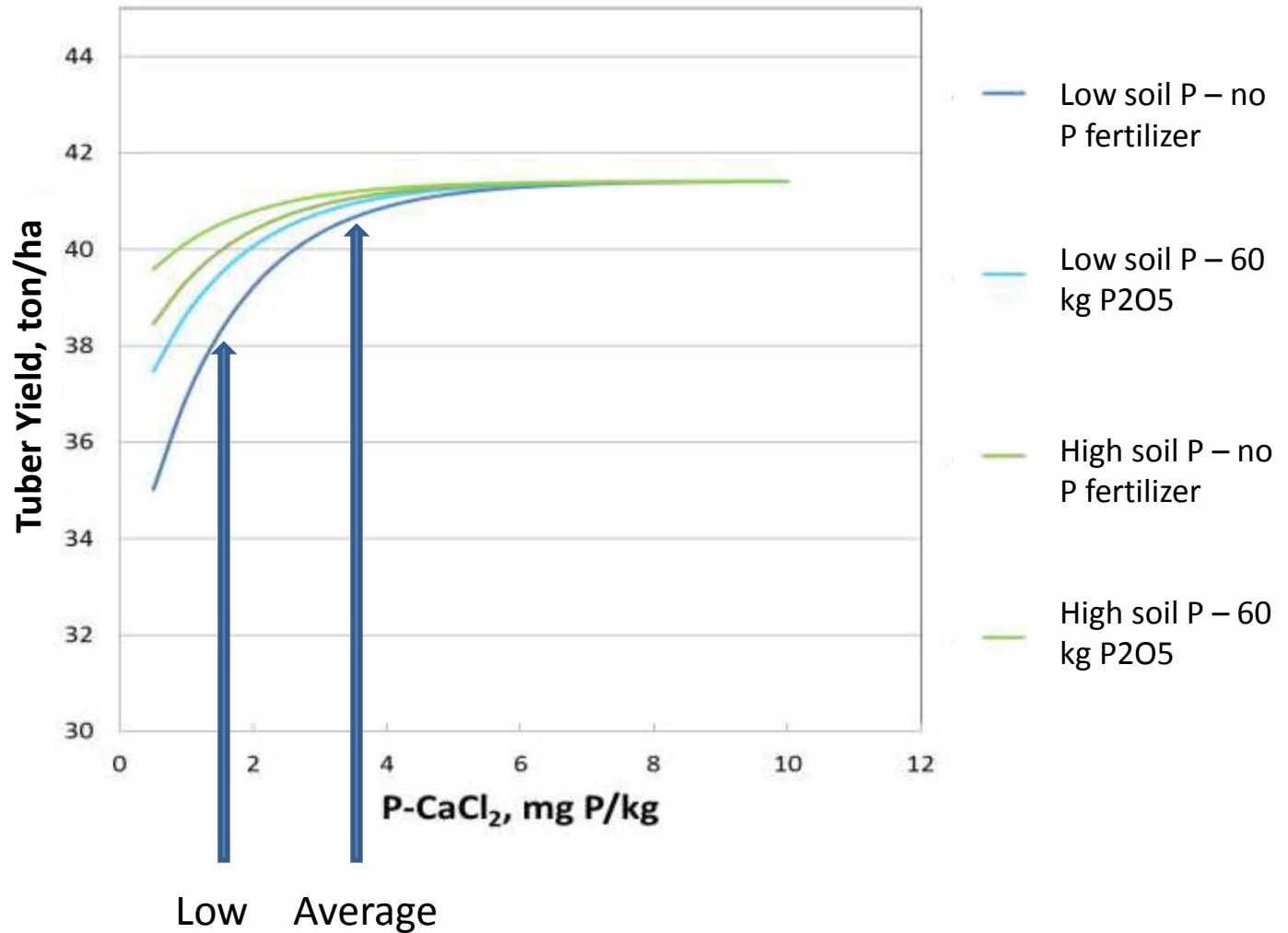


- Dairy farms
- Arable farms

deficit

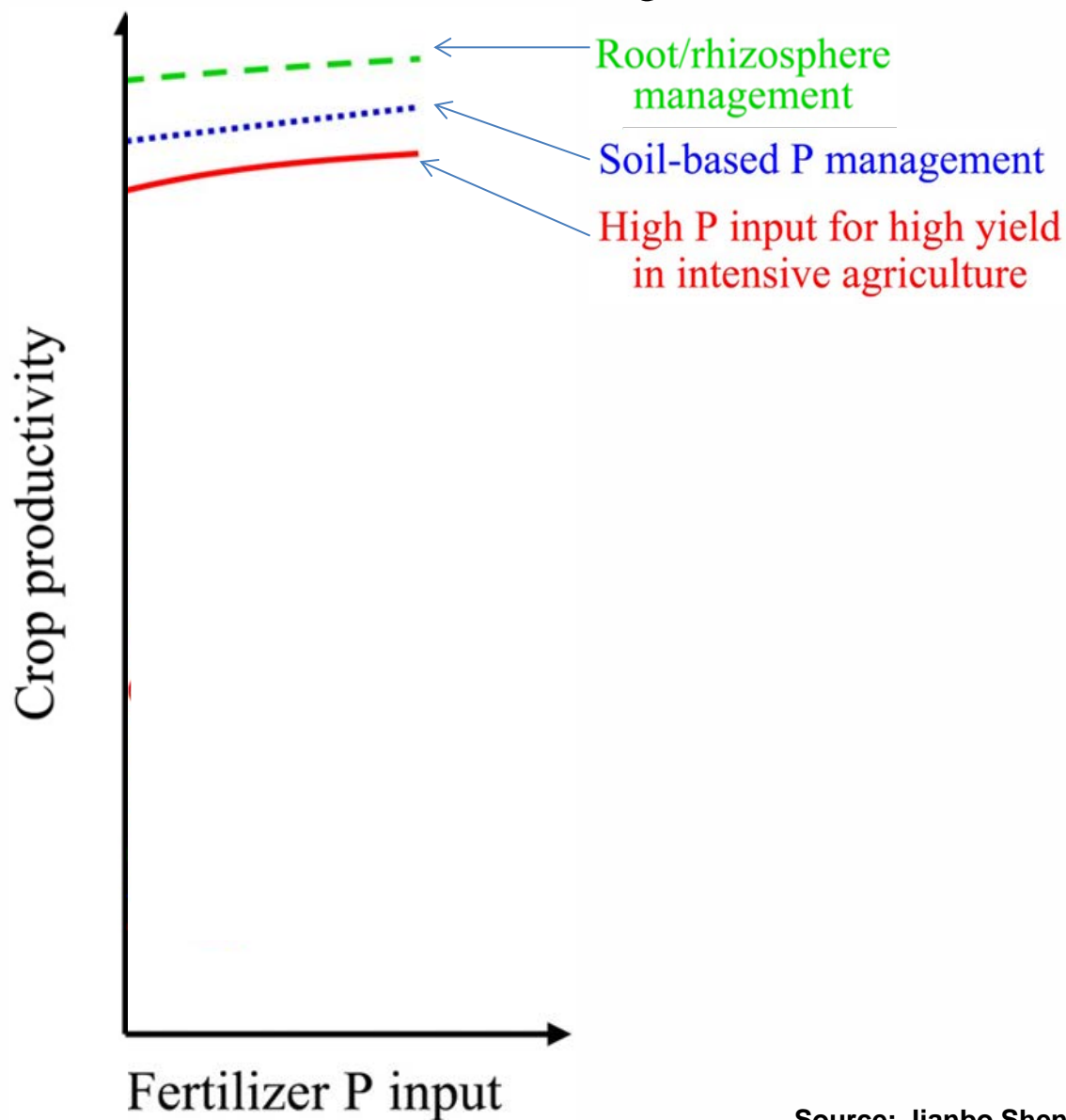


