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Evaluating vegetated buffer zones for P retention in cereal and grass production

Jaana Uusi-Kämppä

MTT, Jokioinen, Finland

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3. Results
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1. Introduction: surface runoff and buffer zones

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Headlands

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Buffer strips and buffer zones

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Retention prosesses on buffer zones

1. Deposition of soil particles
2. Adsorption of P to soil surface, and infiltration of water into soil pores
3. Plant uptake of P

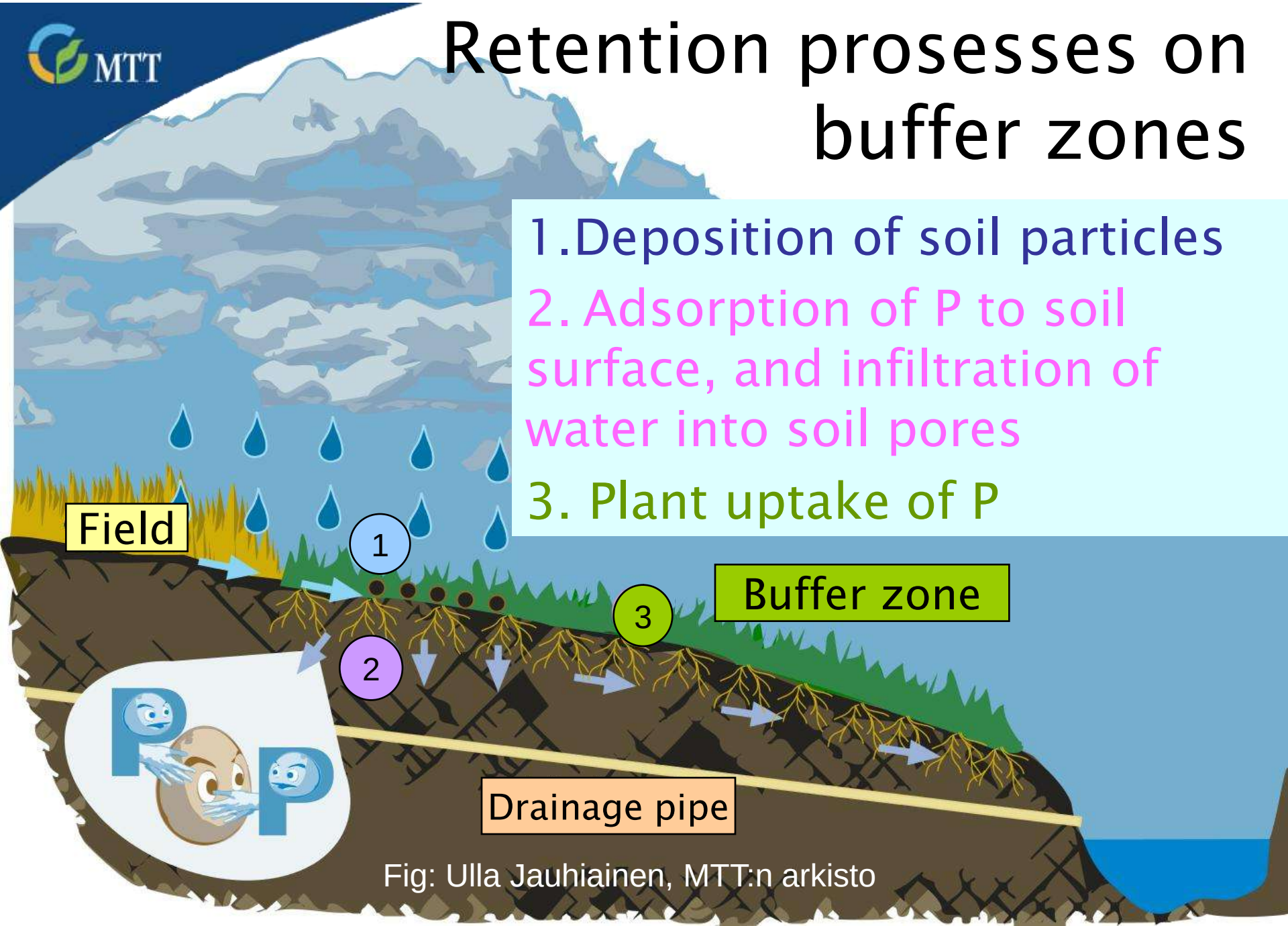

Fig: Ulla Jauhiainen, MTT:n arkisto

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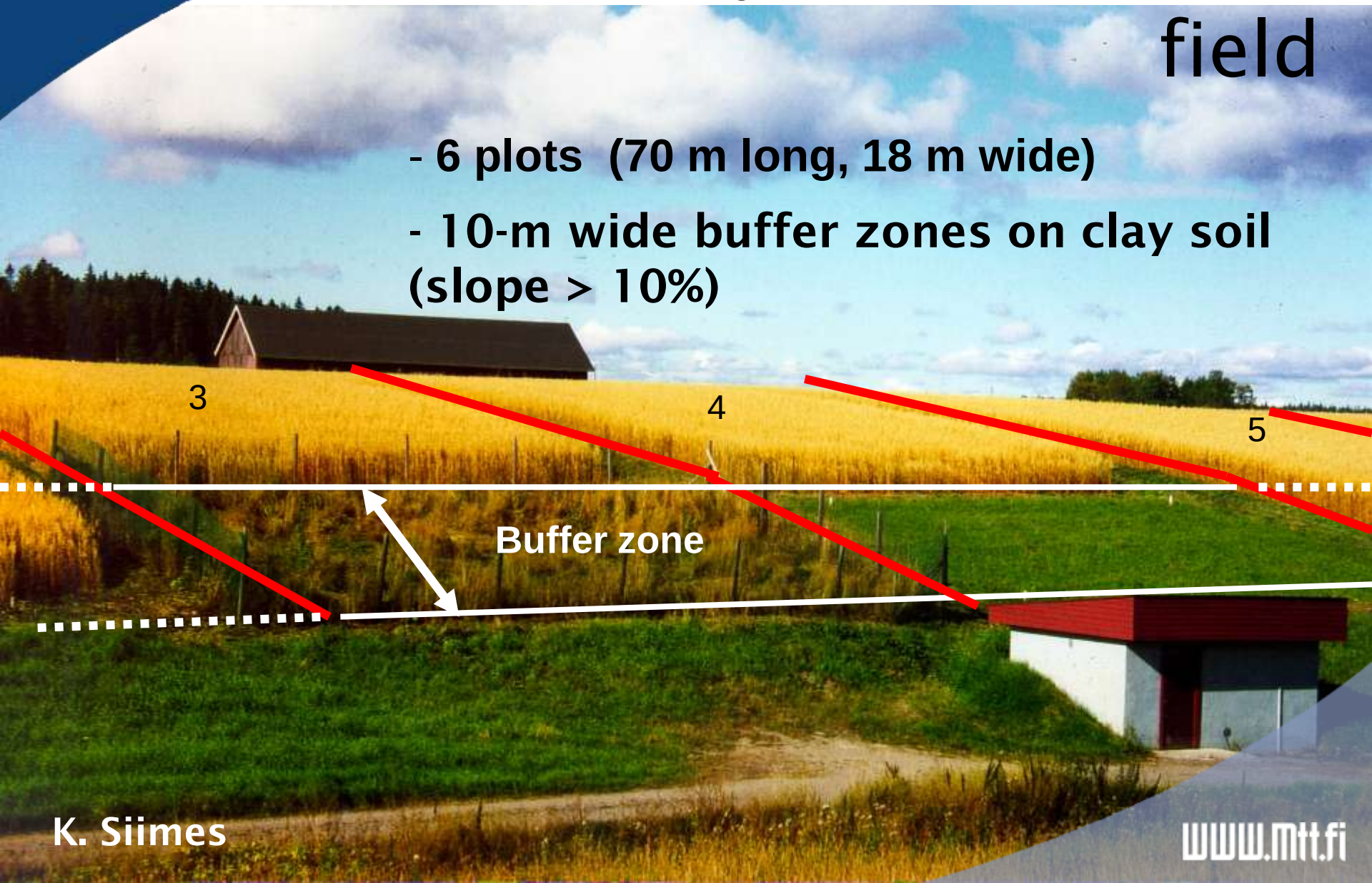
2. Lintupaju experimental field



