Technologies to improve nutrient utilization and maize production with special focus on phosphorous and nitrogen

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European Maize Meeting Sept. 7-8 2022

Miljø- og Fødevareministeriet
gudp

STØTTET AF
Promilleafgiftsfonden for landbrug

SEGES INNOVATION

Denmark is situated close to the northern border for maize production

- So, low temperatures – especially in spring - is restricting maize development.
- Due that most Danish farmers apply starter fertilizer to secure enough available P to the crop.

SEGES INNOVATION

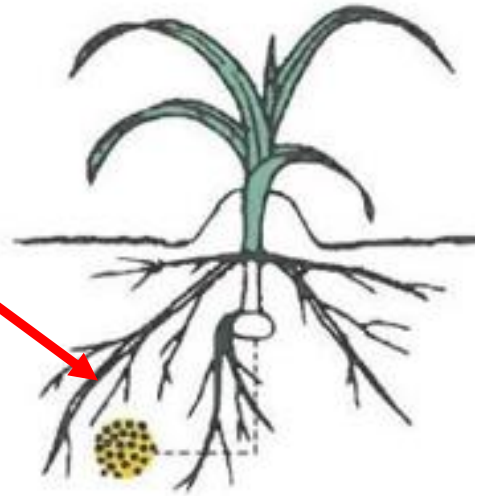
Effect of starter P

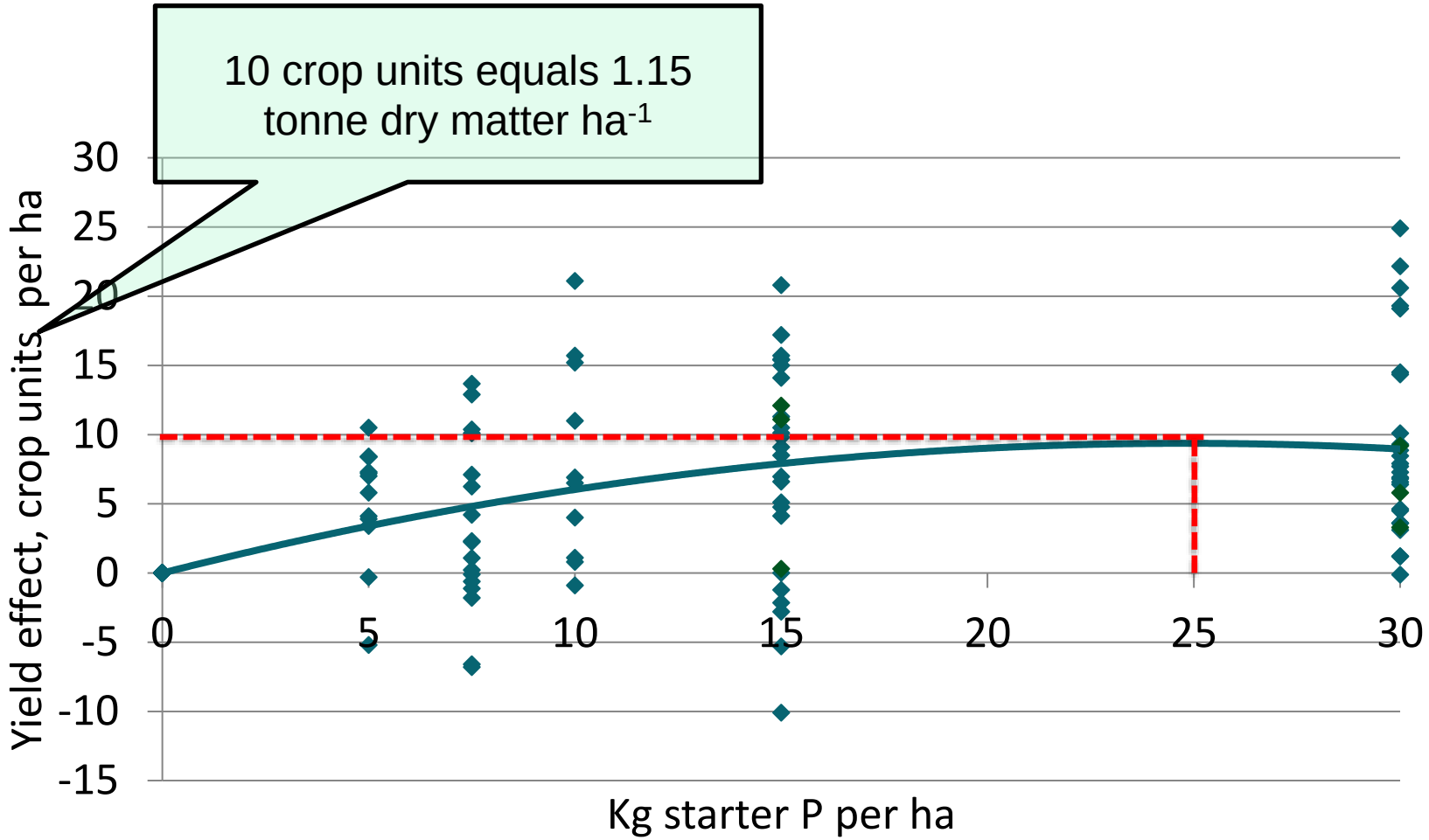
Foto: Martin Mikkelsen, SEGES

Traditional starter P to maize

37 trials 2003-2017, 2019-2021

Mineral start P fertiliser





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New Danish phosphorus regulation in 2018

	N-Ceiling, kg N ha^{-1}	P-ceiling, kg P ha^{-1}
Dairy farms, normal	170	30
Dairy, derogation	230	35

How do we compensate for the effect of starter P?

