



NUTRIENT LEGISLATION VERSUS FERTILISATION PRACTICES IN POTATO FIELDS IN FLANDERS, BELGIUM

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Introduction



ENVIRONMENT

<50 mg NO₃/l

EU-nitrate directive

Flanders: Manure decree

- 1) Fertilisation standards
N en P₂O₅
- 2) Residual Nitrate in soil

ECONOMY

Yield, Quality

Fertilisation practices

- 1) N-, P₂O₅- dose
- 2) K, Mg, liming
- 3) time of application
- 4) fertiliser type
 - Organic/mineral
- 5) application mode



SSB

Scientific research

Fertilizer recommendations

Nutrient legislation

Background

Nutrient export **55 ton/ha**

N

210

P₂O₅

58

K₂O (kg/ha)

>300

Fertilisation standards (kg/ha)

P₂O₅: **65**

from 2015 : 55
farm level

Soil type

Sandy Other

N-total animal
170

N

190

210

Working coefficient

%

mineral fertiliser

100

slurry

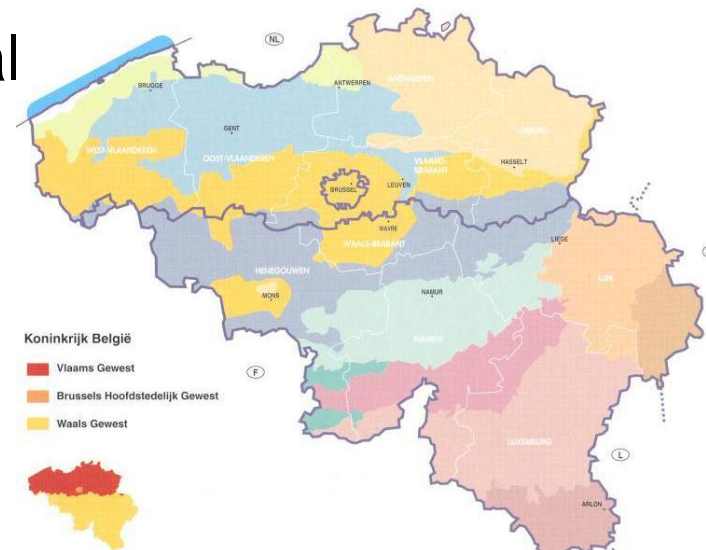
60

farmyard manure

30

certified VFG-compost

15





Nutrient legislation

Soil residual nitrate (kg N/ha, 0-90 cm, period 1/10-15/11) Potatoes

Soil Type	Focus area	Threshold	Level 1	Level 2	Level 3	
Sand	Yes	< 85	133	183	188	
No sand	Yes	< 85	133	198	218	
Sand	No	< 90	141	191	196	
No sand	No	< 90	141	206	226	
Imposed measures:*		0	1	2	3	> 4

*1 : N-soil analysis in spring, control residual nitrate

2 = 1 + extra residual nitrate control on other parcel

3 = 2 + reduction fertilisation standards 20 – 30 %

4 = 3 + strongly reduction fertilisation standards, 0 in focus area

Fertiliser recommendations

potatoes Sandy Loam region, period '08-'11

P*, K* : mg/100 g dry soil, AL-extract

Soil fertility	P*	% parcels	K*	% parcels
Very low	< 5	0.0	< 6	0
Low	5 - 8	2.3	6 - 10	2.2
Rather low	9 - 11	6.0	11 - 13	6.1
Target zone	12 - 18	23.3	14 - 20	43.5
Rather high	19 - 30	36.8	21 - 35	46.4
High	31 - 50	27.1	36 - 60	1.7
Very high	> 50	4.5	> 60	0
Recommendation	(kg/ha): P ₂ O ₅		K ₂ O	
Very low	-		-	
Low	198		359	
Rather low	180		320	
Target zone	138		263	
Rather high	77		207	
High	41		76	
Very high	0		-	
Overall average	87		239	