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Experiments on the Lintupaju field

1. Coventional tillage with autumn ploughing (1992–2002)

3. Direct drilling (2006–)

2. Pasture (2003–2005)

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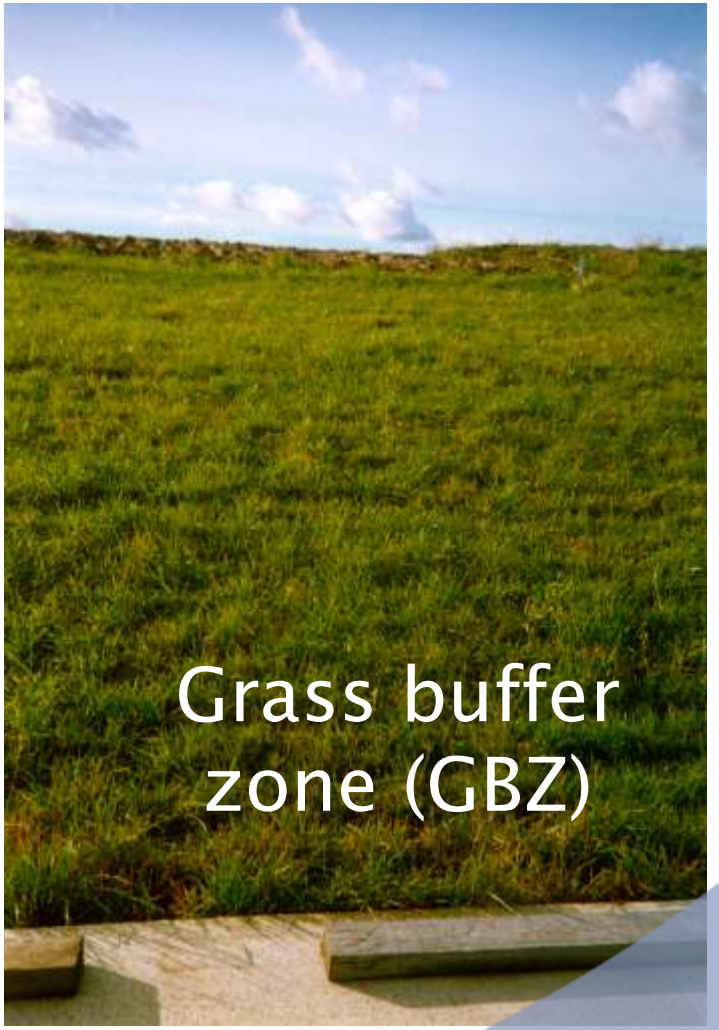
Treatments



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Samplings

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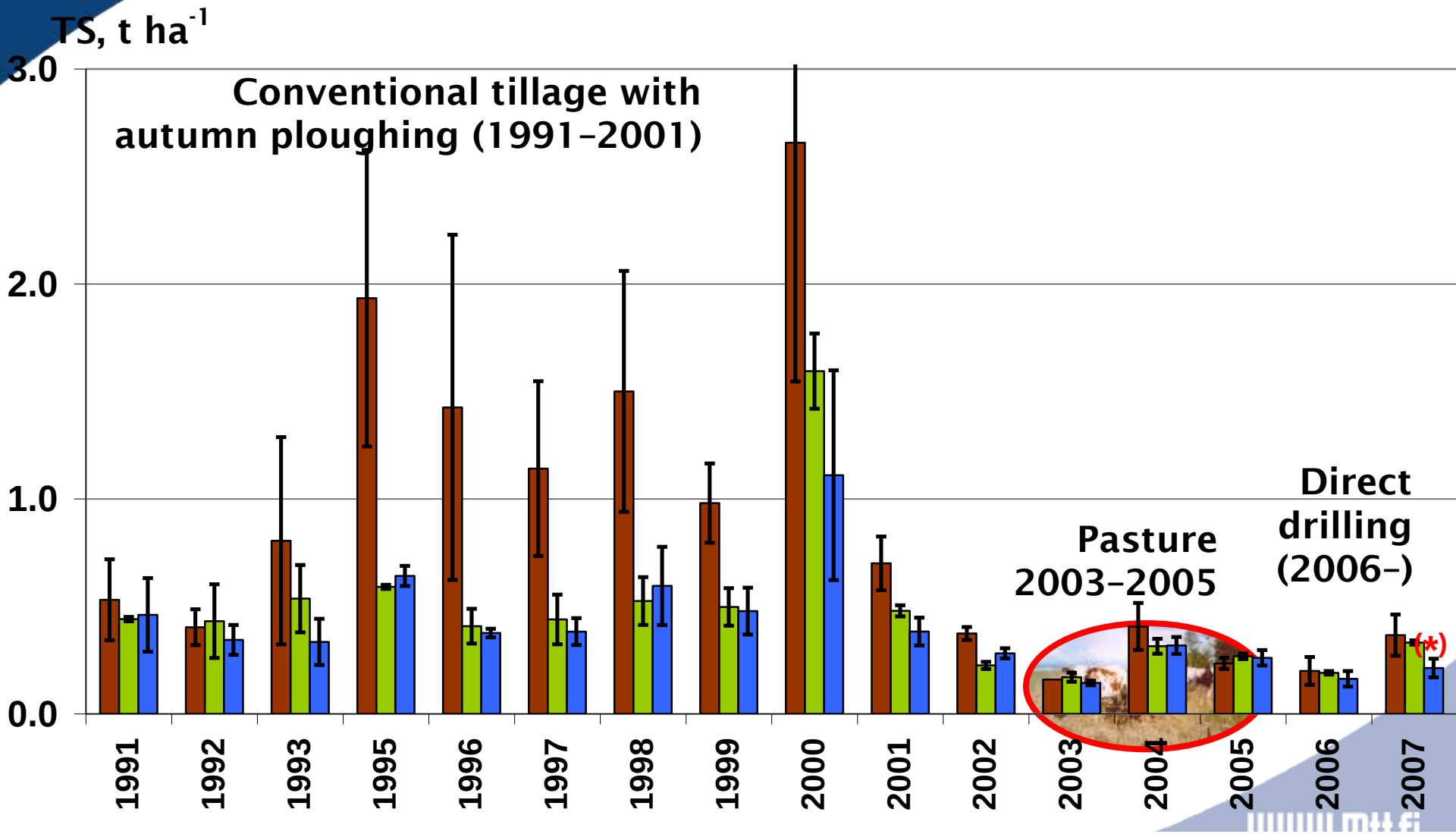
3. Results and discussion