- Better effect of slurry
- Better effect of small amounts of P in starter fertilisers

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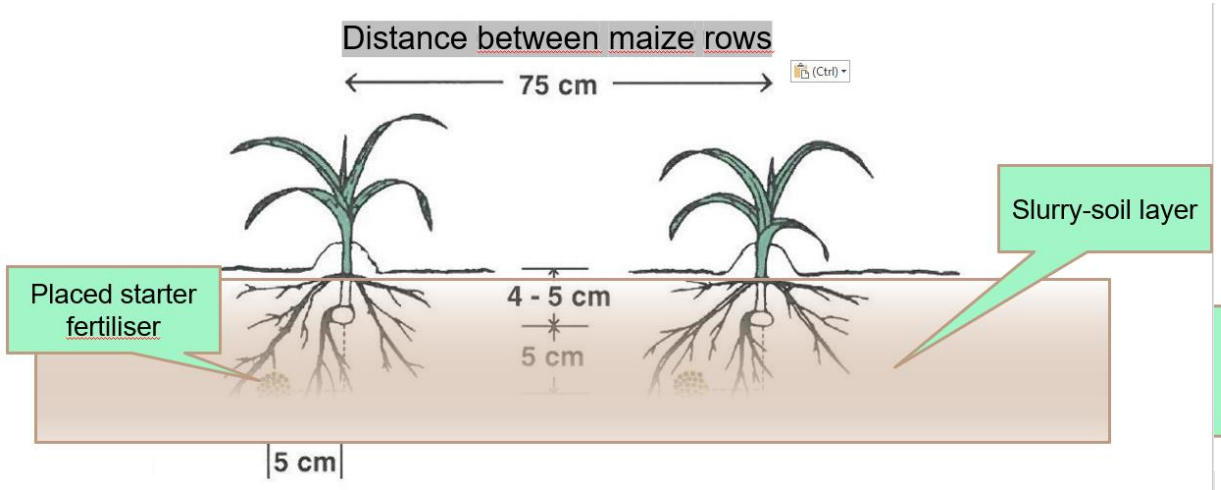
Difference between the standard and the row-injection method

