A rainfall simulation study on P removal in buffer zones amended with Fe and Ca compounds

Riparian buffer strips as a multifunctional management tool in agricultural landscapes - COST Action 869

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The Lintupaju buffer zone field

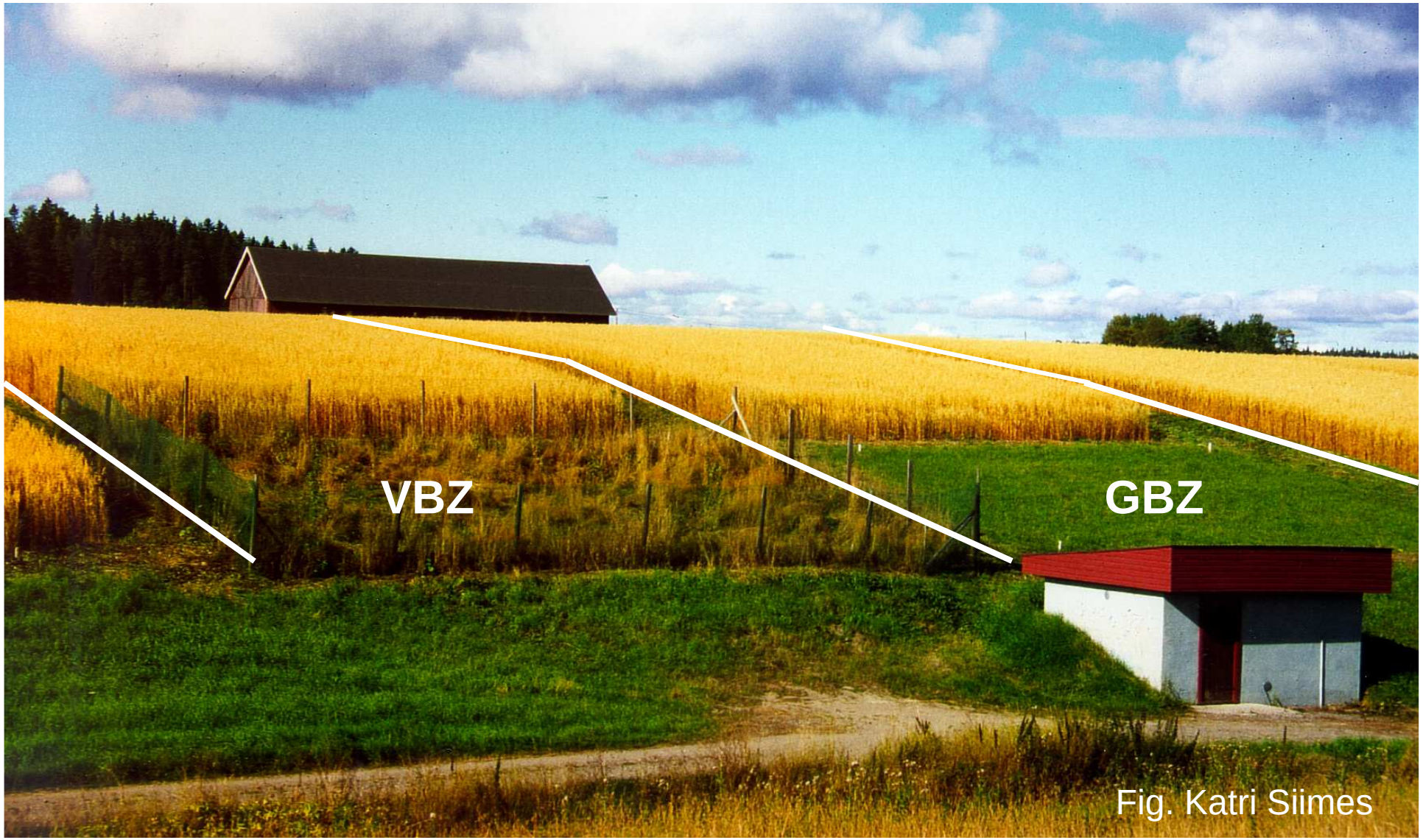


Fig. Katri Siimes

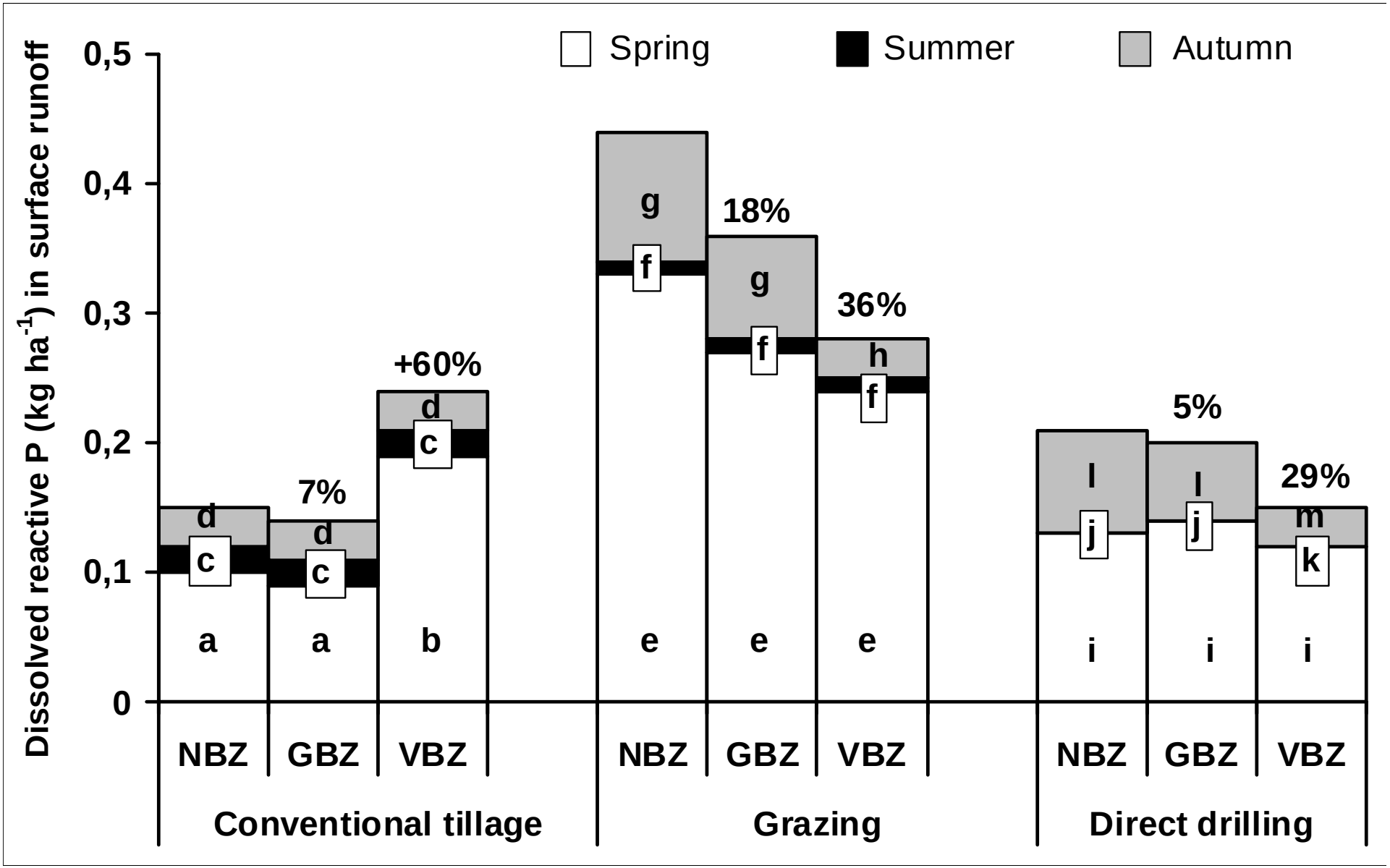
Buffer zones since 1991

Grass buffer zone (GBZ)