Effect P fertilization and soil P condition on tuber yield

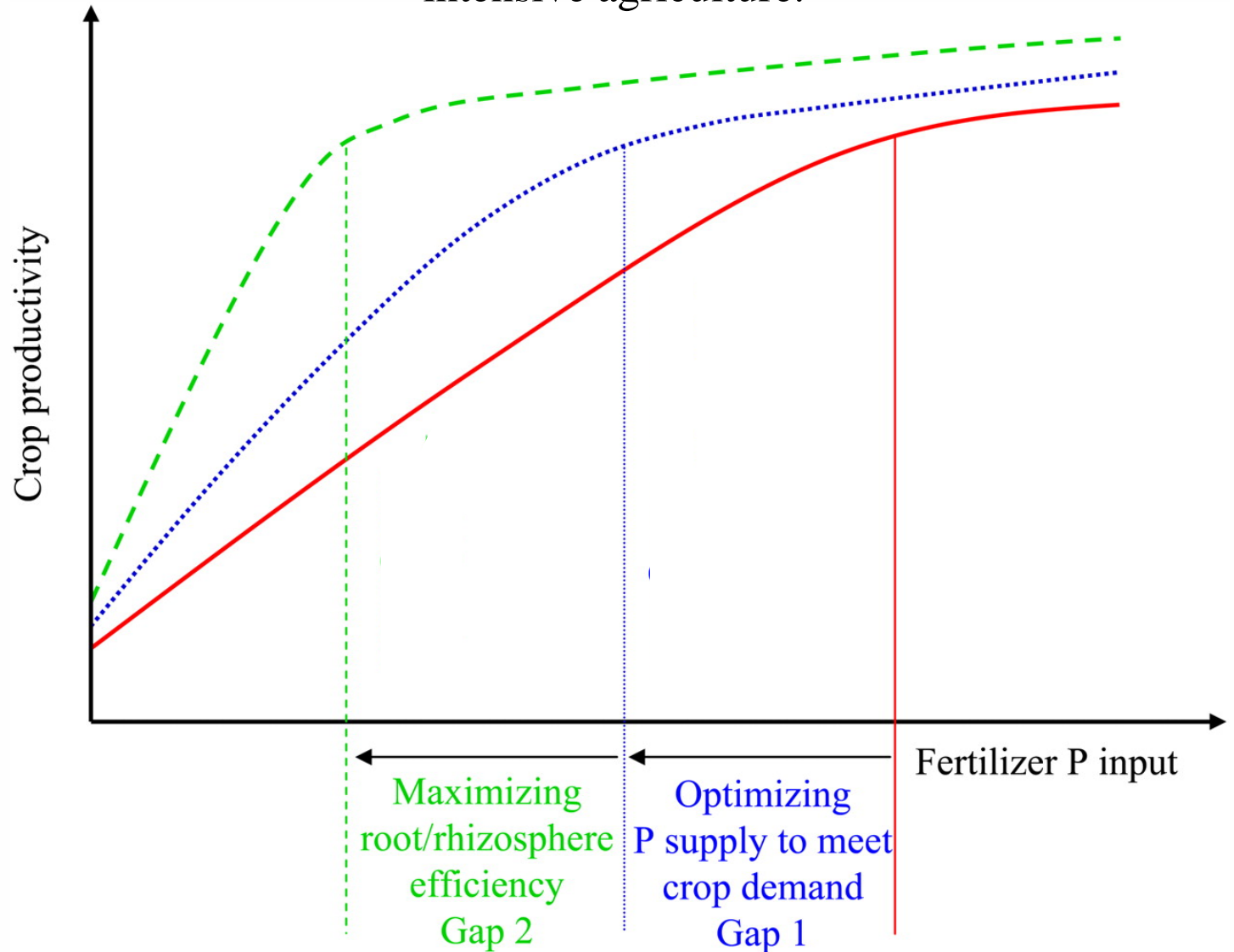




Conceptual model of root/rhizosphere and soil-based nutrient managements for improving P-use efficiency and crop productivity in intensive agriculture.