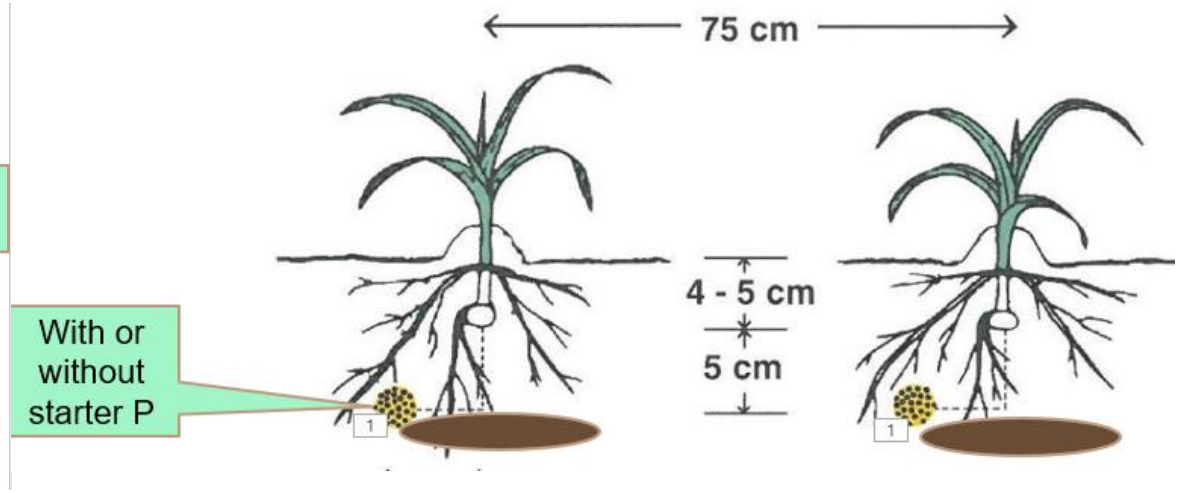
Standard application of slurry

1. Injection, 25 cm between the tines
2. Tillage
3. Sowing of maize

Row-injection of slurry

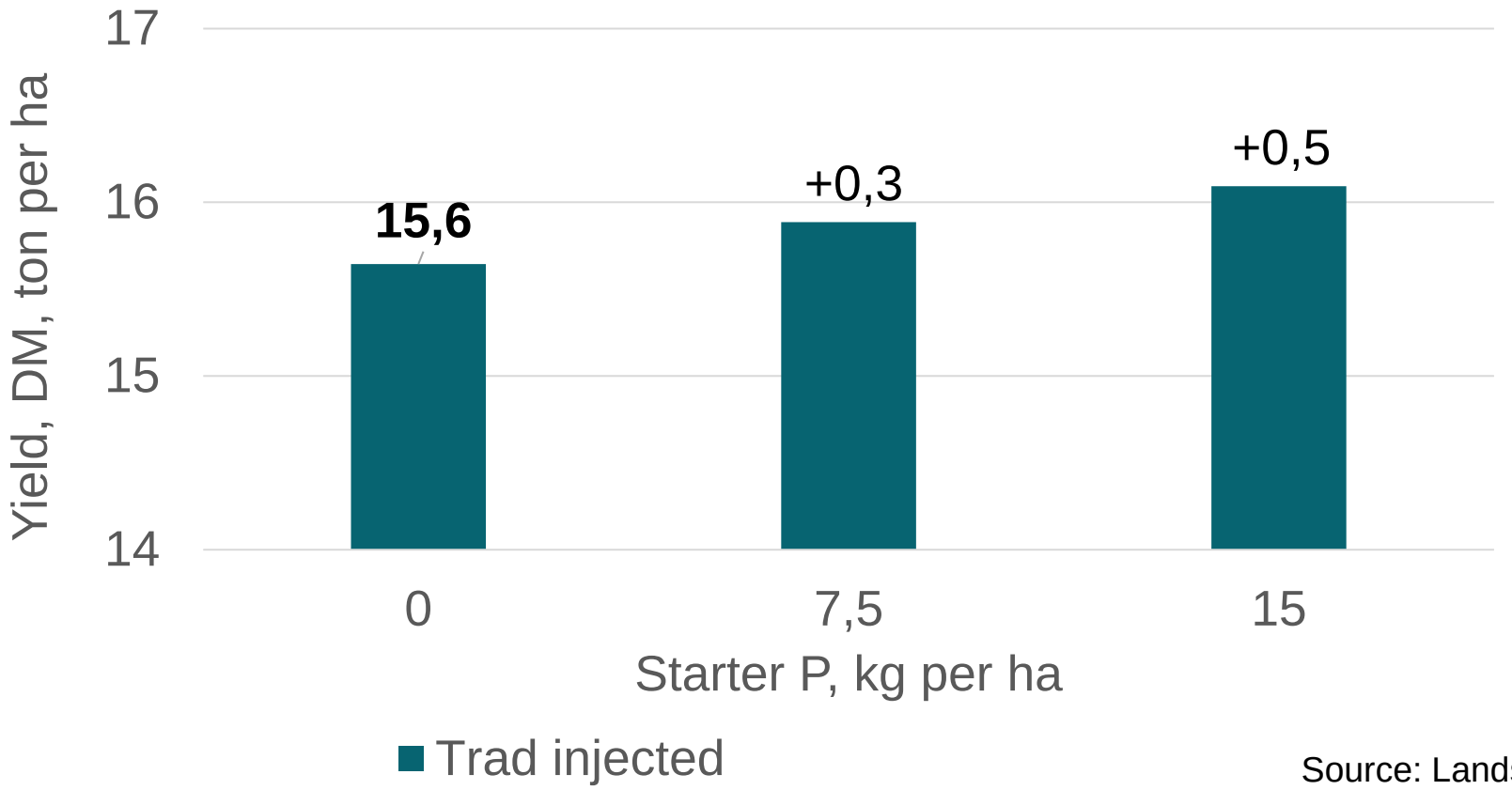
1. Tillage
2. Row-injection, 75 cm between the tines (GPS)
3. Sowing of maize (GPS)





Traditional injection – effect of starter P

10 field trials, 2020 and 2021



Source: Landsforsøgene 2021

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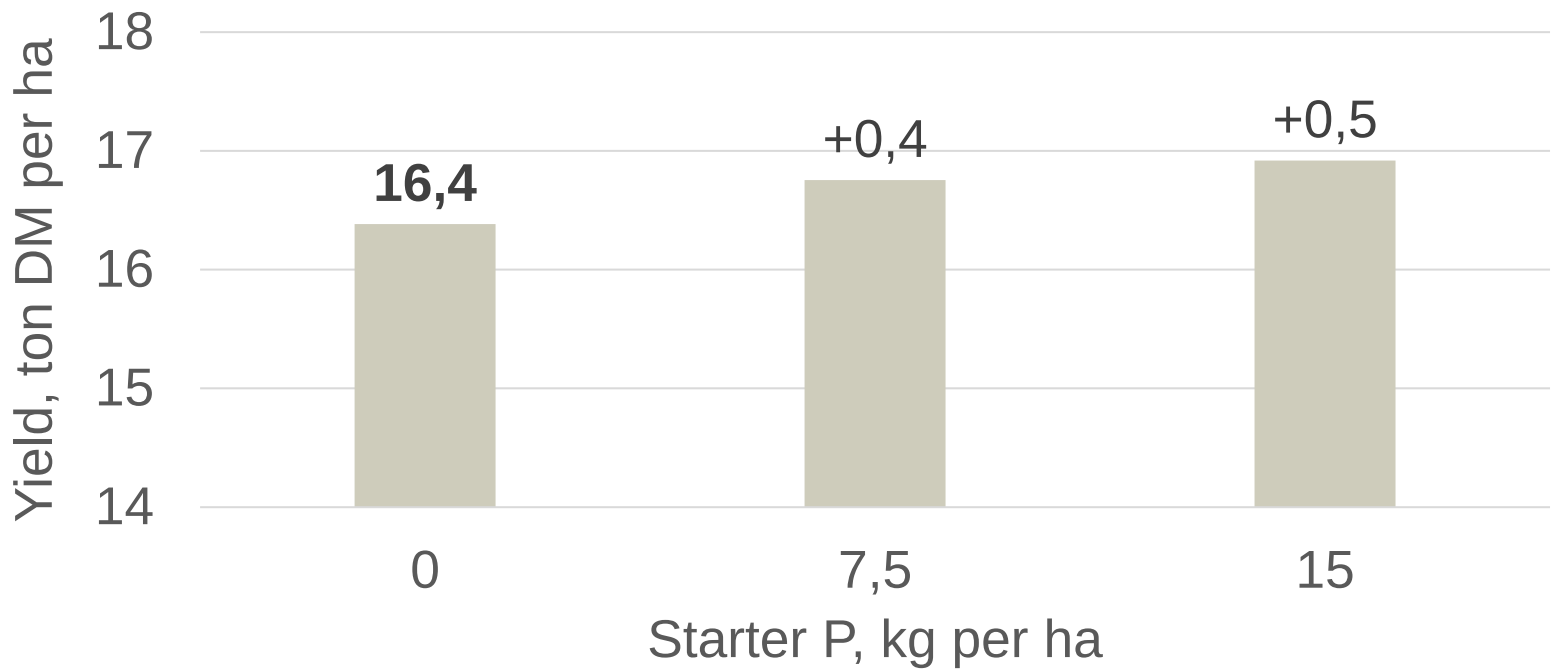
Row injection – effect of starter P

