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SUB-IRRIGATION AND CONTROLLED DRAINAGE INCREASE YIELDS AND MITIGATE ACID LOADING IN FINNISH CULTIVATED ACID SULFATE SOILS

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L'IRRIGATION SOUTERRAINE ET LE DRAINAGE CONTRÔLÉ AUGMENTENT LES RENDEMENTS ET ATTÉNUENT LA CHARGE ACIDE DANS LES SOLS SULFATÉS ACIDES FINLANDAIS


Photo: Rainer Rosendahl

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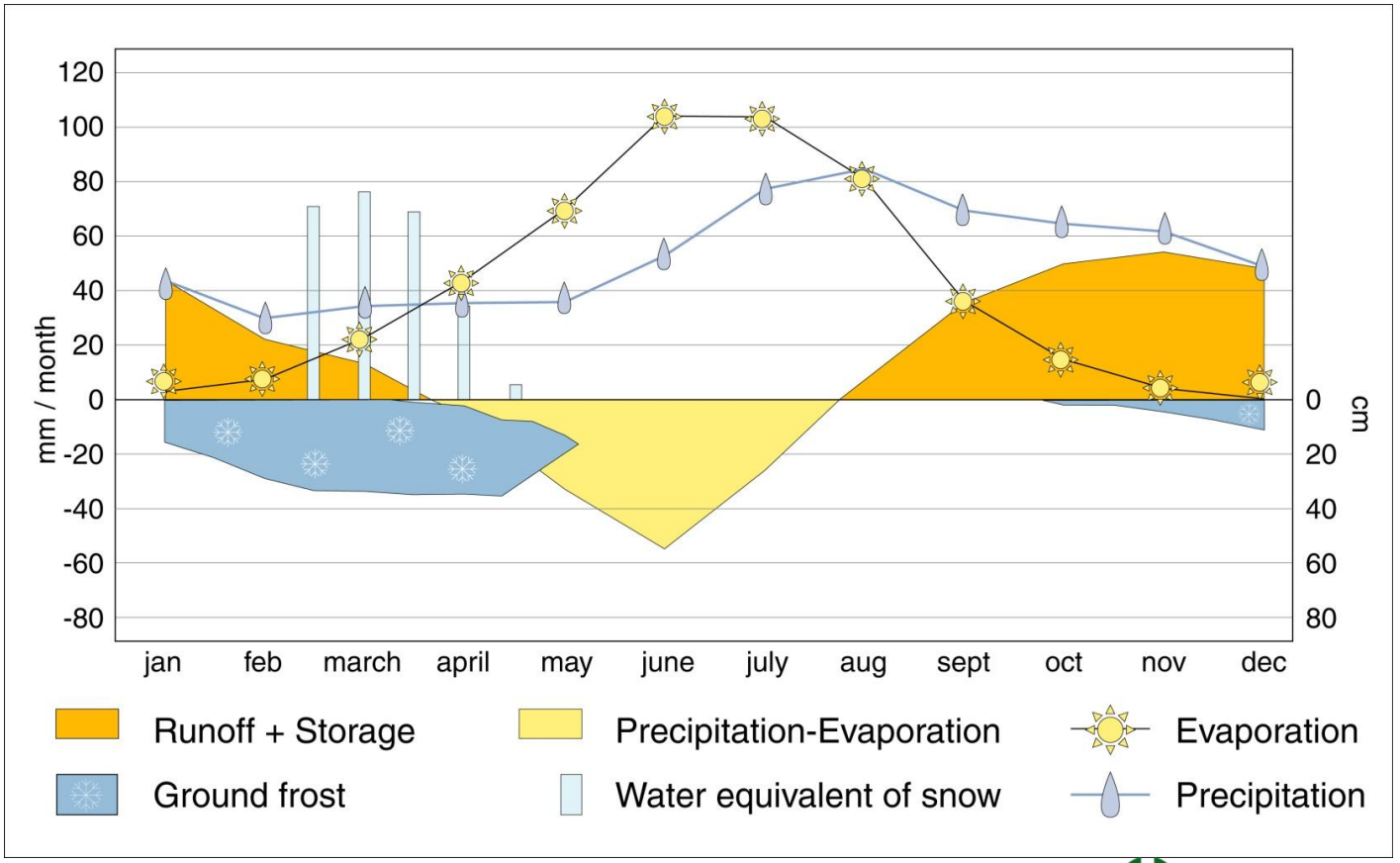
Presentation outlines