No buffer zone (NBZ)

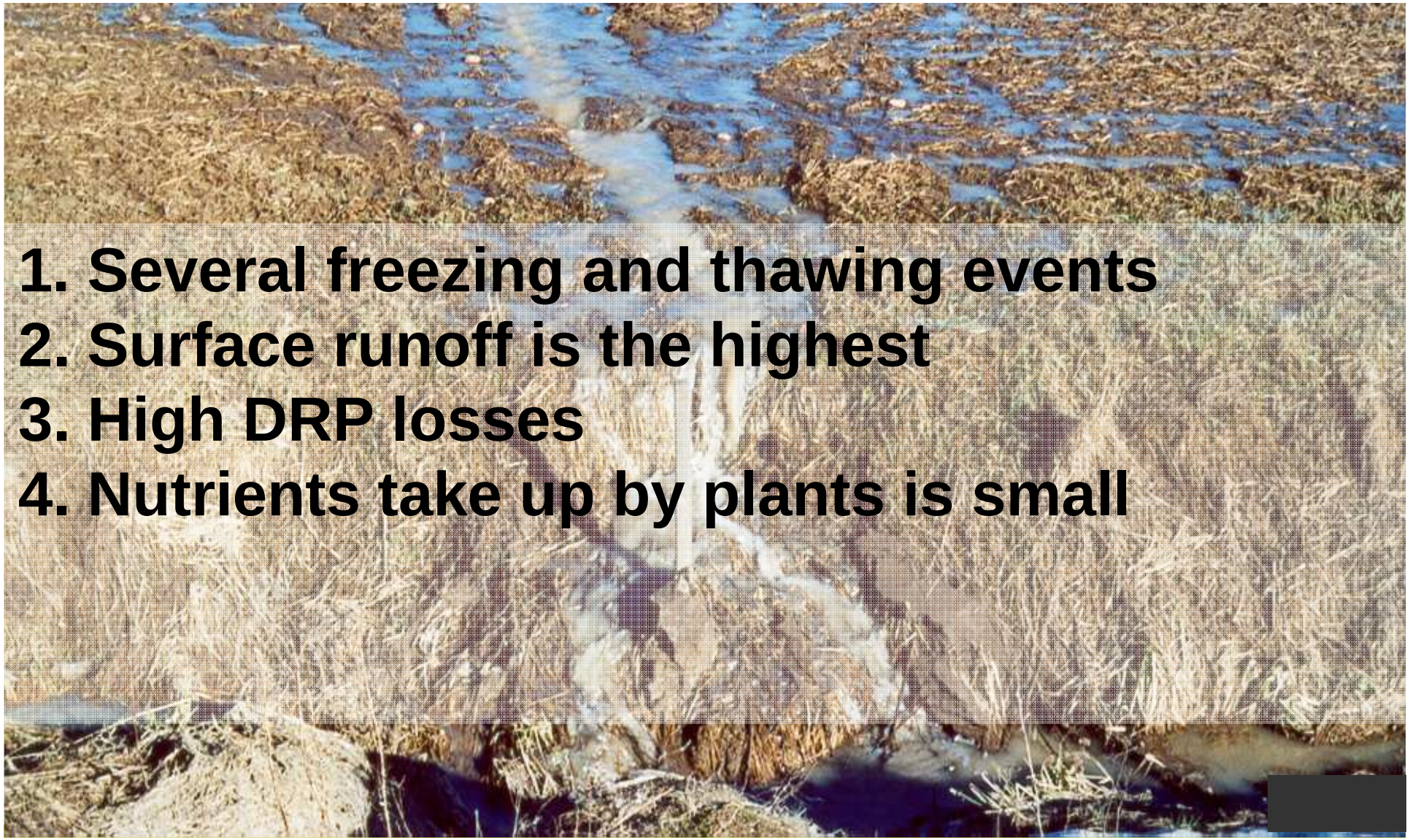
Vegetated buffer zone (VBZ)