Total solids in surface runoff



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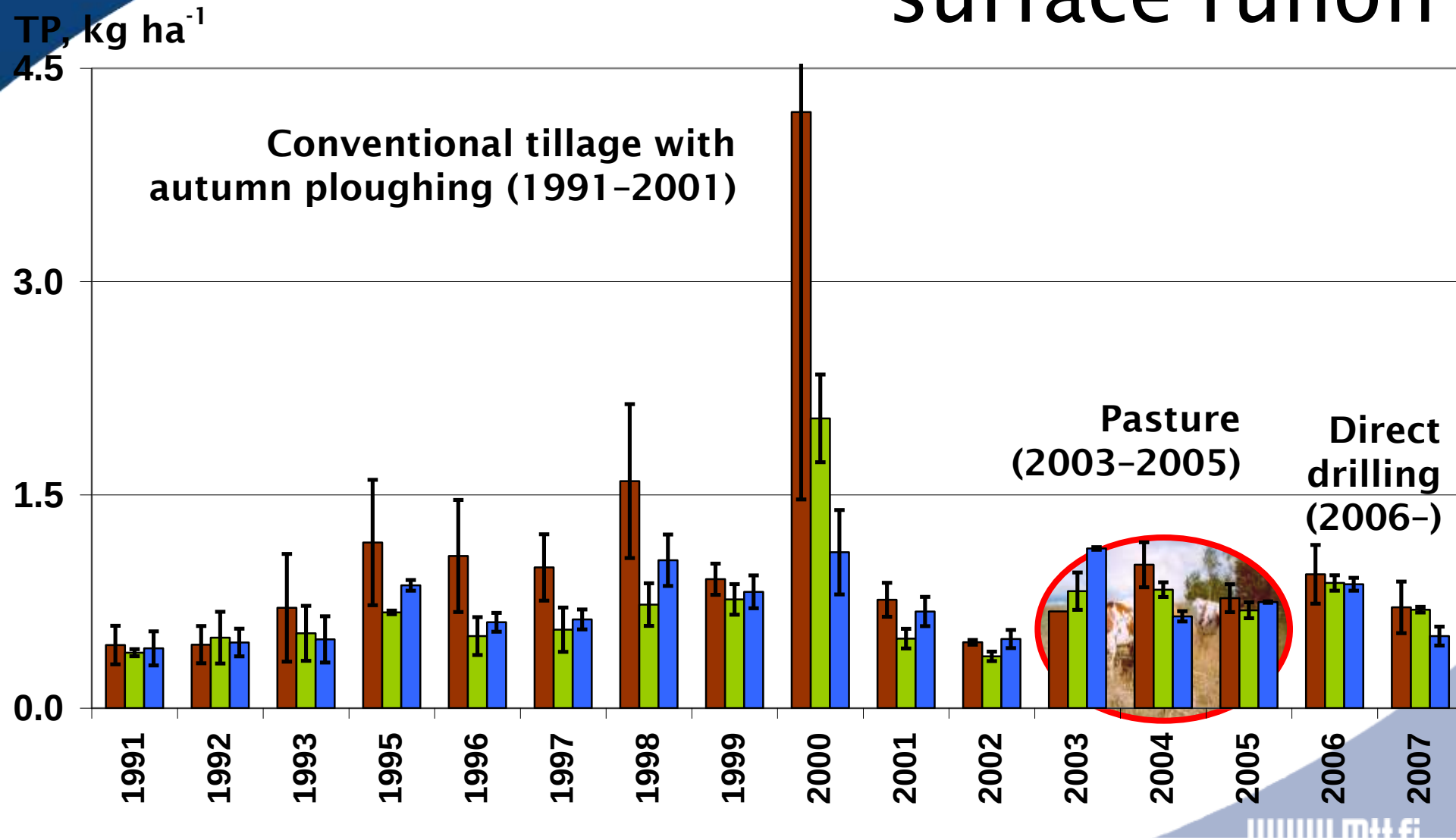
Total phosphorus in surface runoff