1. Background information
2. Experimental setup
3. Results
4. Discussion
5. Conclusion

Hydrological conditions in Finland



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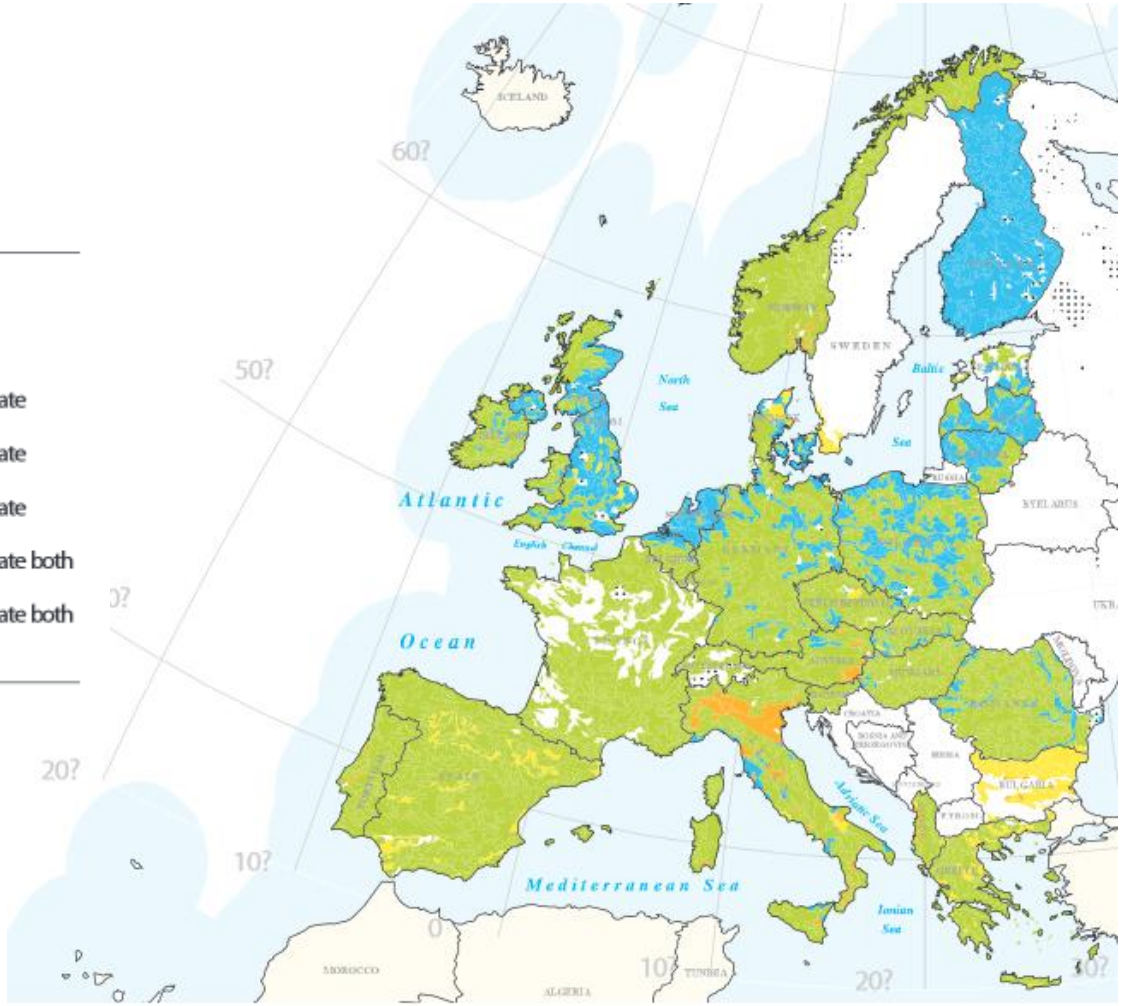
Prevalent water management systems in Europe

Code for normal presence and purpose of an existing water management system in agricultural land on more than 50 % of the Soil Typological Unit (STU)

% OF MAP:	(Attribute WM1):
83 %	No information
0 %	Not applicable (no agriculture)
13 %	No water management system
4 %	A water management system exists to alleviate waterlogging (drainage)
1 %	A water management system exists to alleviate drought stress (irrigation)
1 %	A water management system exists to alleviate salinity (drainage)
1 %	A water management system exists to alleviate both waterlogging and drought stress
1 %	A water management system exists to alleviate both waterlogging and salinity
	Non soils



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http://esdac.jrc.ec.europa.eu/resource-type/european-soil-database-maps

The most important limitation to agricultural land use in Europe

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Code of the most important limitation to agricultural use of the STU.

% OF MAP:	(Attribute AGLIM1):
2 %	No information
42 %	No limitation to agricultural use
13 %	Gravelly (over 35% gravel diameter < 7.5 cm)
8 %	Stony (presence of stones diameter > 7.5 cm, impracticable mechanisation)
11 %	Lithic (coherent and hard rock within 50 cm)
0 %	Concretionary (over 35% concretions diameter < 7.5 cm near the surface)
0 %	Petrocalcic (cemented or indurated calcic horizon within 100 cm)
0 %	Saline (electric conductivity > 4 mS.cm 1 within 100 cm)
1 %	Sodic (Na/T > 6% within 100 cm)
0 %	Glaciers and snow caps
0 %	Soils disturbed by man (i.e. landfills, paved surfaces, mine spoils)
0 %	Fragipans
2 %	Excessively drained
4 %	Almost always flooded
0 %	Eroded phase, erosion
17 %	Phreatic phase (shallow water table)
0 %	Duripan (silica and iron cemented subsoil horizon)
0 %	Petroferric horizon
1 %	Permafrost
	Non soils