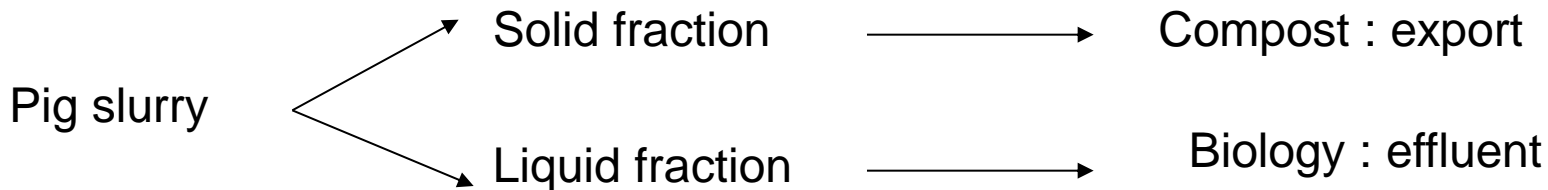


Nutrient supply organic manure

P-limit : 65 - 55

	N	P ₂ O ₅	K ₂ O
Cattle slurry	170	51	166
Pig slurry	170	87	100
Farmyard manure	170	80	162
Treated pig slurry (liquid fraction after separation)	170	23	129
Effluent after biology (of liquid fraction)	170	136	1360

Source: manure analysis Soil Service of Belgium





N-recommendations based on N-INDEX method

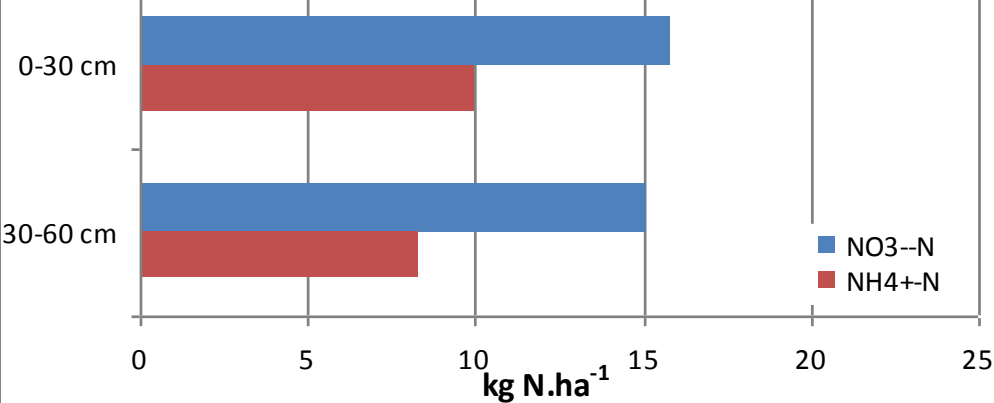
N-index (18 factors)

- + soil mineral N-stock
(60 cm, rooting depth)
- + mineralisation:
 - organic matter(% C)
 - green manure
 - crop residues
 - previously applied manure
- effect structure, low pH
- leaching during growing season


$$\text{N-advice} = A - b * \text{N-index}$$

N-recommendations

sampling 1/1/2013-15/3/2013
no manure, no cover crop



Soil sampling **before** growing season

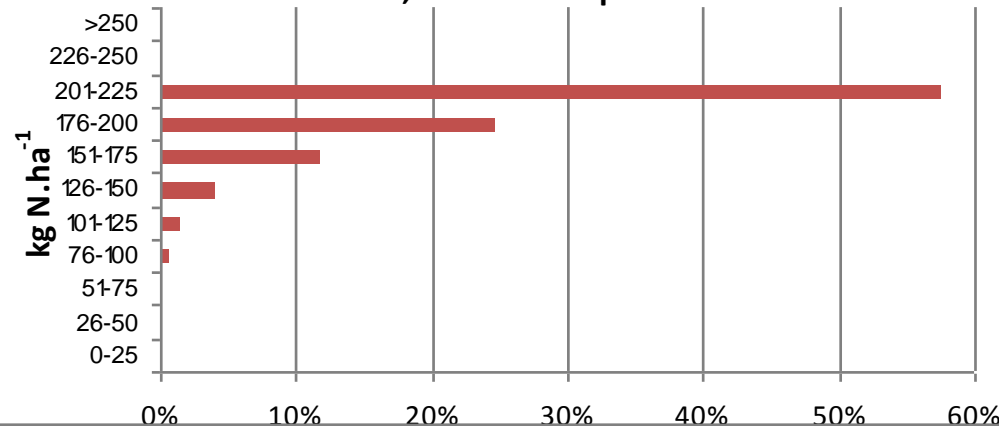
Average:

mineral N stock **49** kg N/ha

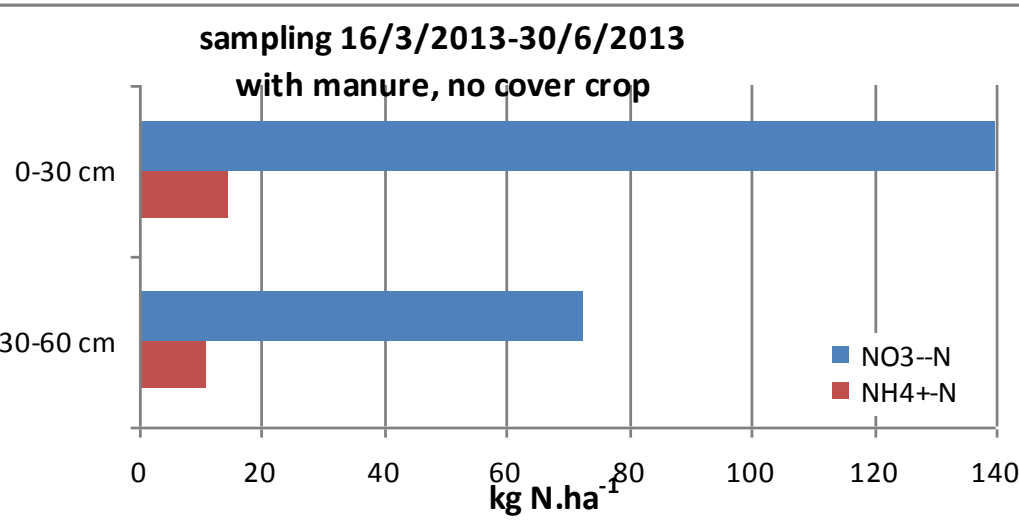
N-advice : **198** kg N/ha

(cv Bintje, processing industrie)

sampling 1/1/2013-15/3/2013
no manure, no cover crop



N-recommendations



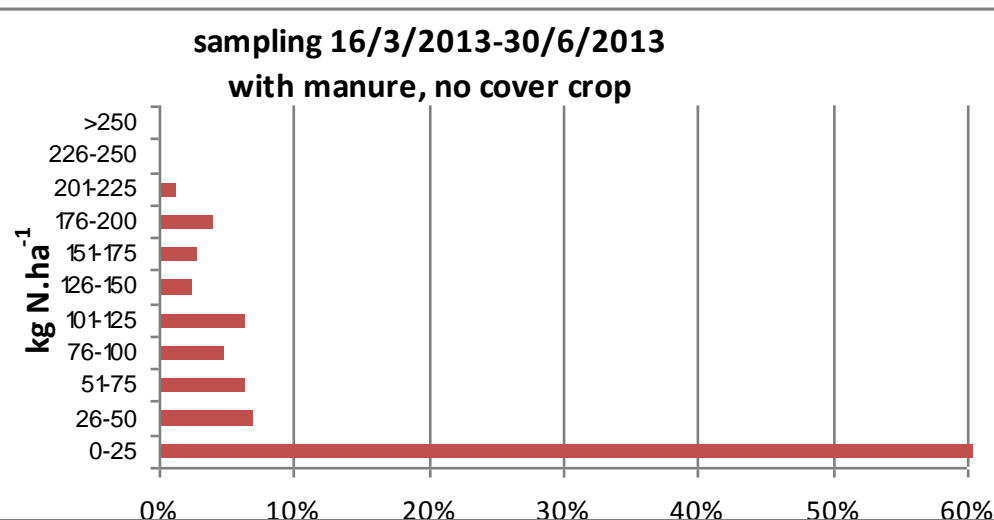
Soil sampling during growing season, after application of organic manure

Average:

mineral N stock **238** kg N/ha

N-advice : **37** kg N/ha

(cv Bintje, processing industry)