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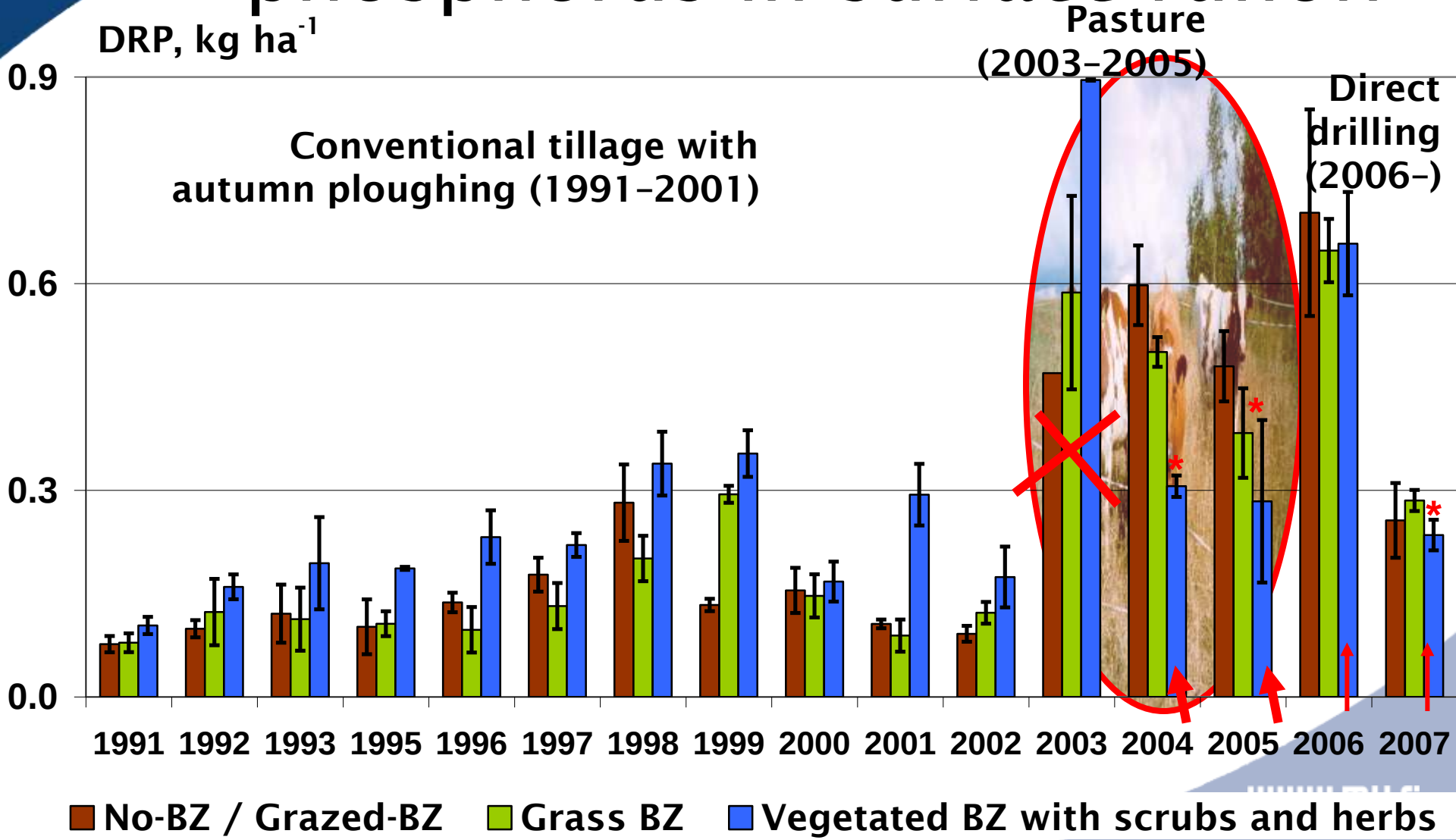
Dissolved reactive phosphorus in surface runoff



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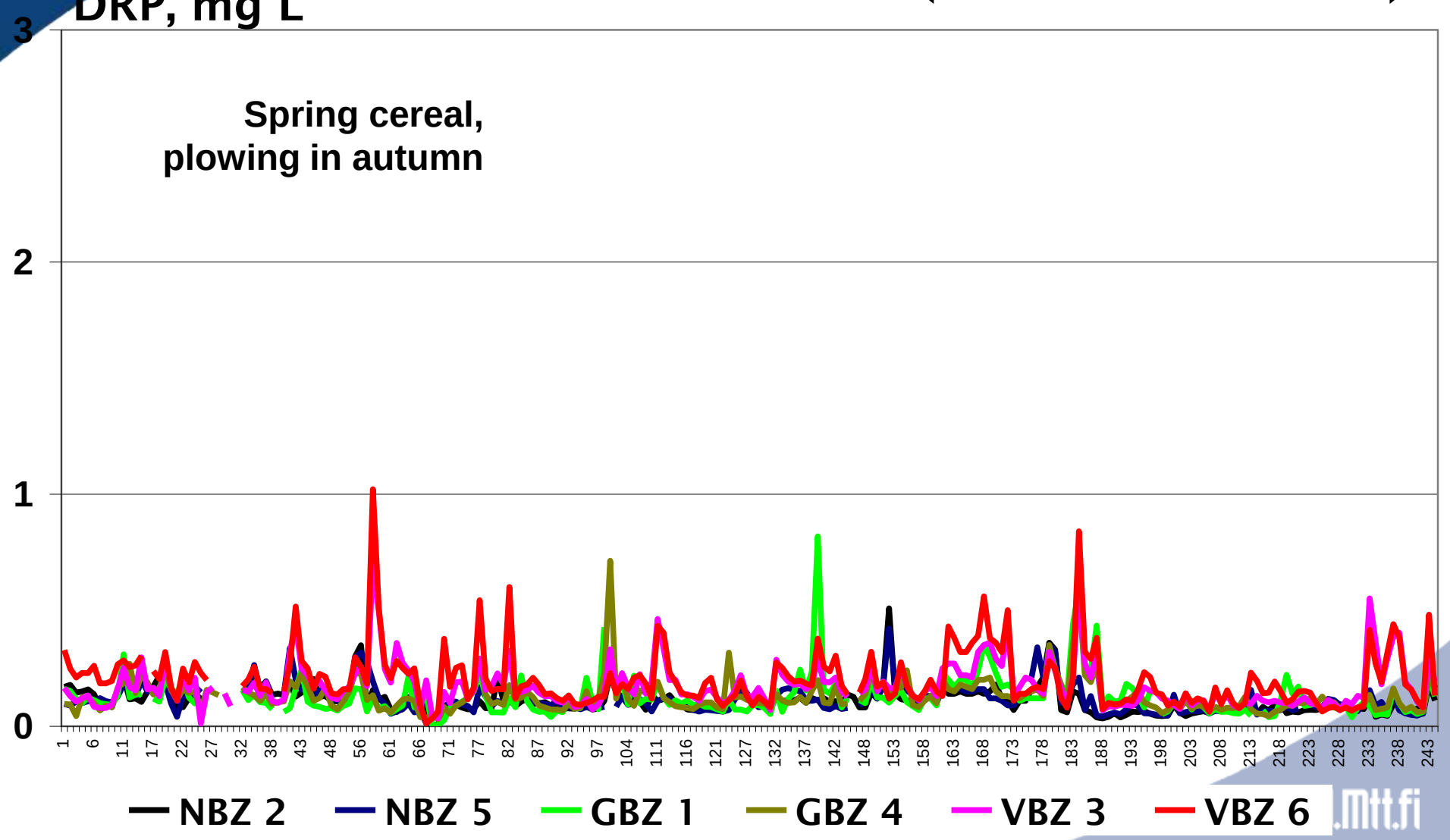
DRP concentrations in surface runoff (1991–2001)