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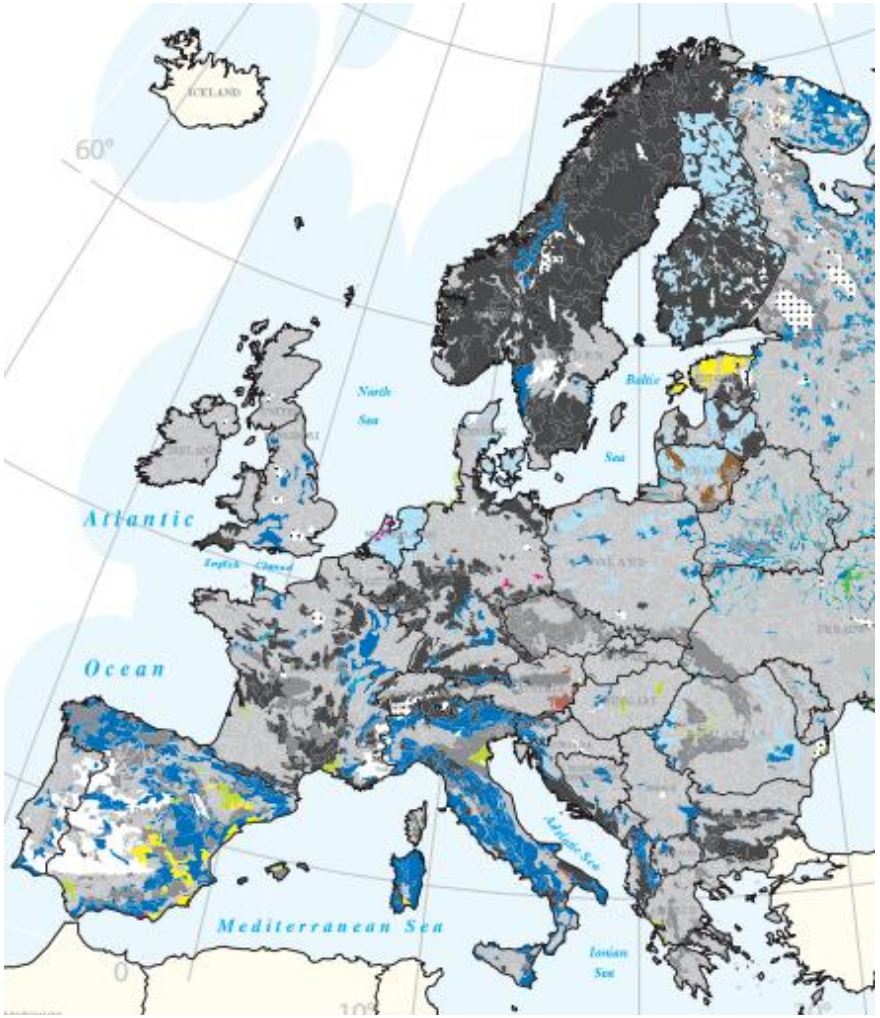
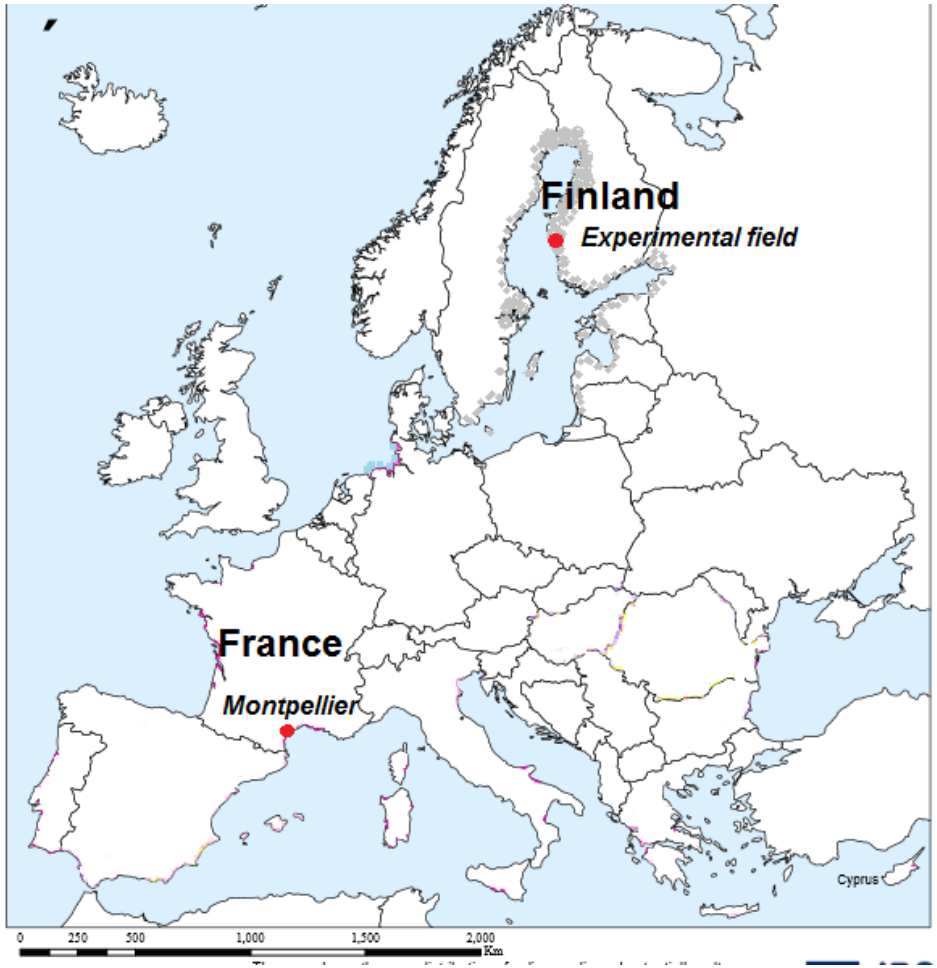