10 trials 2020 and 2021

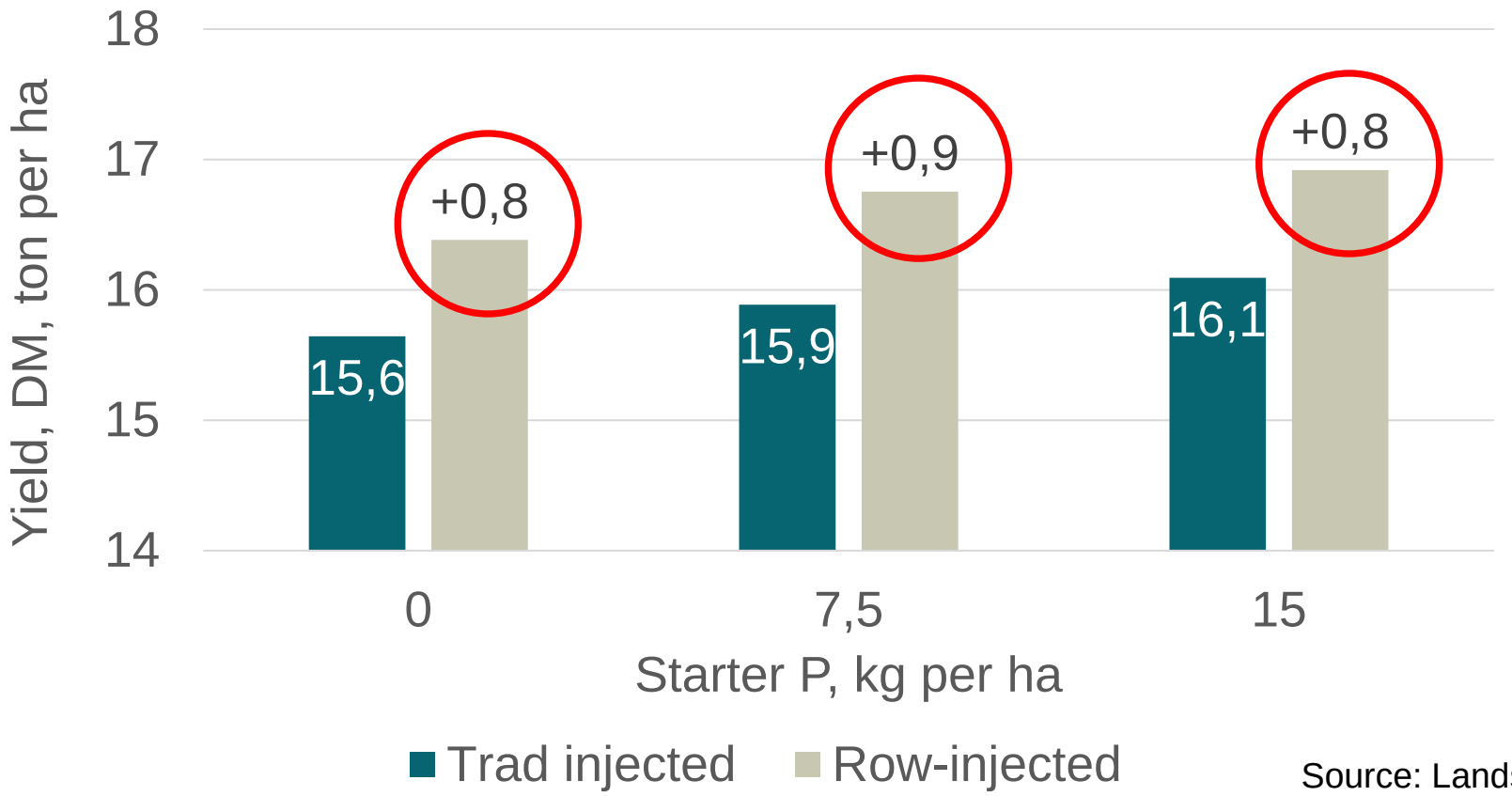


Source: Landsforsøgene 2021

SEGES INNOVATION

Effect of row injection

10 trials 2020 and 2020

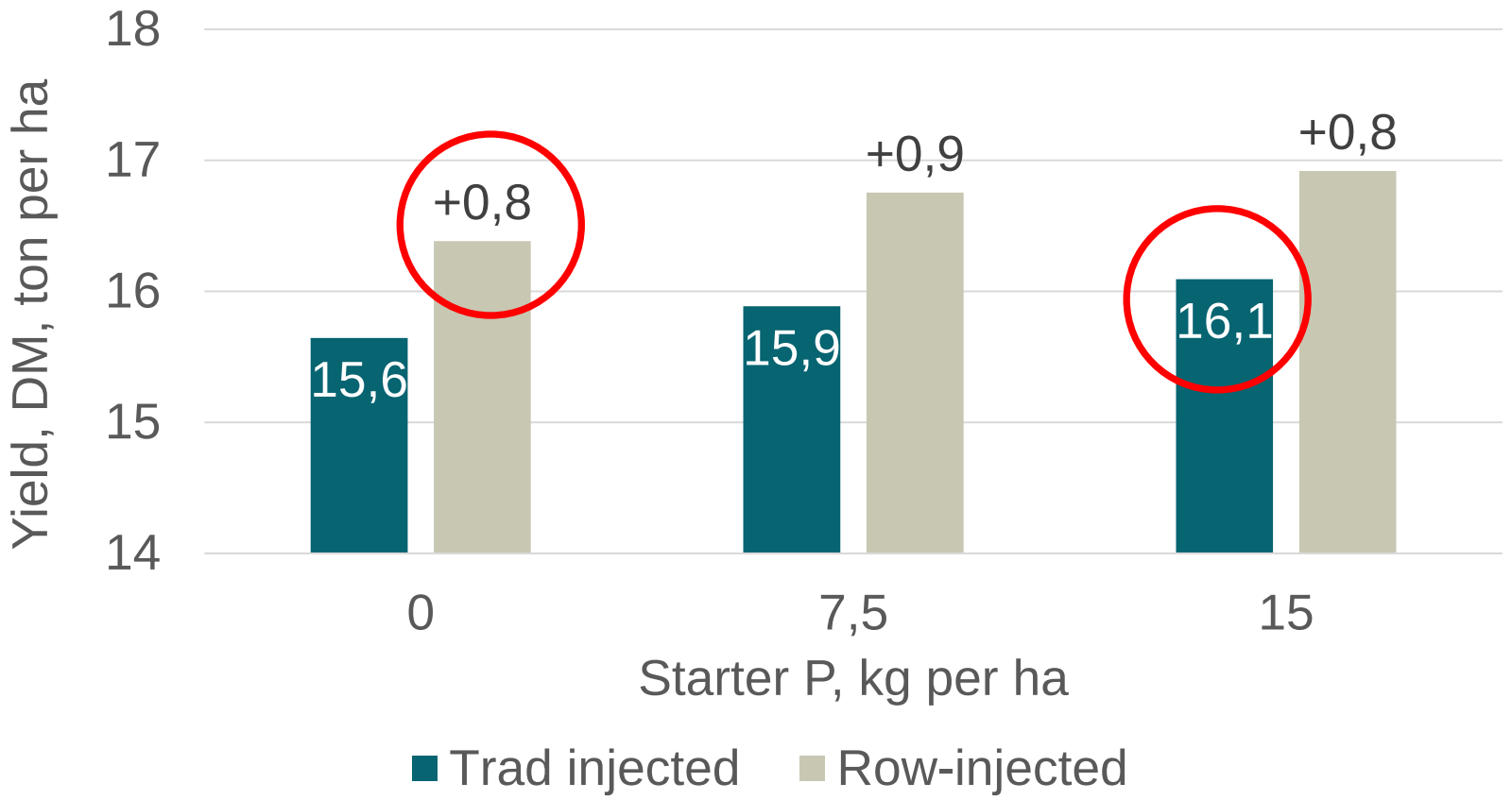


Source: Landsforsøgene 2021

SEGES INNOVATION

Effect of row injection