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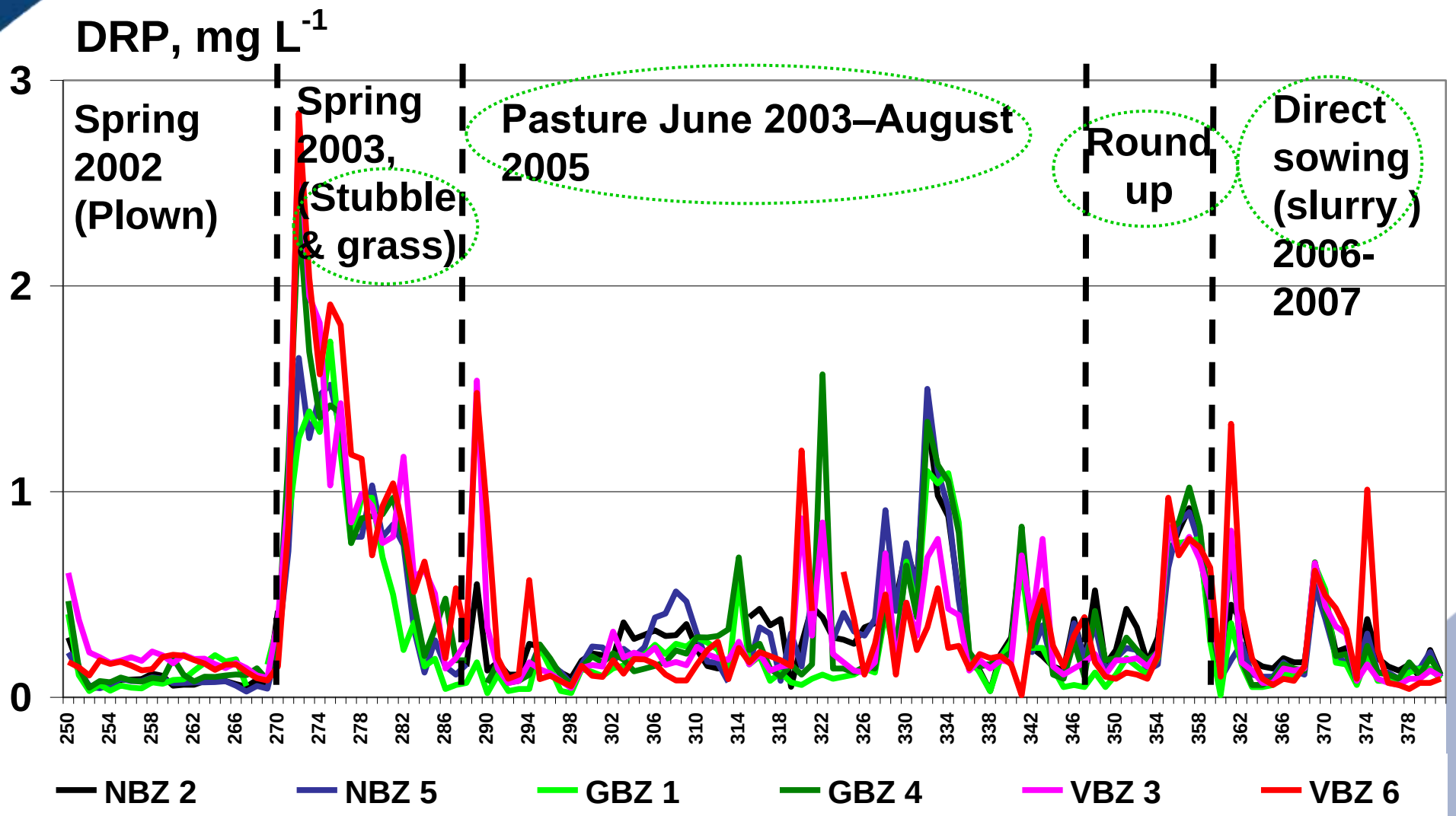
DRP concentrations in surface runoff (2002–2007)



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Mean annual loads

Treatment	Runoff	Erosion	Total P	Particle P	DRP
(n)‡	mm yr^{-1}	t ha^{-1} yr^{-1}	kg ha^{-1} yr^{-1}		
Conventional tillage with autumn ploughing, 1992–2002 *(precipitation 660 mm yr^{-1})*					
NBZ (245)	160 ± 20	1.3 ± 0.5	1.3 ± 0.5	1.2 ± 0.5	0.16 ± 0.02
GBZ (245)	130 ± 20	0.6 ± 0.09	0.8 ± 0.1	0.6 ± 0.1	0.16 ± 0.03
VBZ (245)	140 ± 20	0.5 ± 0.1	0.8 ± 0.08	0.5 ± 0.07	0.26 ± 0.02
Pasture, 13 May 2003–8 May 2006 *(precipitation 653 mm yr^{-1})*					
NBZ (71)	130 ± 20	0.26 ± 0.06	0.9 ± 0.1	0.3 ± 0.07	0.59 ± 0.08
GBZ (72)	120‡ ± 20	0.24 ± 0.03	0.8 ± 0.03	0.3 ± 0.03	0.51 ± 0.01
VBZ (72)	110* ± 4	0.23 ± 0.003	0.7(0.07) ± 0.05	0.3 ± 0.06	0.41(0.05) ± 0.01
Direct drilling, 9 May 2006–17 Apr. 2008 *(precipitation 674 mm yr^{-1})*					
NBZ (28)	100 ± 20	0.40 ± 0.08	0.7 ± 0.1	0.5 ± 0.09	0.20 ± 0.05
GBZ (28)	100‡ ± 10	0.34 ± 0.02	0.6 ± 0.02	0.4 ± 0.01	0.20 ± 0.01
VBZ (28)	70*** ± 20	0.30(0.05) ± 0.06	0.5 ± 0.09	0.4 ± 0.06	0.16(0.07) ± 0.03

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Buffer zones in different seasons