DRP losses



Uusi-Kämppä & Jauhiainen, 2010 (Agriculture, Ecosystems and Environment)

Surface runoff in spring

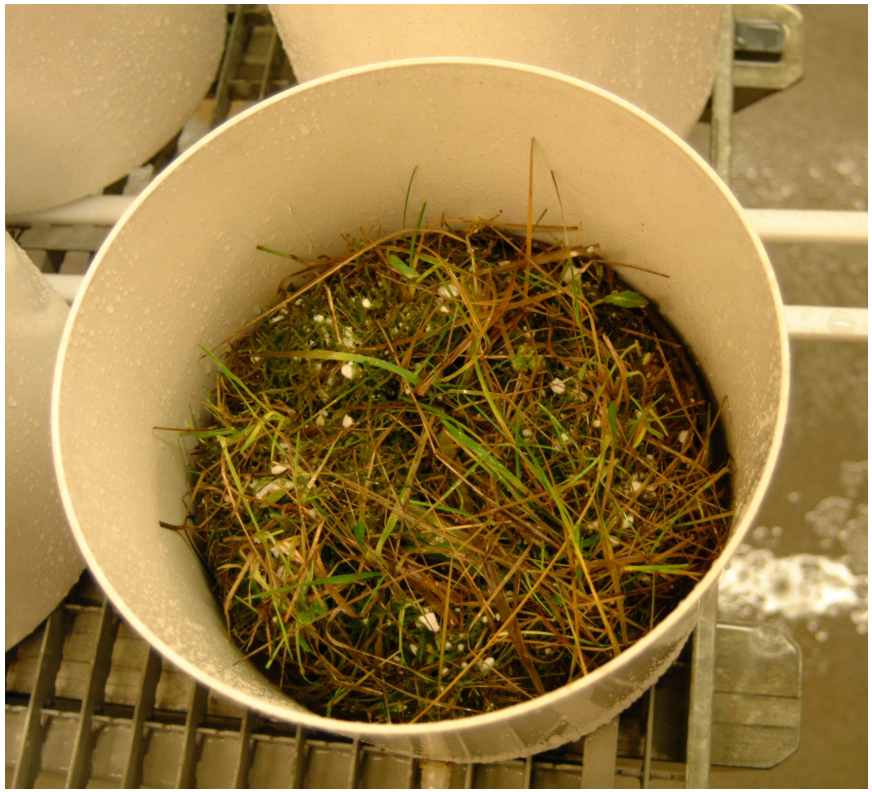


1. Several freezing and thawing events
2. Surface runoff is the highest
3. High DRP losses
4. Nutrients take up by plants is small

Sampling

Added amendment

Gypsum



Fe-gypsum

Rainfall simulation

Experiment sites and treatments

Two old grass buffer zones under simulated rainfall (5 mm h^{-1})

- Jokioinen (P_{AAAc}: 6.4 mg L^{-1})
- Pöytyä (P_{AAAc}: 47 mg L^{-1})

Treatments (four replicates)

1. Control
2. $CaCO_3$
3. Gypsum
4. Fe-gypsum
5. Ferix-3 [$Fe_2(SO_4)_3$]

Surface runoff (2 x 500 mL)