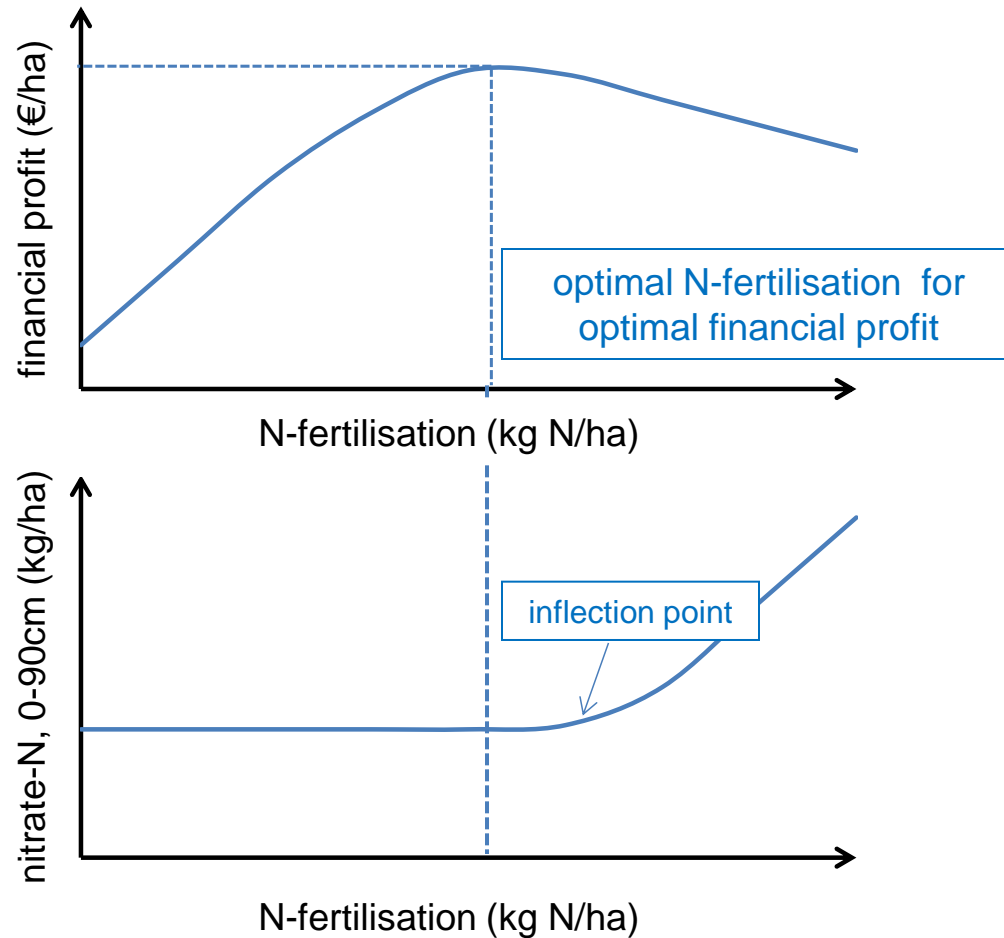


What about the environment?