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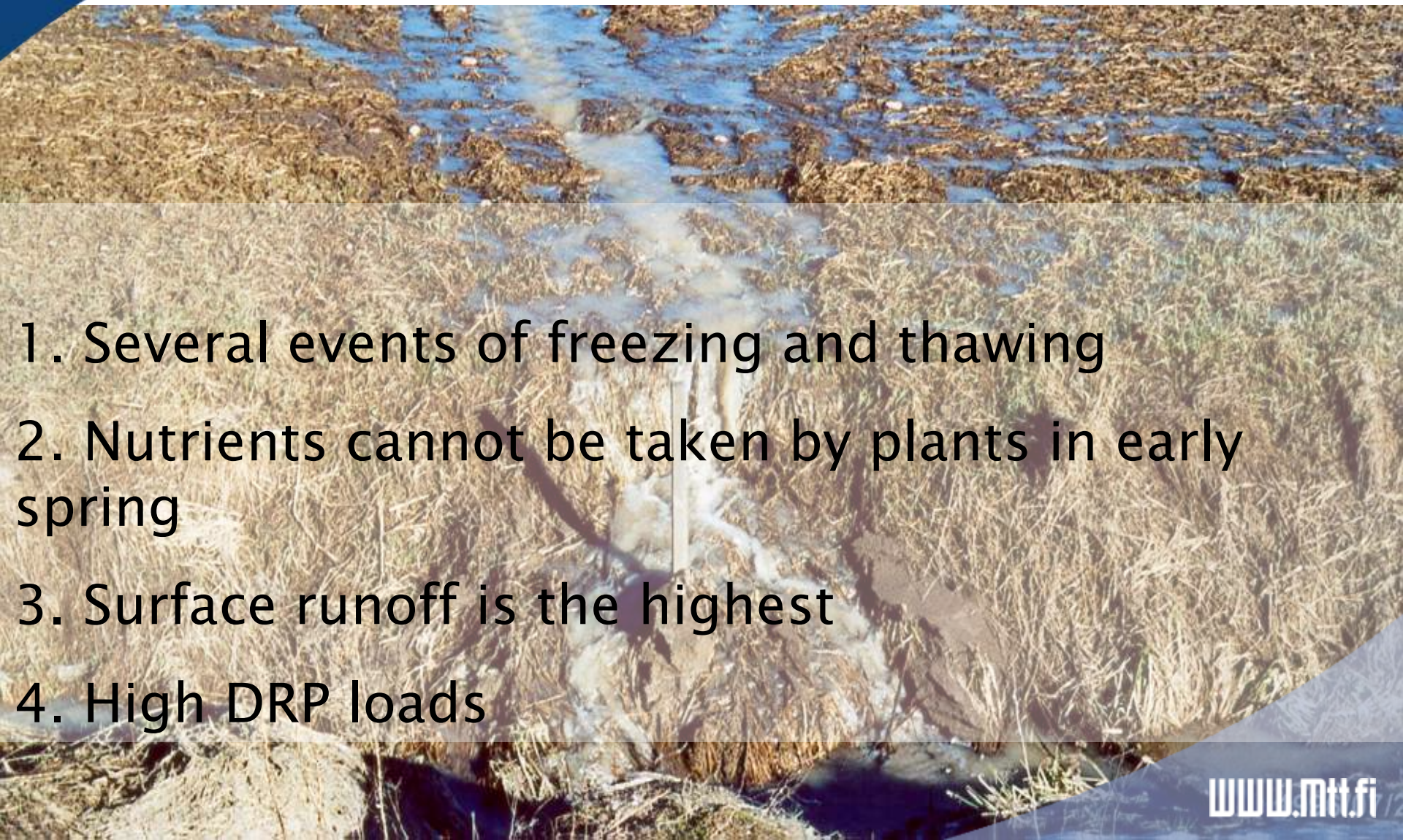
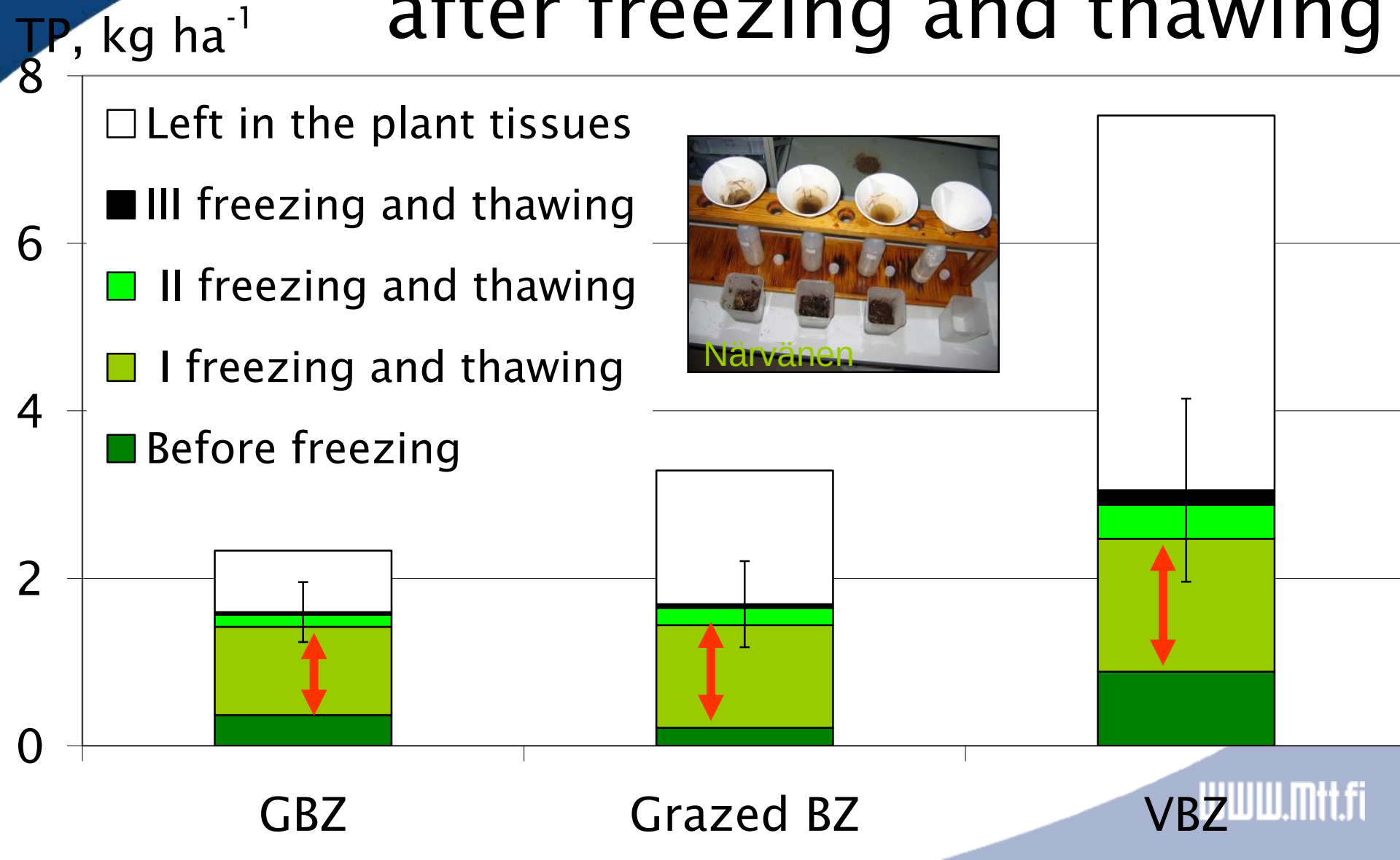
Surface runoff in spring