10 trials 2020 and 2020



SEGES INNOVATION

A lot of digging has been done to see, how slurry is distributed by different tine systems – and to what depth.

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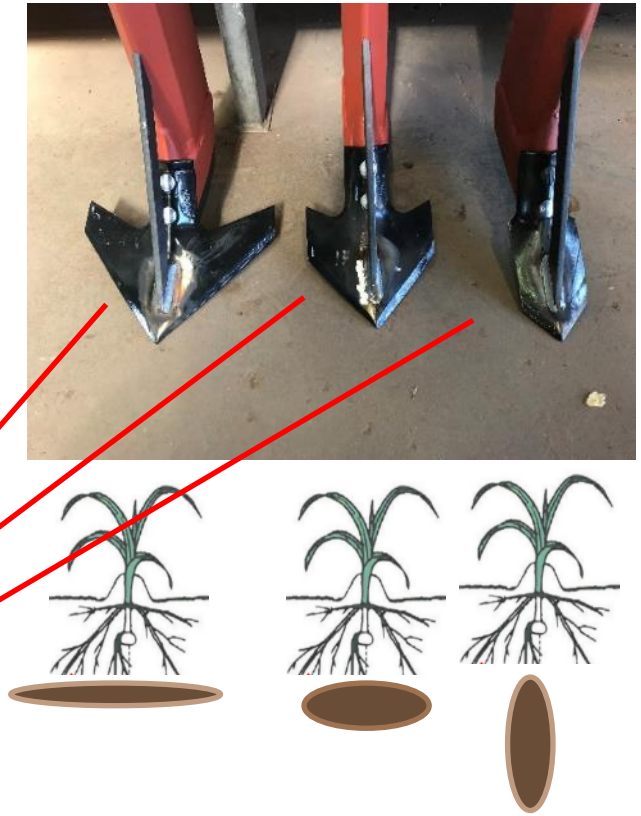
The design of tines effects crop yield