I Before freezing

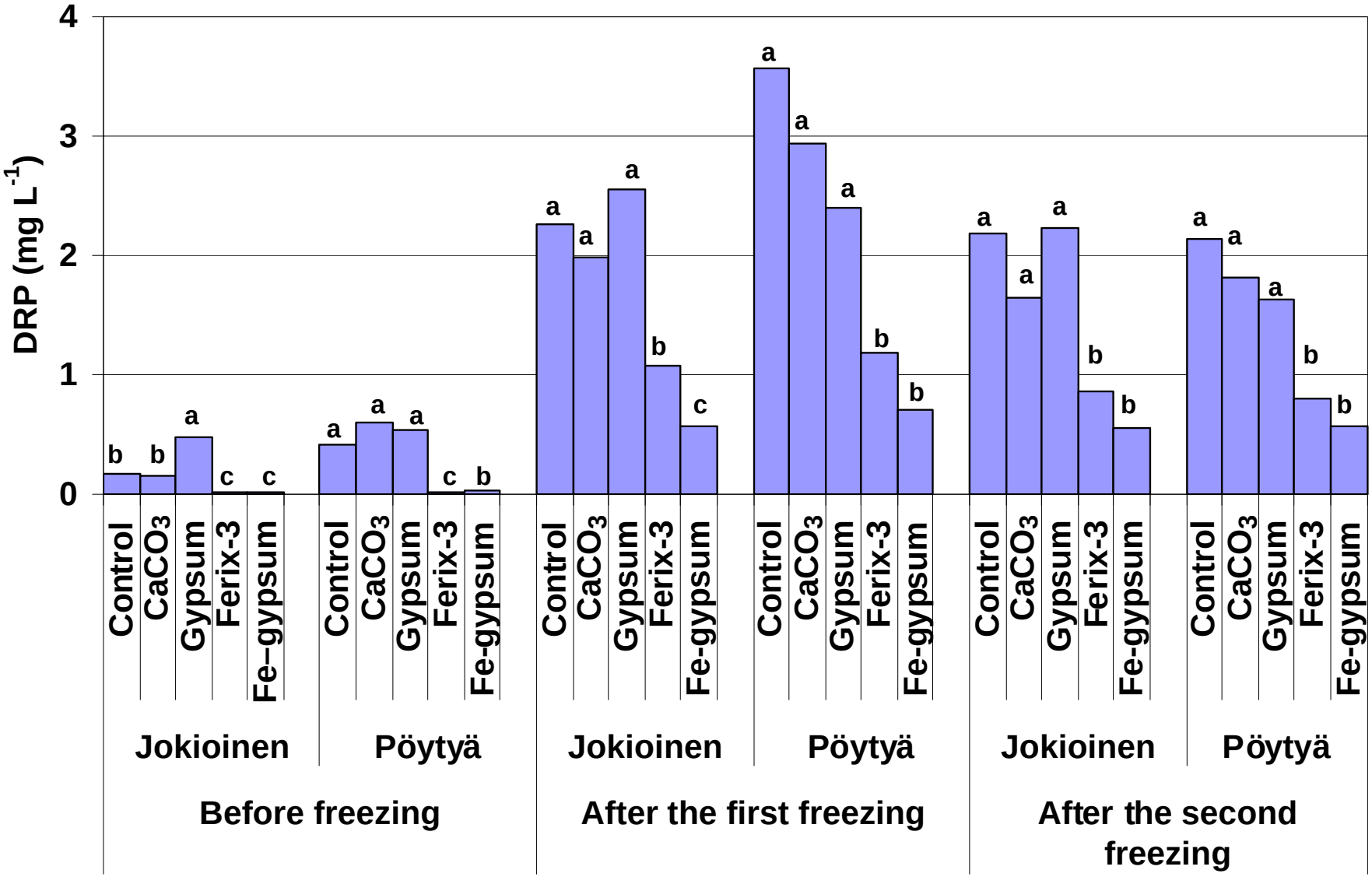
II After 1st freezing

III After 2nd freezing

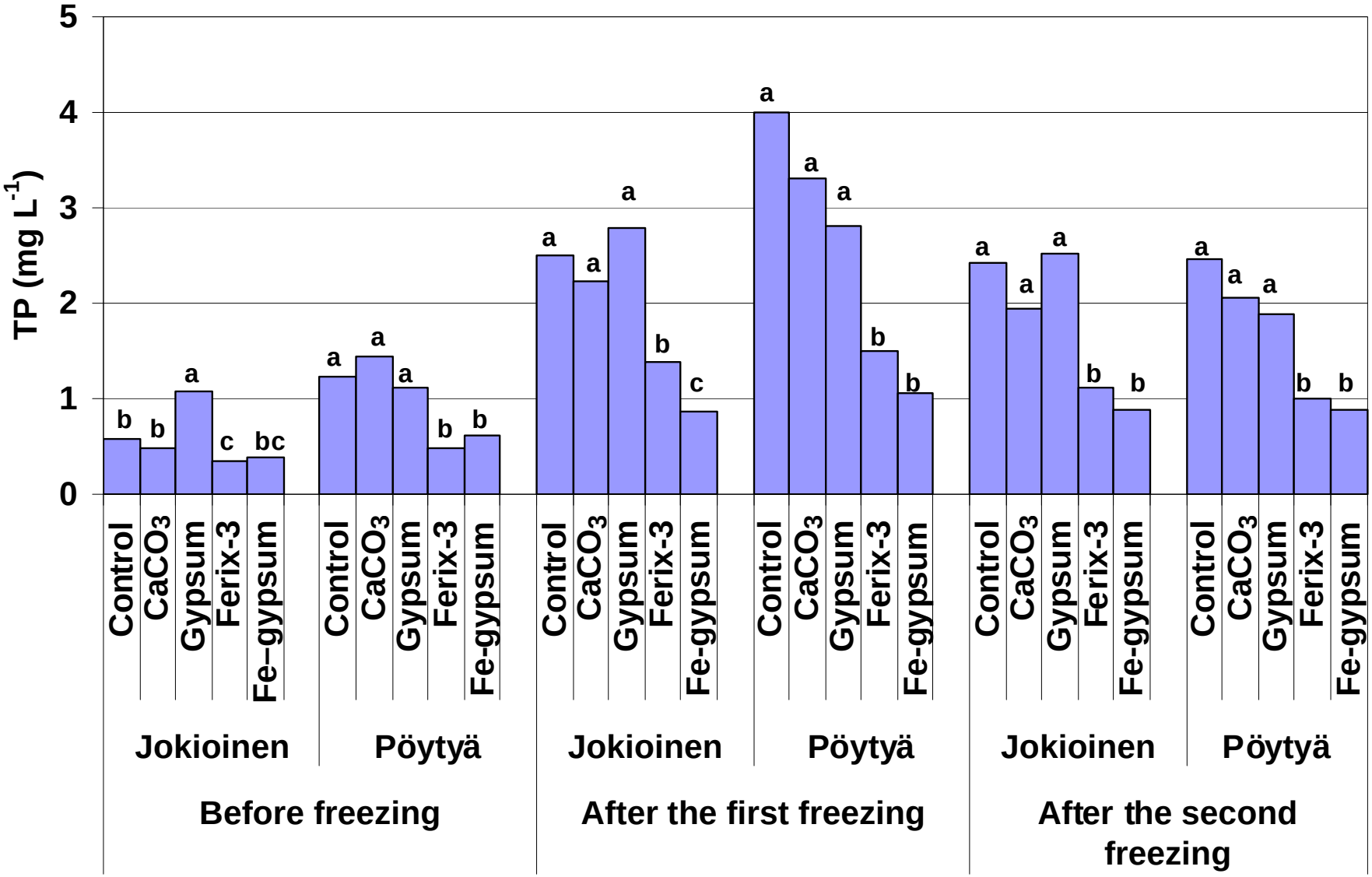
Added soil amendments

Added amendment	Amount t ha^{-1}	Ca kg ha^{-1}	Fe kg ha^{-1}
Gypsum	6	1300	5
Fe-gypsum	8.5	1240	1010
$CaCO_3$	3.3	1320	-
Ferix-3	0.67	-	130