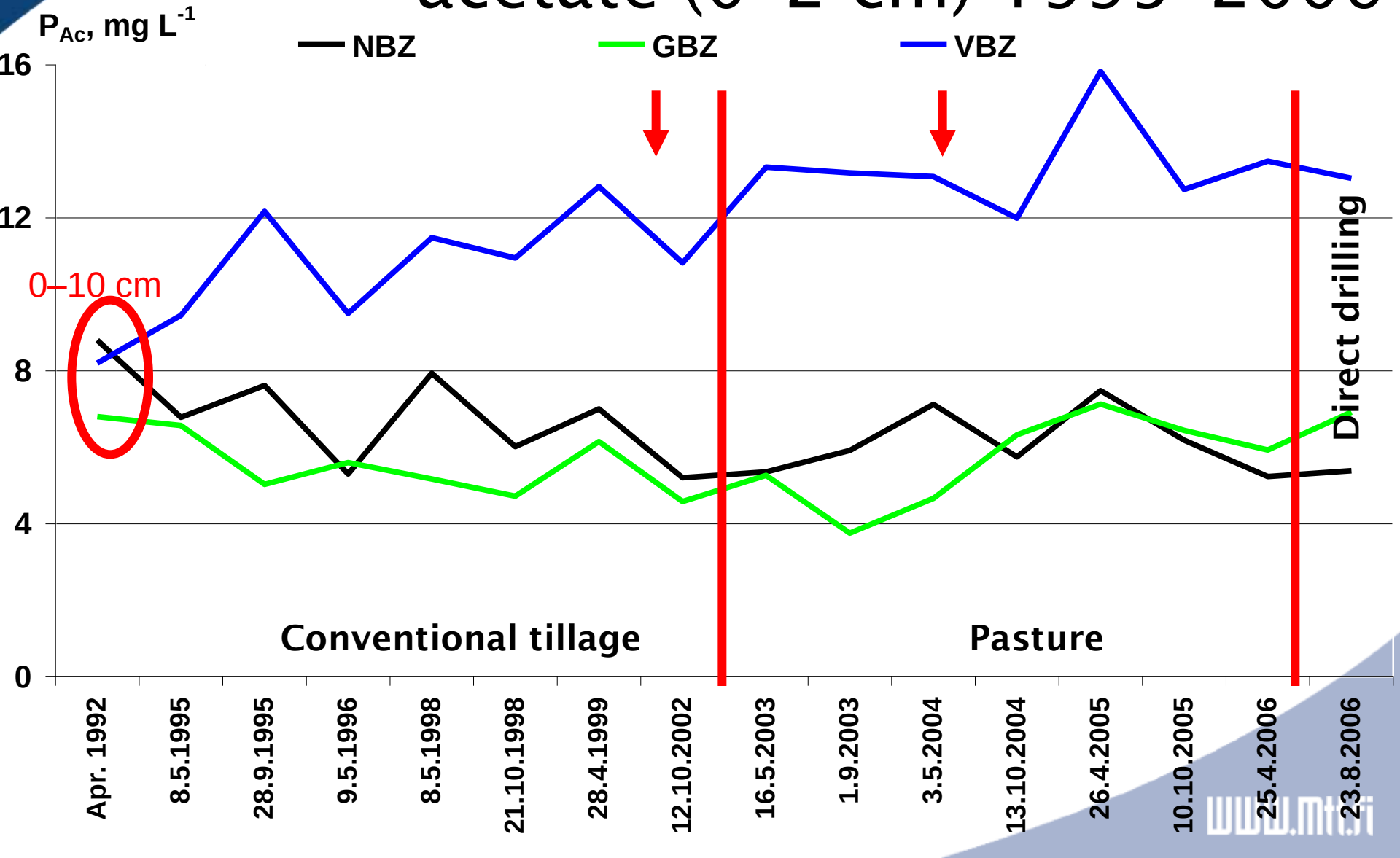


1. Several events of freezing and thawing
2. Nutrients cannot be taken by plants in early spring
3. Surface runoff is the highest
4. High DRP loads