Economical optimum

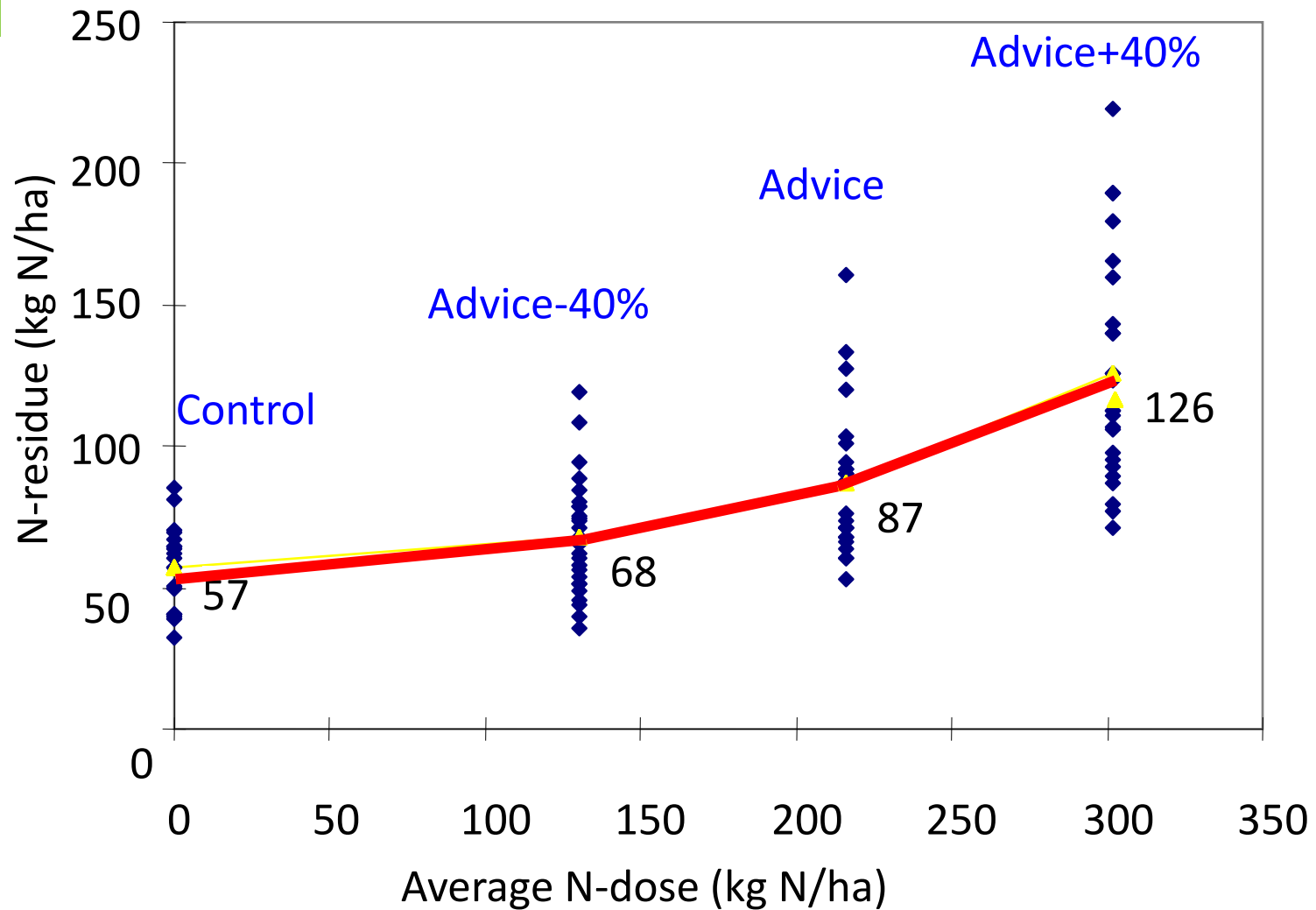


Environmental preconditions





N-response, 14 field trials, Bintje