3 field trials 2019 and 2020

Row-injection of cattle slurry to maize at ploughed soil

Maize	Start-fertilizer, kg pr. ha		NH_4-N in slurry, kg pr. ha	Tillage, before or after slurry application	Slury application system	Tine design	Yield and additional yield. per ha
	N	P					ton DM
2019 og 2020. 3 field trials.							
1.	27	0	127	Ploug, after	Trad. Injected	Black soil injector	**15.7**
4.	27	0	127	Ploug, before	Row-injected	Duck foot, 26 cm	1.6
7.	27	0	127	Ploug, before	Row-injected	Duck foot, 17 cm	1.4
8.	27	0	127	Ploug, before	Row-injected	Narrow share, 8 cm	1.3
							ns



Additional yield

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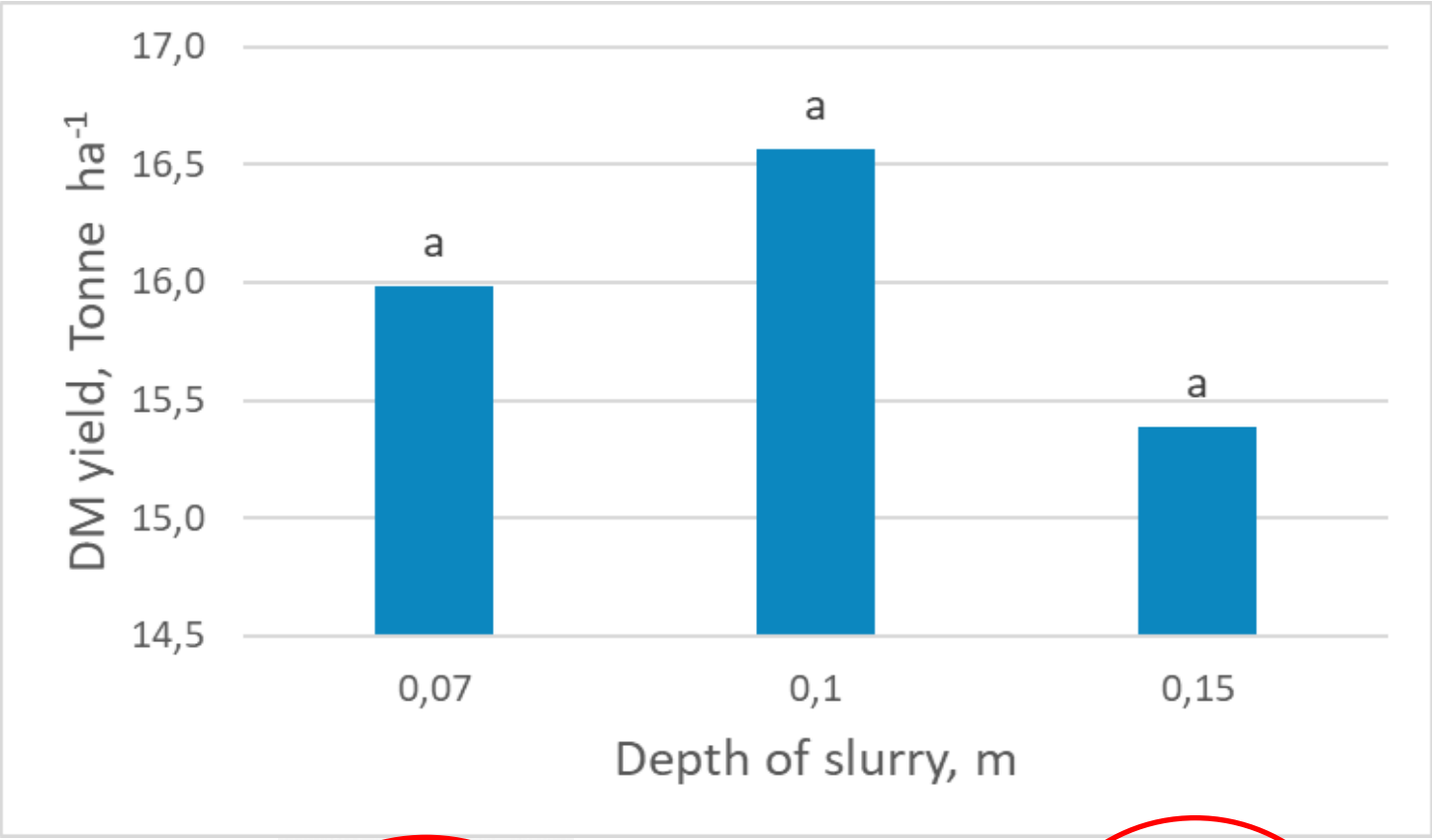
Depth of slurry

3 trials 2019 and 2020



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Summing up - placed slurry

- Row injection gives a higher yield than trad. injection at all levels of starter P
- Row-injection can at least replace the yield effect of 15 kg starter P per ha with trad. injection
- Row injection in 9-10 cm depth (4-5 cm below the seeds)
- Row injection in a band e.g. with 17-26 cm duck food shares