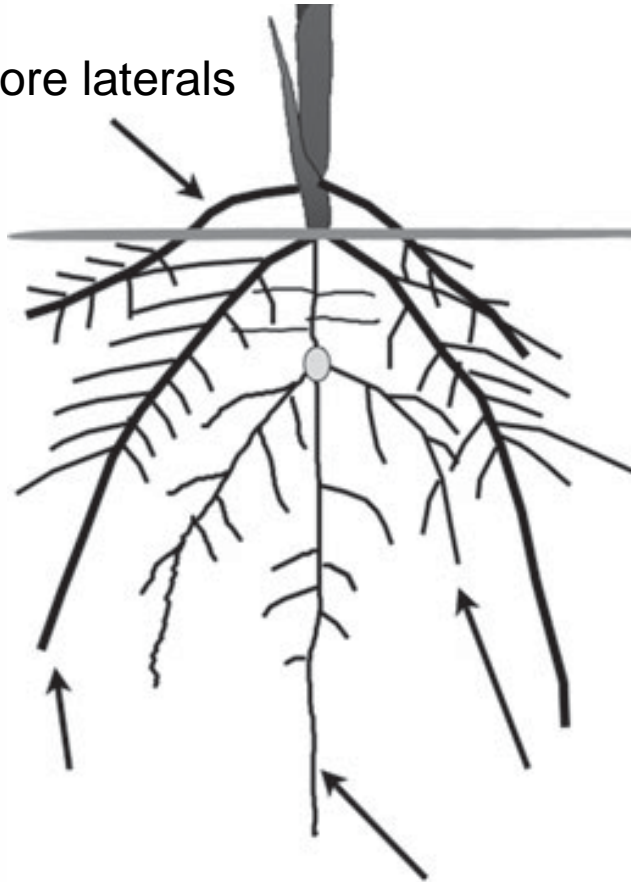
Conceptual model of root/rhizosphere and soil-based nutrient managements for improving P-use efficiency and crop productivity in intensive agriculture.