Potential TP loss from plants after freezing and thawing



Soil P extracted by ammonium acetate (0–2 cm) 1995–2006



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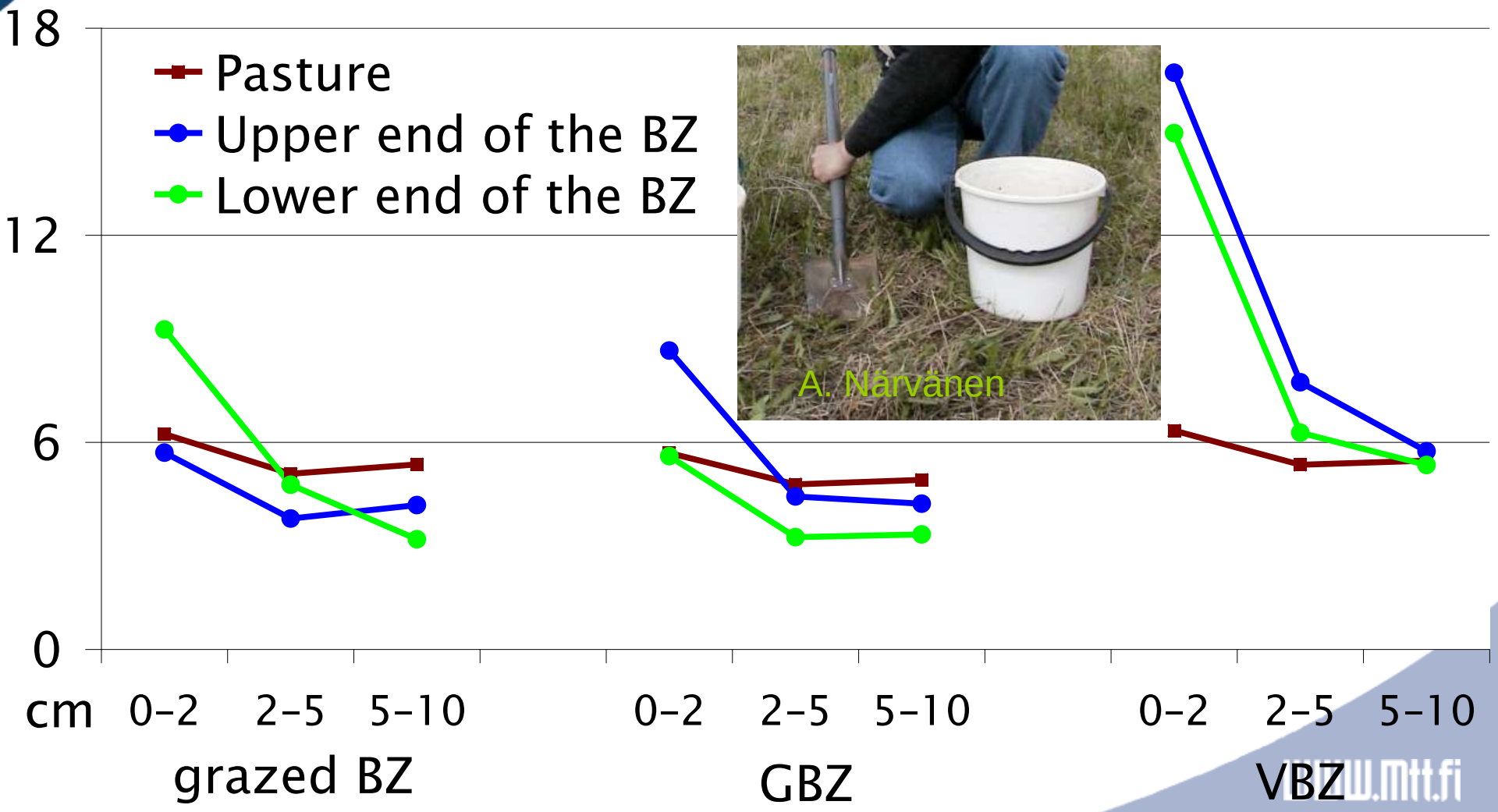
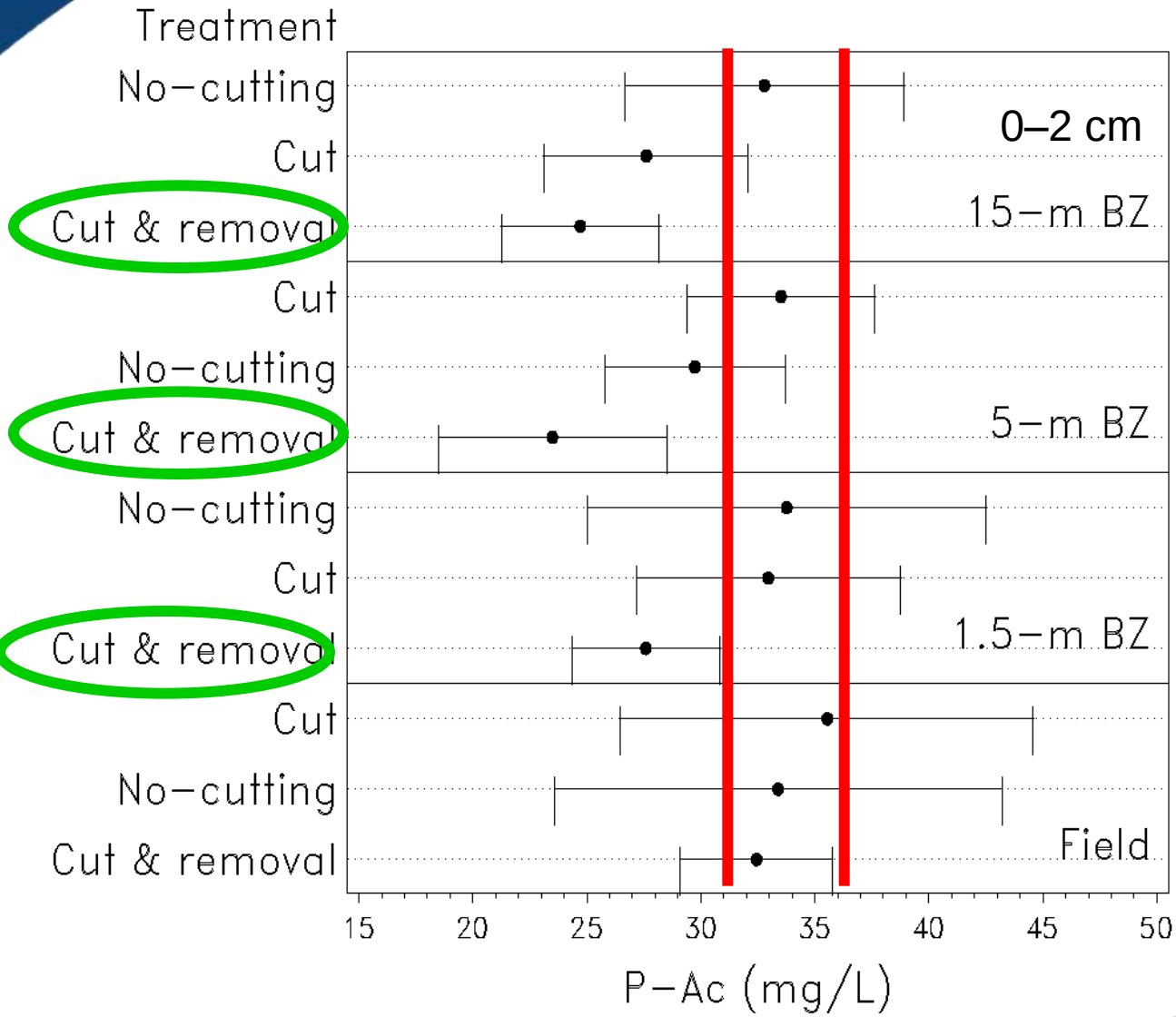
Soil P extracted by ammonium acetate (pH 4.6)

PAc, mg L^{-1}



Soil P in surface soil of BZs managed in different ways



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4. Conclusions (1/2)

- Buffer zones were effective in decreasing losses of eroded soil particles, total P and particulate P in surface runoff from fields ploughed in autumn

-The retention of DRP was low, the DRP loads to surface runoff might increase on BZs in winter and early spring

---> The grass should be cut and the swathe removed on the BZs

--> Innovations, with them DRP can be retained on BZs especially in winter and spring→ StoP

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4. Conclusions (2/2)

- On pasture and in direct drilling, the mean annual DRP load was slightly smaller on the VBZ with native scrubs and herbs compared with NBZ ($p=0.05$, $p=0.07$, respectively)

- There was a significant treatment x season interaction on surface runoff, TP, and DRP and almost significant on total solids (erosion), and PP.

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Thank you!