http://esdac.jrc.ec.europa.eu/resource-type/european-soil-database-maps

Acid sulphate soils in Finland

- The largest AS areas in Europe are located in Finland
- AS fields have high economic value due to their high yields
- Acid loads from fields are hazardous to aqueous ecosystems
- Large fish kills have occurred after dry summers (*e.g.* 2006)



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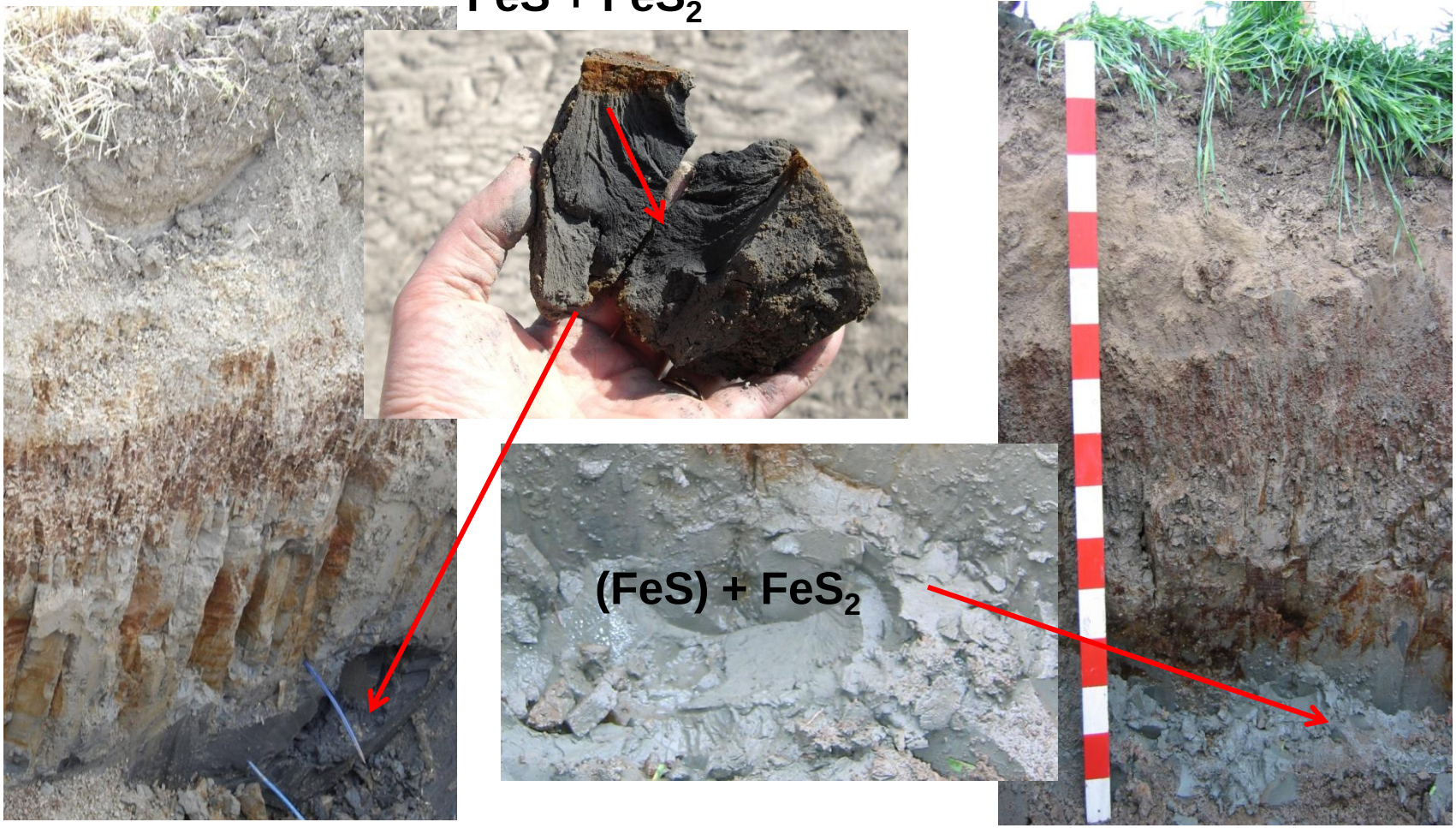
Acid sulphate soils in Finland



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Aim of study

Can off-site hazards of AS soils be mitigated by controlled drainage and subirrigation ?

-> Hypothesis: acid loads decrease

Do controlled drainage and subirrigation result in better yields ?