Tuber Yield: 100

114.7

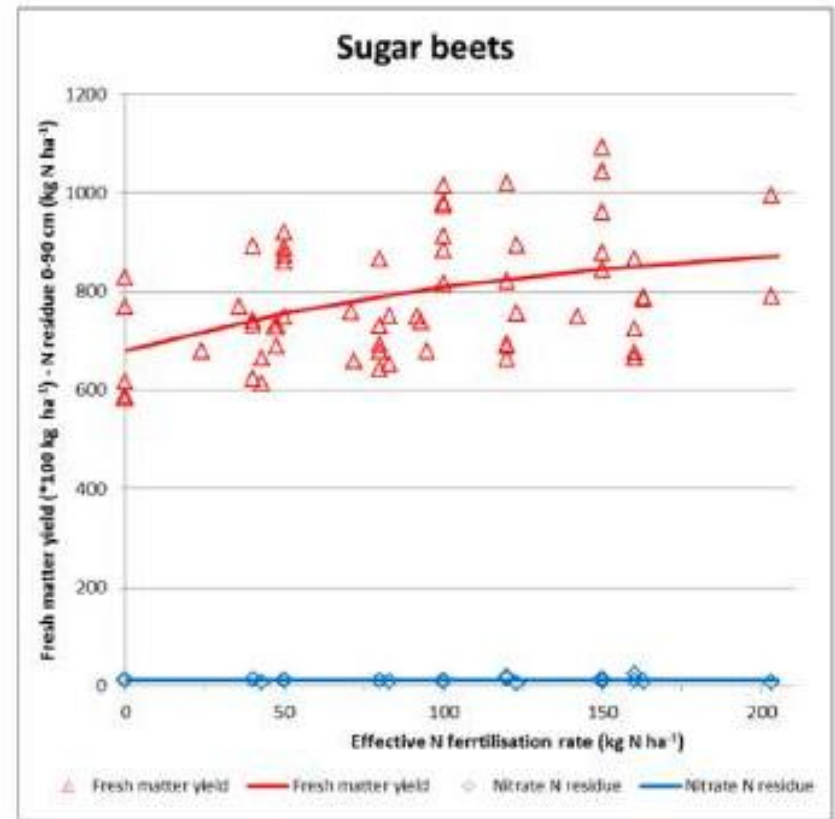
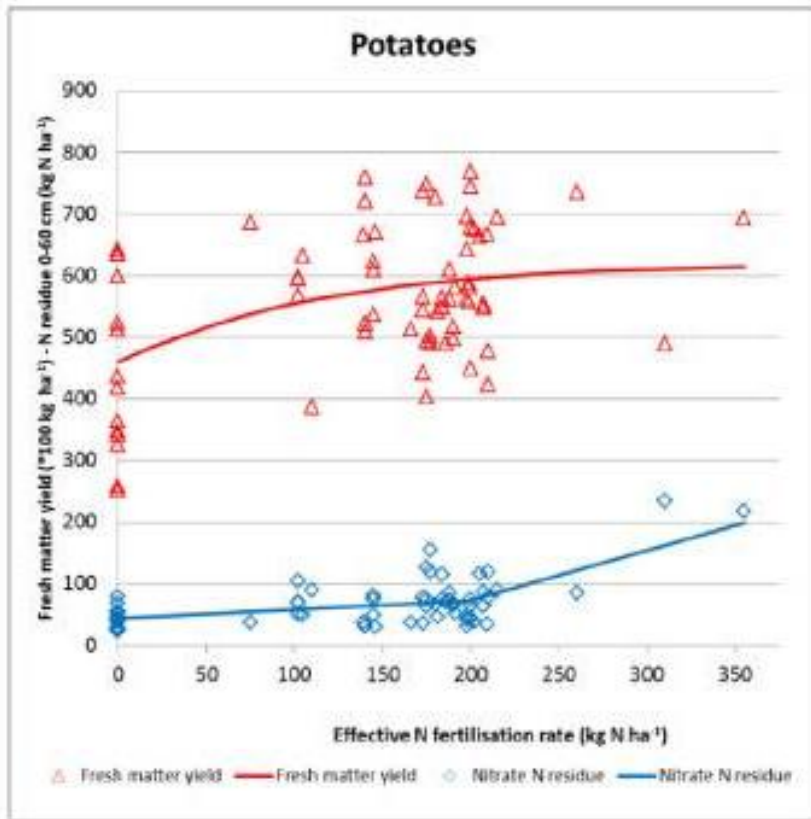
119.3