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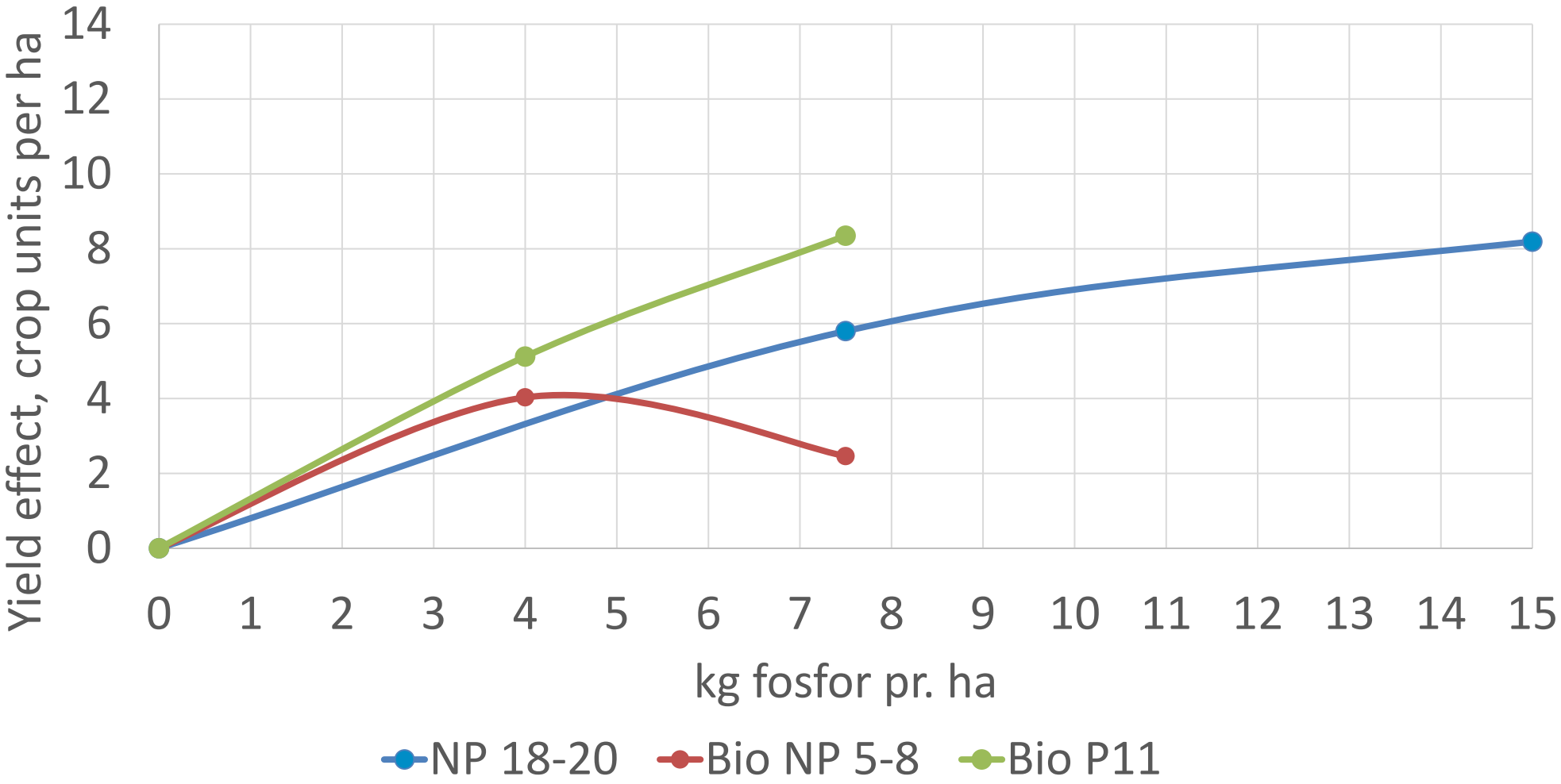
Starter fertilizer in the sowing track