-> Hypothesis: yields increase

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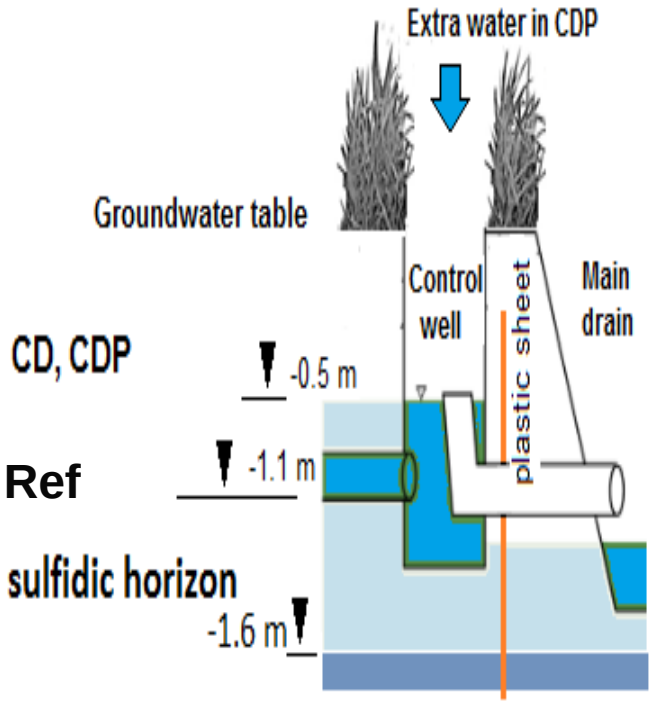
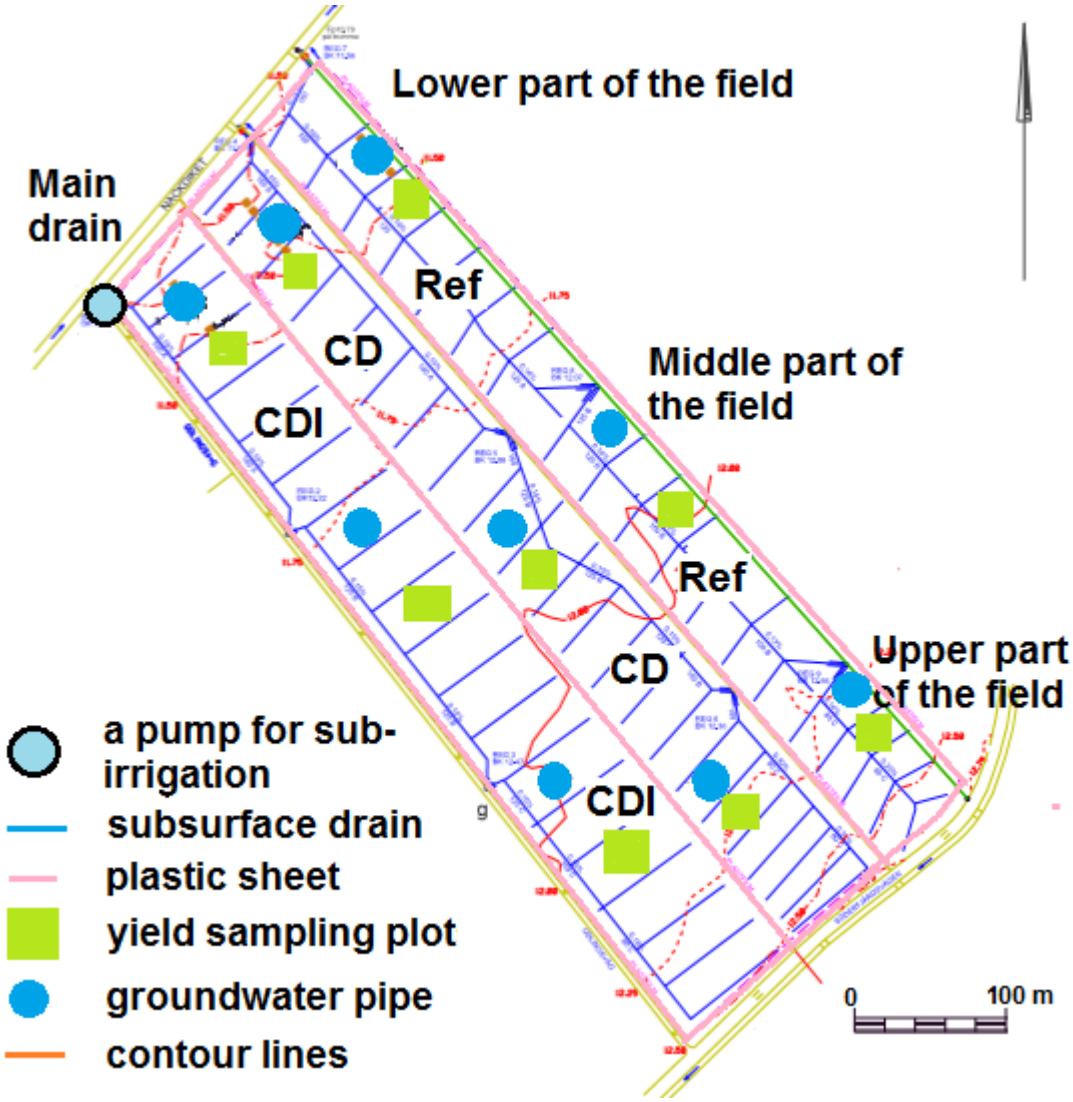
Experimental set up