Root architecture under high P

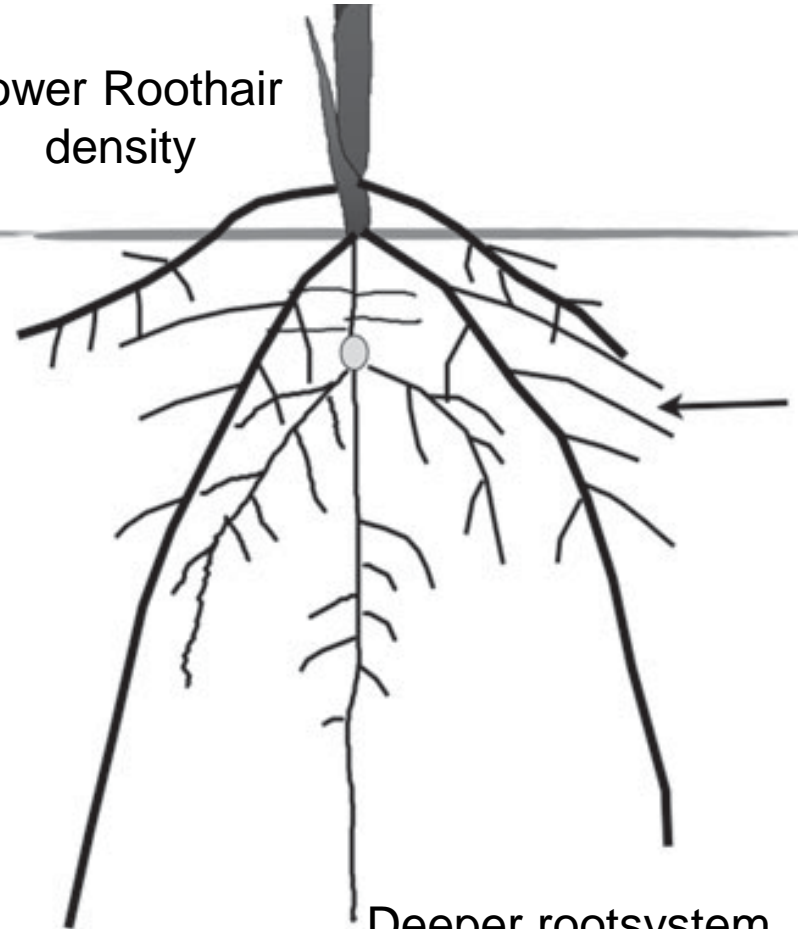
More laterals



Shallower rootsystem

Root architecture under low P

Lower Roothair density

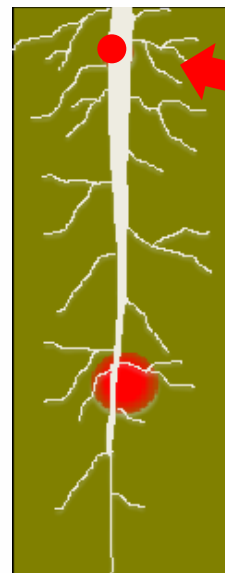
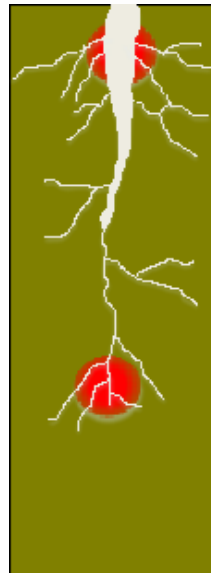
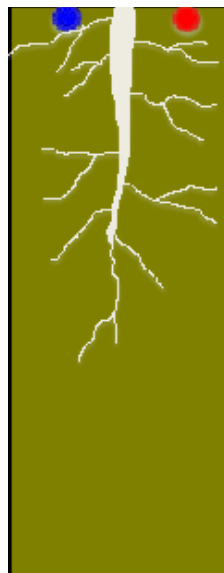


Deeper rootsystem



Small P- quantities placed on the right place may promote and attract root growth

Placement of elements shapes root architecture. A P-starter application in combination with basic N+P placed on distance, gives maximum root development.