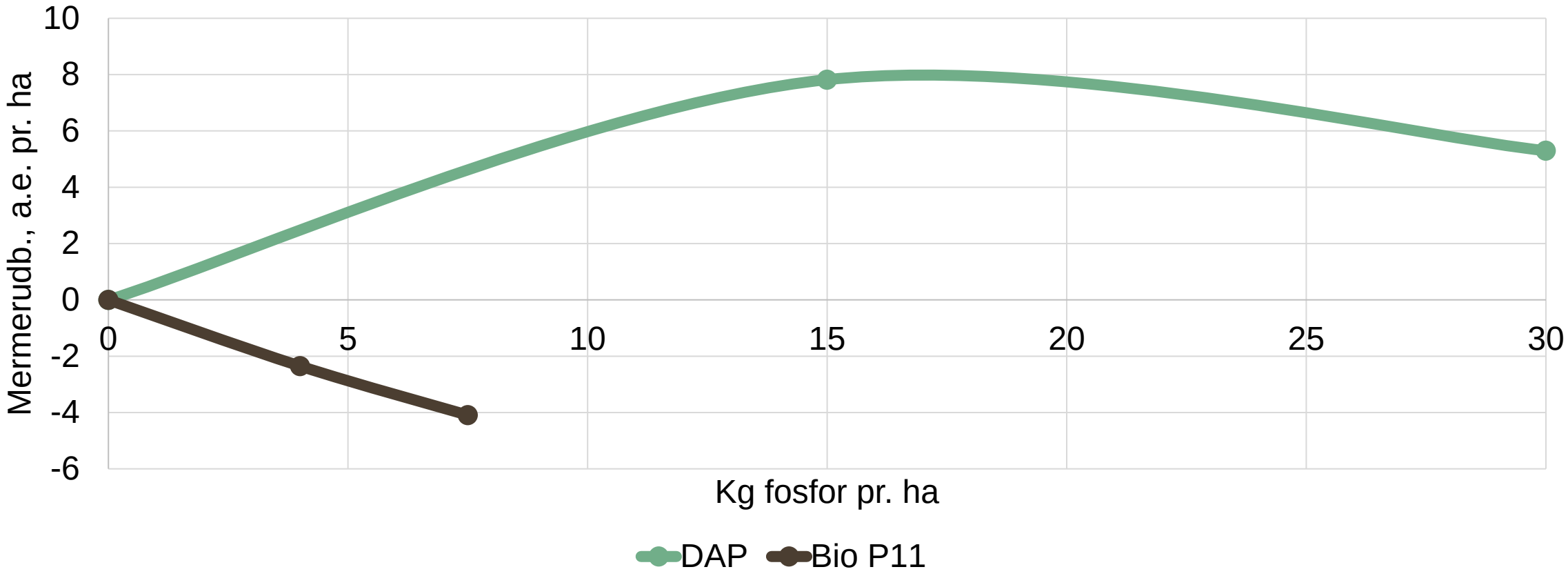
4 forsøg 2020



SEGES INNOVATION

Starter fertilizer in the drilling track

3 forsøg 2021



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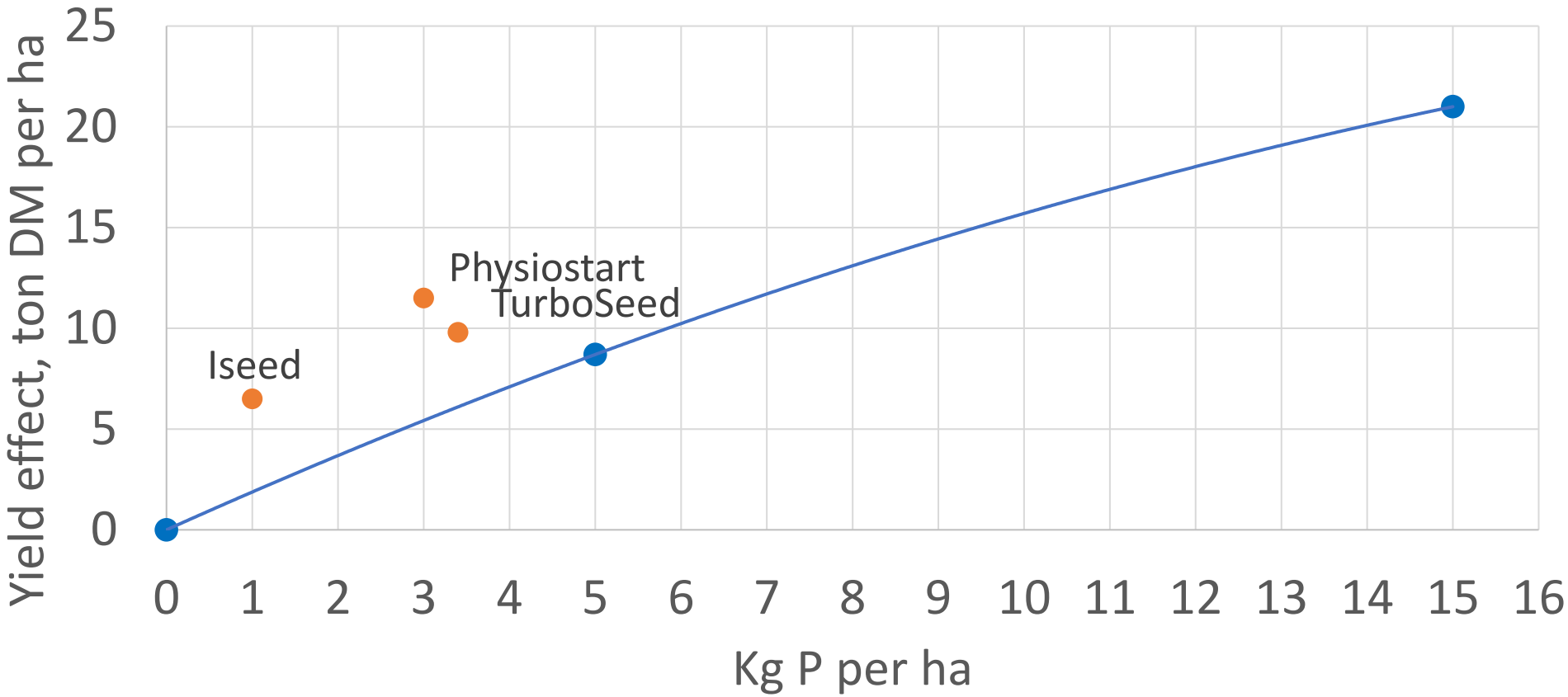
Iseed and mikro granulate fertilizers
4 forsøg 2007



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Physiostart and Turbo Seed

Physiostart	Pct.
N	8
P	12,2
S	9,2
Zn	2
Amminopyriner	+

Turbo Seed Zn	Pct.
P	22
K	27
Zn	1

Biostimulant – Star cover - coatet on maize seeds

10 trials 2016-2018

Starcover*	Placed P**	5 trials 2017-2018	2 trials 2017	3 trials 2016
		Yield and yield effect, dt DM per ha		
		109,8	**141,1**	
	+	10,0	12,2	
		109,8	**141,1**	
+		5,2	-1,3	
	+	**119,8**	**153,3**	**146,6**
+	+	3,4	1,1	1,8
LSD		*ns*	*ns*	*ns*

*) Extract of Guar beans and Baccilus amyloliquefaciens
**10 or 28 kg P per ha

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Conclusions

- Placed slurry gives a better utilization of nutrients in slurry at all levels of starter P
- Placement of a fluid P fertilizer in the sowing track - ?
- Coating of seeds with P maybe helps a bit – but risky
- Microminerals helps maybe a bit – but too ekspensiv
- Biostimulants helps maybe a bit
- So far - nothing can fully replace traditional placed P


Thanks for listening