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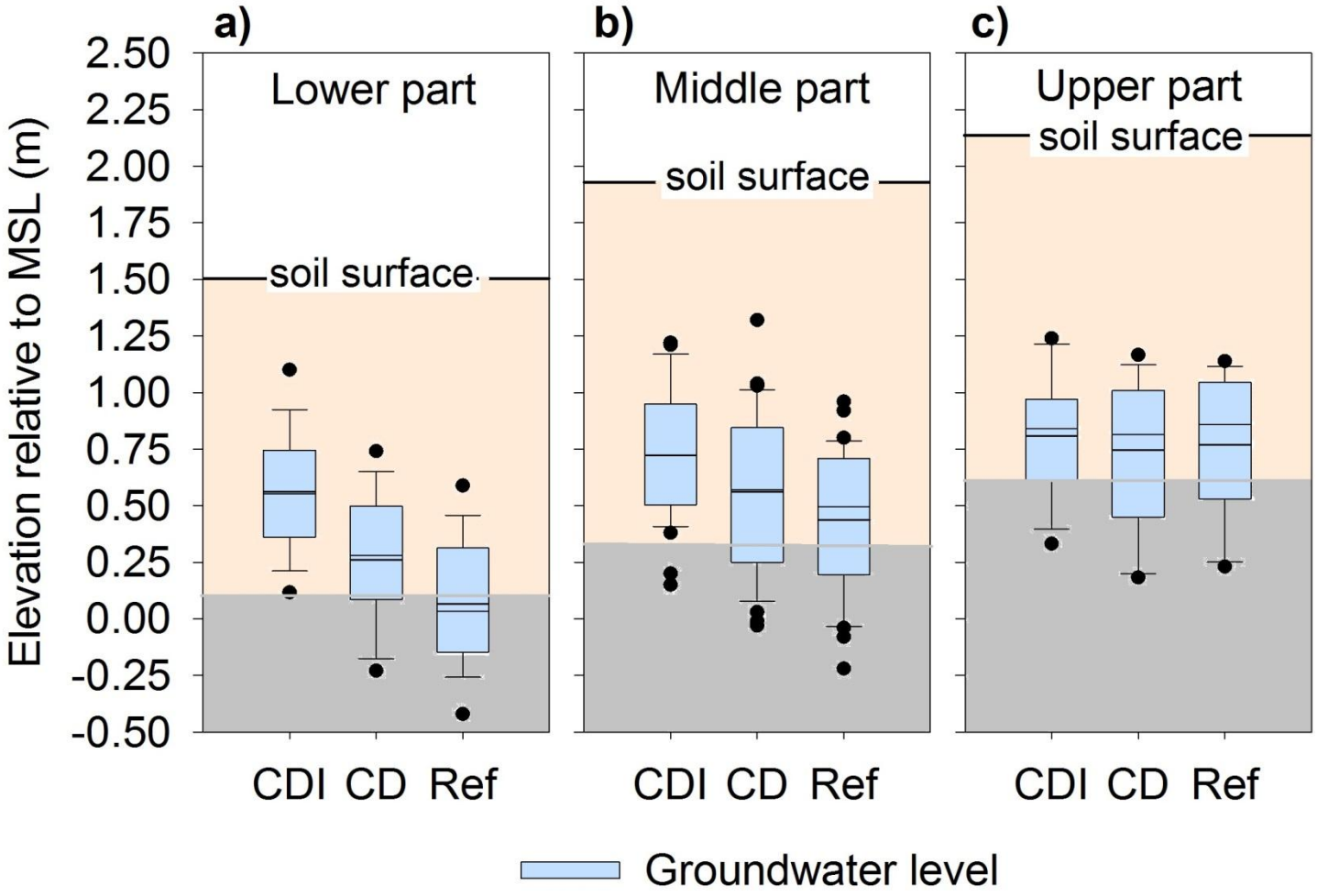
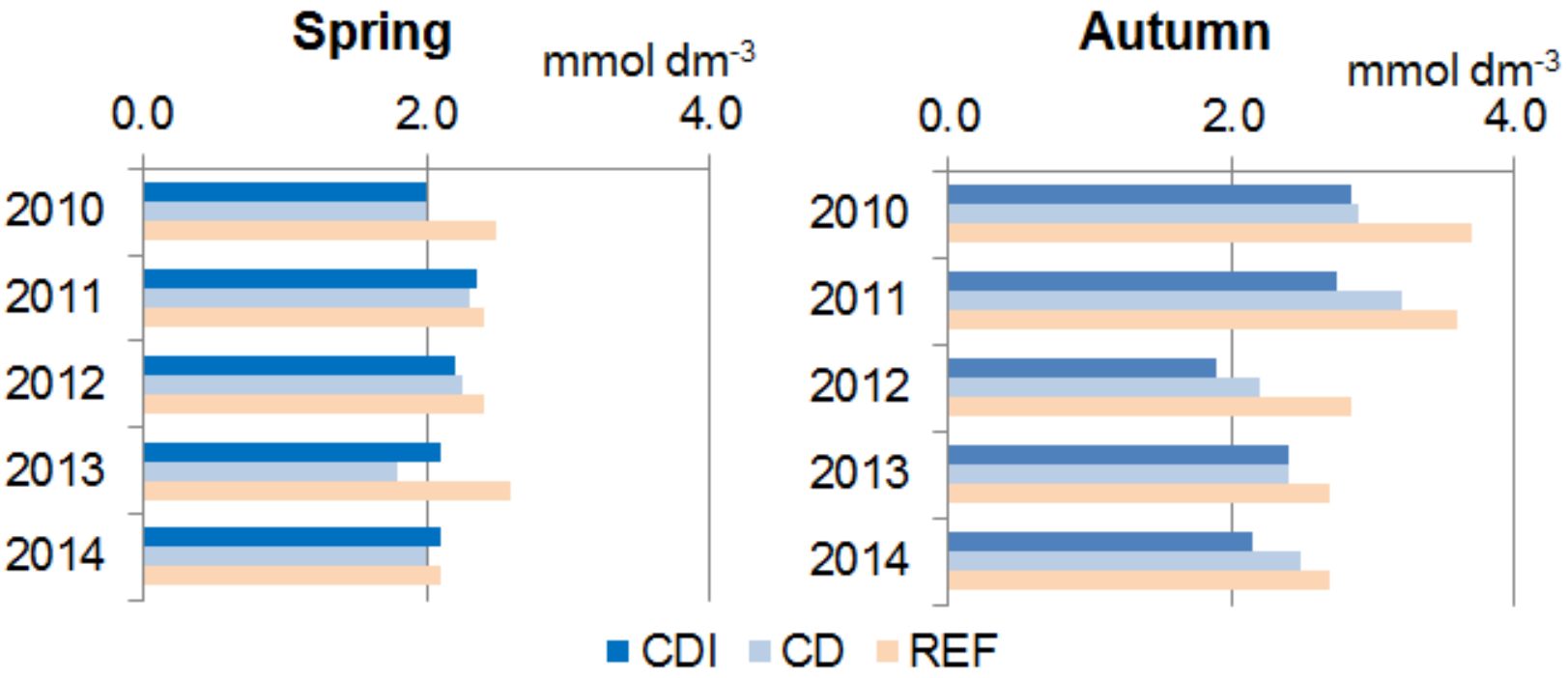
Results I
Groudwater table variation in the fields