118.7

100 = 47 ton/ha



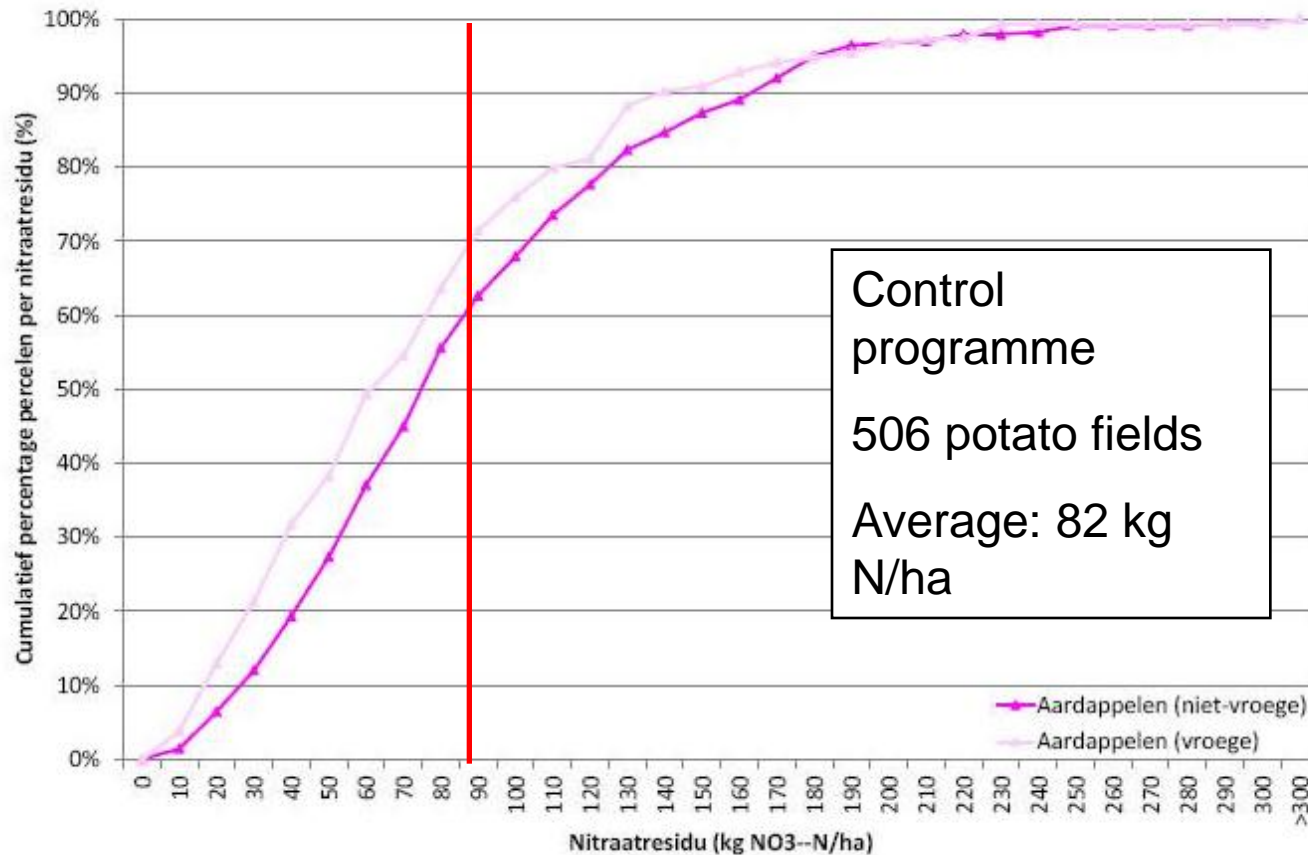
N-reponse versus N-residue



Source: K' D'Haene et al, 2014 based on trial fields UGent, PCA, SSB



Nitrate residue 2013



Threshold value

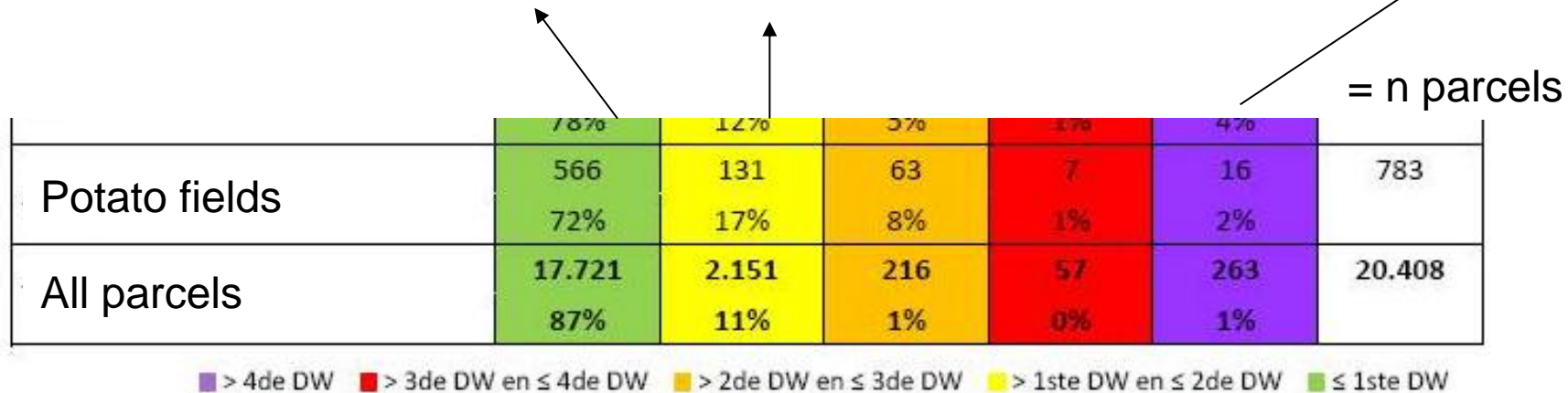
Source: Nitrate residue report 2014 (www.vlm.be)

Evolution	
2006	178
2007	97
2008	114
2009	156
2010	106
2011	127
2012	85
2013	82



Nitrate residue 2013

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Source: Nitrate residue report 2014 (www.vlm.be)



Conclusion

- **Nutrient legislation forces potato grower to reduce N and P-input**
- **Potatoes : risk to pass the threshold value for residual nitrate**
- **N-fertilisation based on N-index (mineral N-stock, expected mineralisation) = optimal tool to optimise potato yield and reduce residual nitrate.**