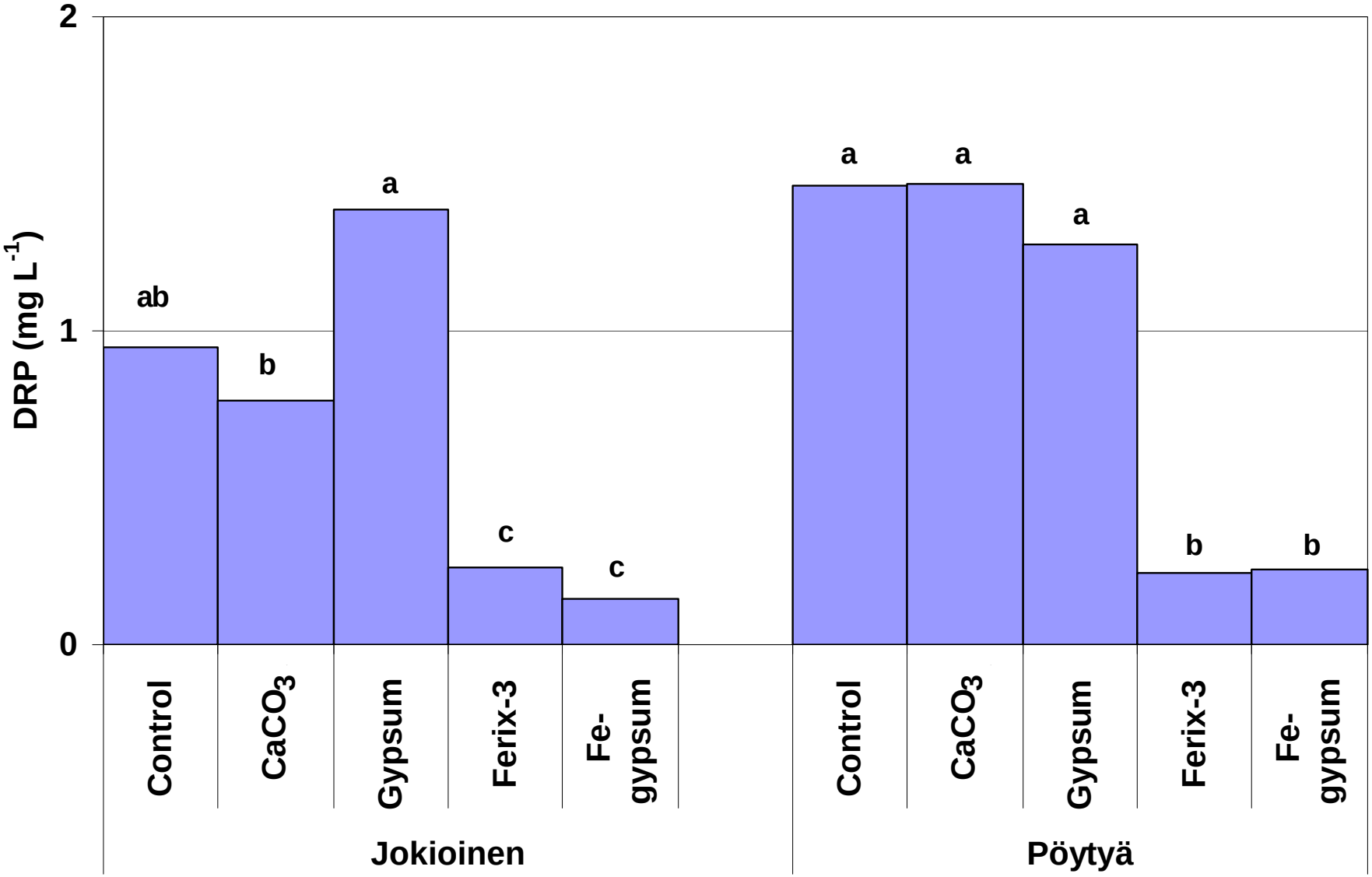
DRP concentration in surface runoff



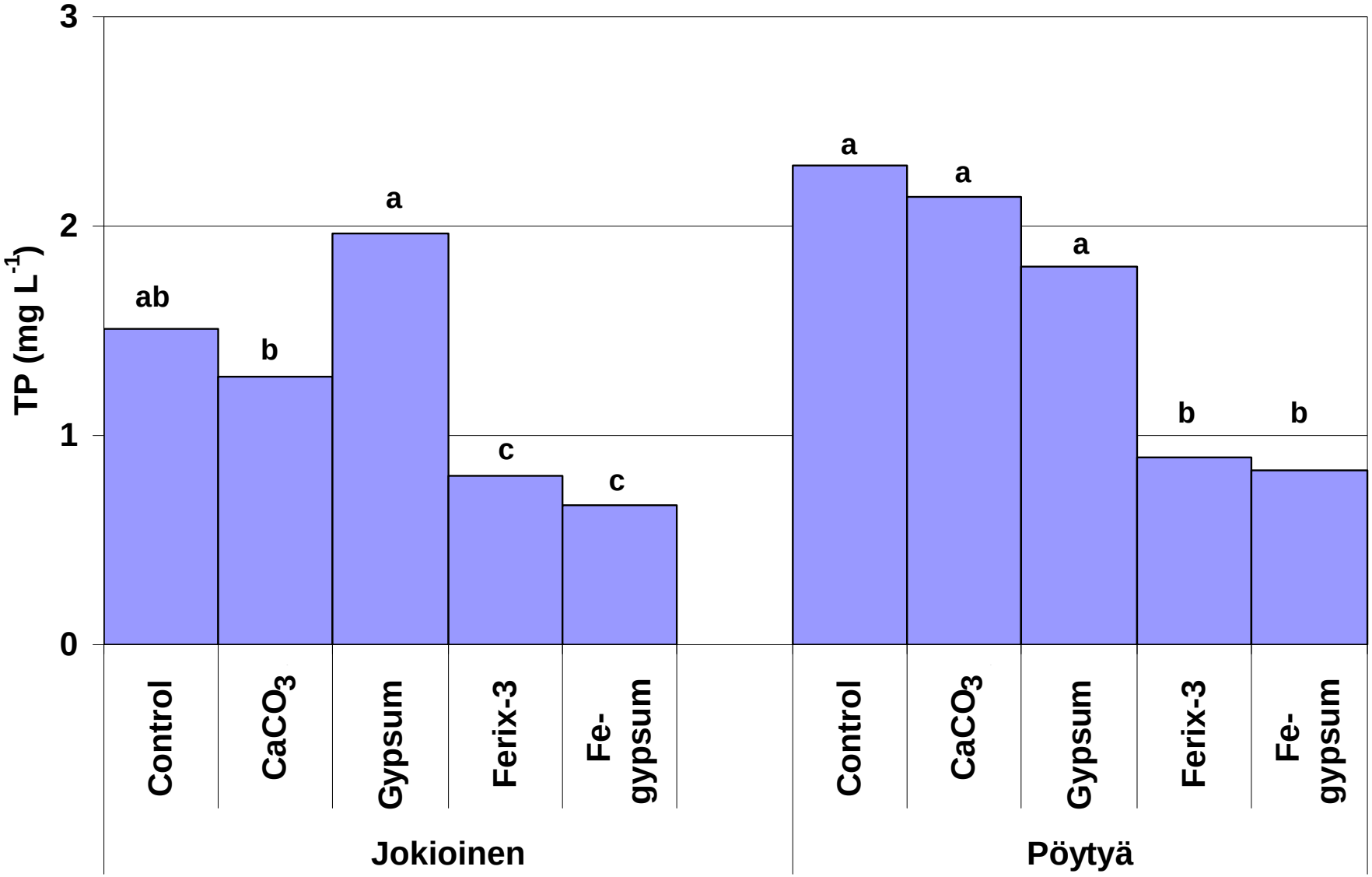
TP concentration in surface runoff



Mean DRP concentration in surface runoff



Mean TP concentration in surface runoff



Summary

- Freezing and thawing increased DRP concentration of control up to 13-fold
- The retention efficiency for DRP was increased in the order: gypsum<$CaCO_3$<<Ferix-3<Fe-gypsum
- Fe-amendments retained 74–85 % of DRP and 47–64 % of TP
- Gypsum and $CaCO_3$ were not effective

Thank you!