Results II
Acidity of discharge water



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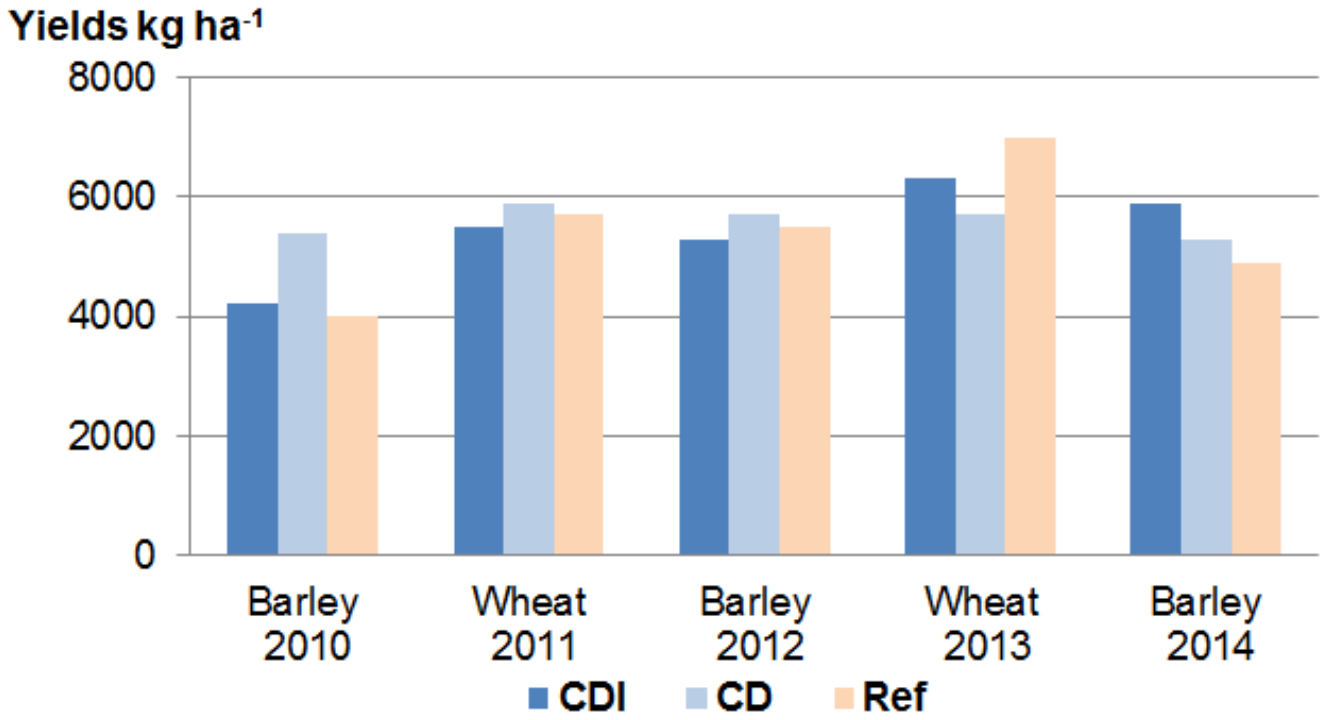
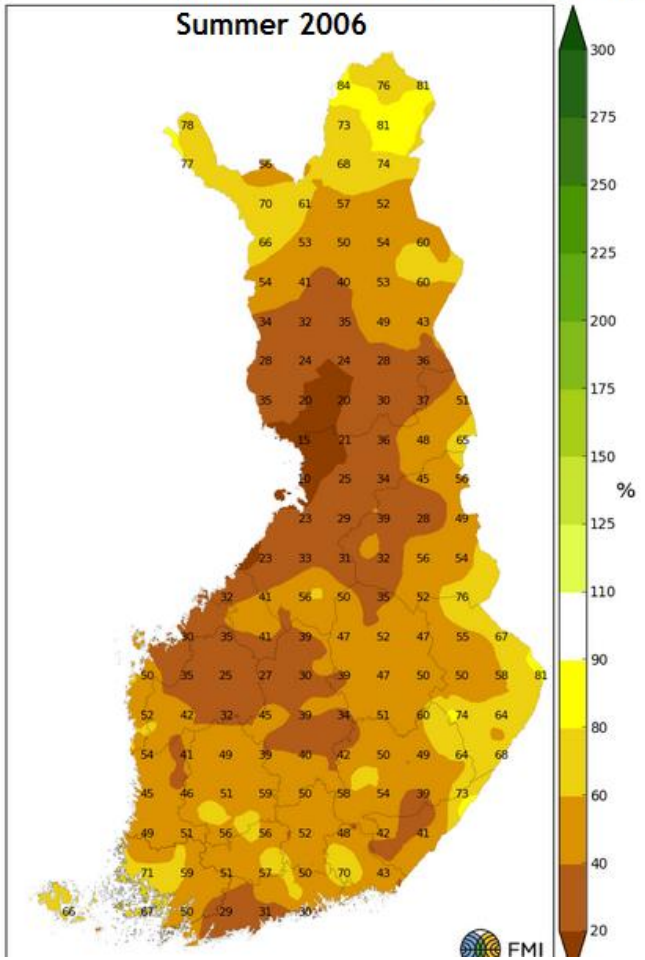
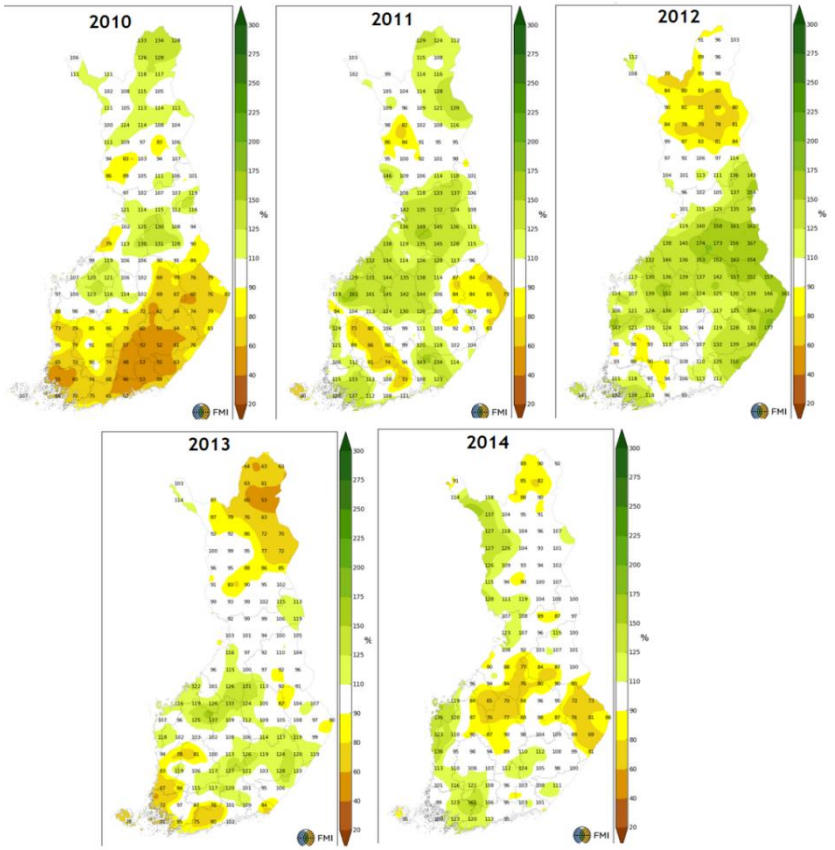
Results III
Yields



Discussion



Precipitation percentace in summers during The experimental period



Conclusions

- **The off-site hazards of AS soils can be slightly mitigated by controlled drainage and subirrigation**
  -> Effects in dry summer are unknown

- **Yields were higher only in one summer**
  -> Effects in dry summer are unknown

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Thank you for your attention!

Merci beaucoup pour votre attention !

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