Micro dose P-starter application

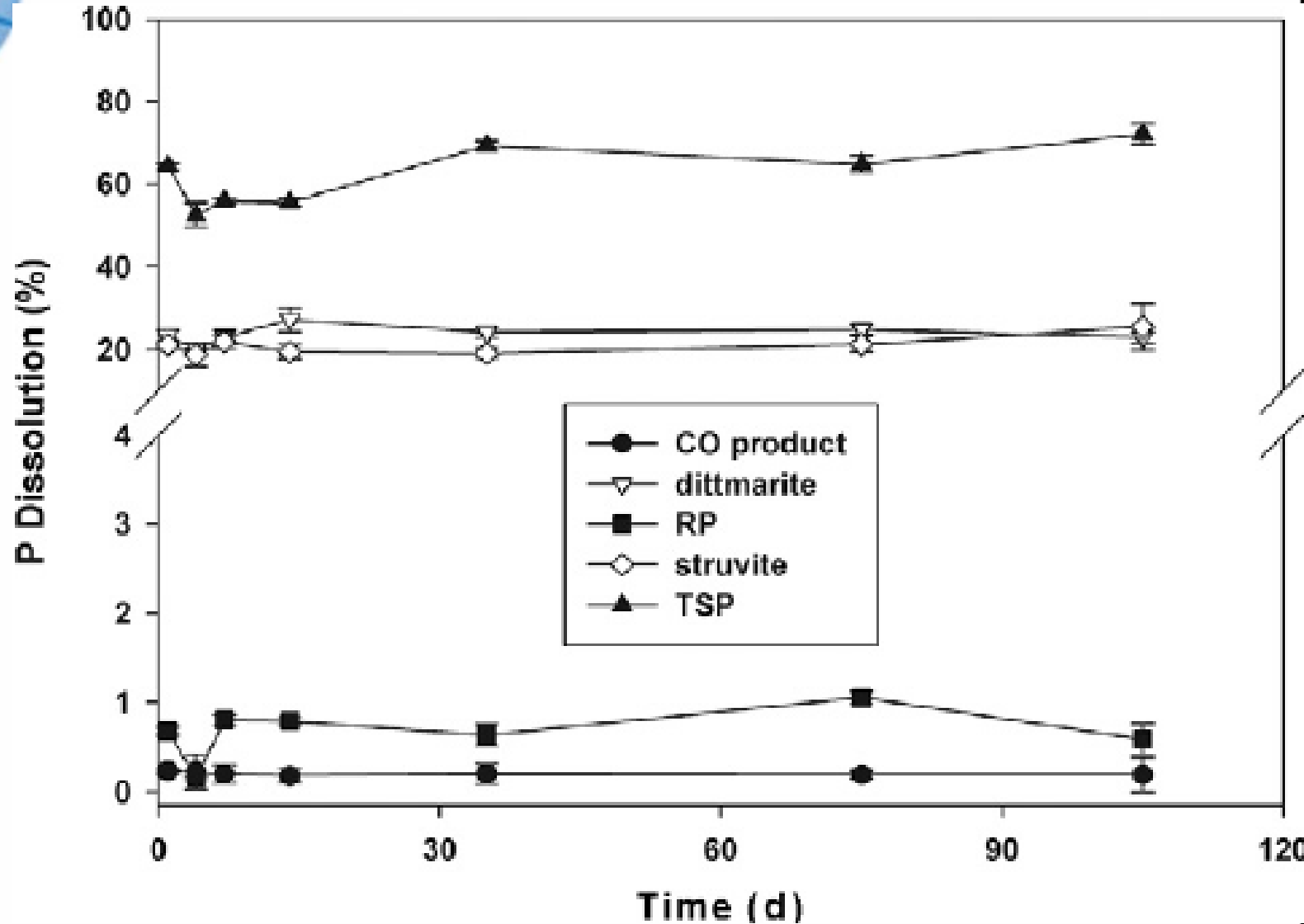
Ridge Tillage







Mg-struvite release by pH (8,0)





Struvite-based micro-granular experiments

2014 - desk studies

consultation by experts on chemical, juristic and agronomical topics (e.g. NMR analyses)

2015 - 3 field experiments (Delphy/WUR)

greenhouse pot experiment (Aeres)

2016 - greenhouse pot experiment (Aeres/WUR)

6 field experiments (corn) (WUR)

field experiment (potatoes) (WUR)

greenhouse experiment (lettuce) University of Milan

2017 - greenhouse pot experiment (Aeres)

4 field experiments (corn) (Delphy/WUR)

3 field experiments (potatoes) (Delphy/WUR)

Total: 21 trials



Trial results 2015

Object	FY		DM%		DMY	
Untreated	53.3	a	32.9	a	17.2	a
Mineral Micro-granular	54.1	a	34.1	a	18.1	b
Struvite based Micro-granular	54.6	a	33.9	a	18.2	b
Lsd	2.0		1.4		0.8	
F pr.	n.s.		n.s.		<0.05	

Significantly as good
as mineral P

P and N uptake balance

Table 14. N and P₂O₅ balance of both Physiostarts NP and P-Plus.

	Vredepeel		Joure		Tjalleberd		Mean	
	NP	P-Plus	NP	P-Plus	NP	P-Plus	NP	P-Plus
N-application	1,6	1,0	1,6	0,8	1,6	0,8	1,6	0,9
extra N-uptake	<u>3,6</u>	<u>8,5</u>	<u>23,0</u>	<u>15,0</u>	<u>4,6</u>	<u>10,6</u>	<u>10,4</u>	<u>11,4</u>
N-balance	-2,0	-7,5	-21,4	-14,2	-3,0	-9,8	-8,8	-10,5
P ₂ O ₅ -application	5,6	6,0	5,6	4,8	5,6	4,8	5,6	5,2
extra P ₂ O ₅ -uptake	<u>4,3</u>	<u>1,9</u>	<u>10,0</u>	<u>3,0</u>	<u>5,3</u>	<u>7,1</u>	<u>6,5</u>	<u>4,0</u>
P ₂ O ₅ -balance	1,3	4,1	-4,4	1,8	0,3	-2,3	-0,9	1,2

Positive N-uptake





WILDEBOER
Economic
www.Wildeboer-groep.nl

At the left mineral NK micro-granular - At the right struvite-based micro-granular.



P- start fertilization: Proof of Concept

- 1- Smart precision fertilization in close proximity of roots
- 2- addition of biostimulant Physio⁺ (from group of cytokinins)
- 3- addition of NH₄⁺ (local low acidification)
- 4- processing enhancement of raw struvite
- 5- “Deep, Cheap and Steep”, keep plants lean and mean

Main challenge: identifying 100% organic renewable P-sources that can be upgraded AND processed within the existing industry!





Thanks for your attention,
any questions?

