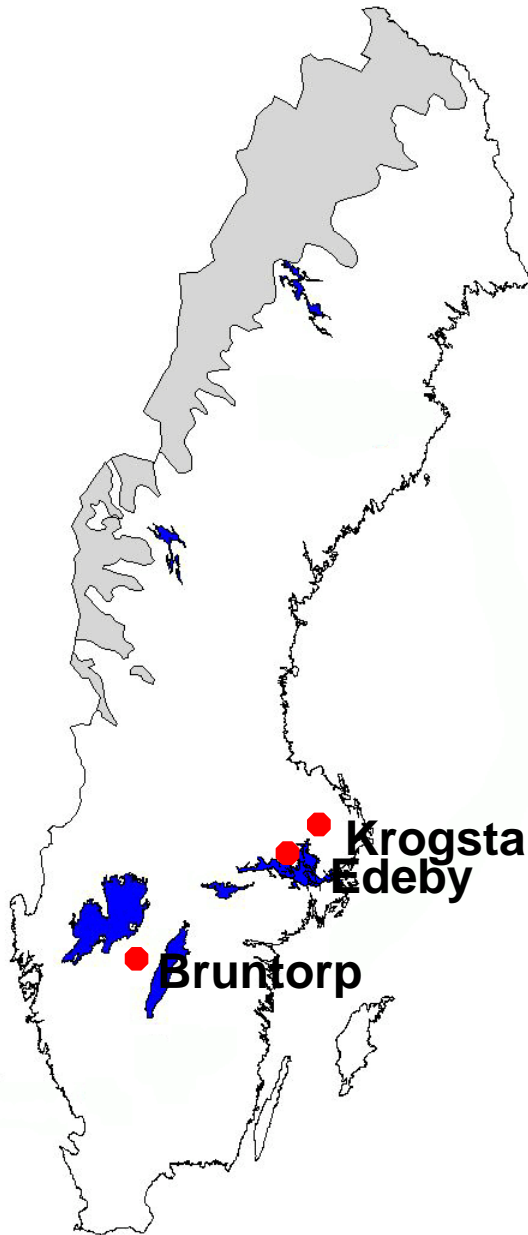


Long-term effects of tile drainage on crop yields and soil physical properties

Ingrid Wesström, Elisabeth Bölenius
Abraham Joel

Department of Soil Sciences, Swedish
University of Agricultural Sciences, Uppsala,
Sweden

Field sites



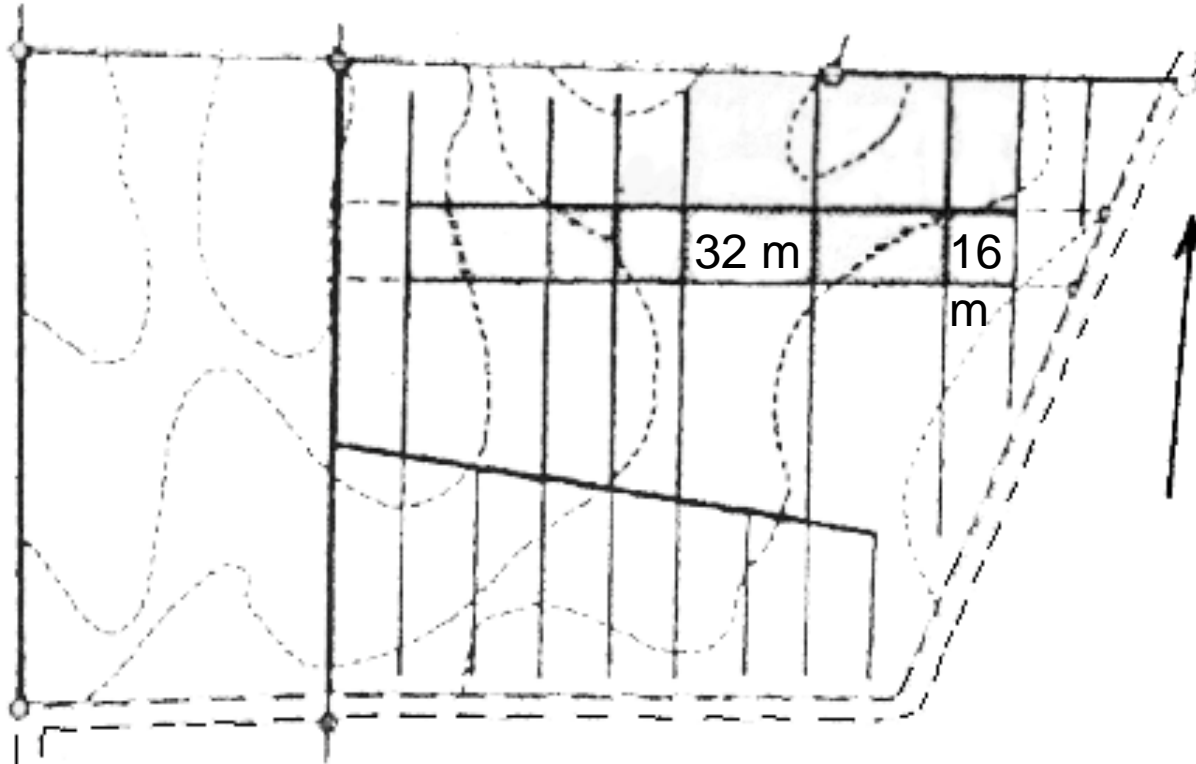
Site	Clay content (%)	
	Topsoil	Subsoil
Bruntorp	26	42
Krogsta	52	55
Edeby	61	72

Drainage system design

Site	Drainage system		
	Age	Depth (cm)	Drain spacing (m)
Bruntorp	47	80	32
Krogsta	58	75	36
Edeby	60	90	30



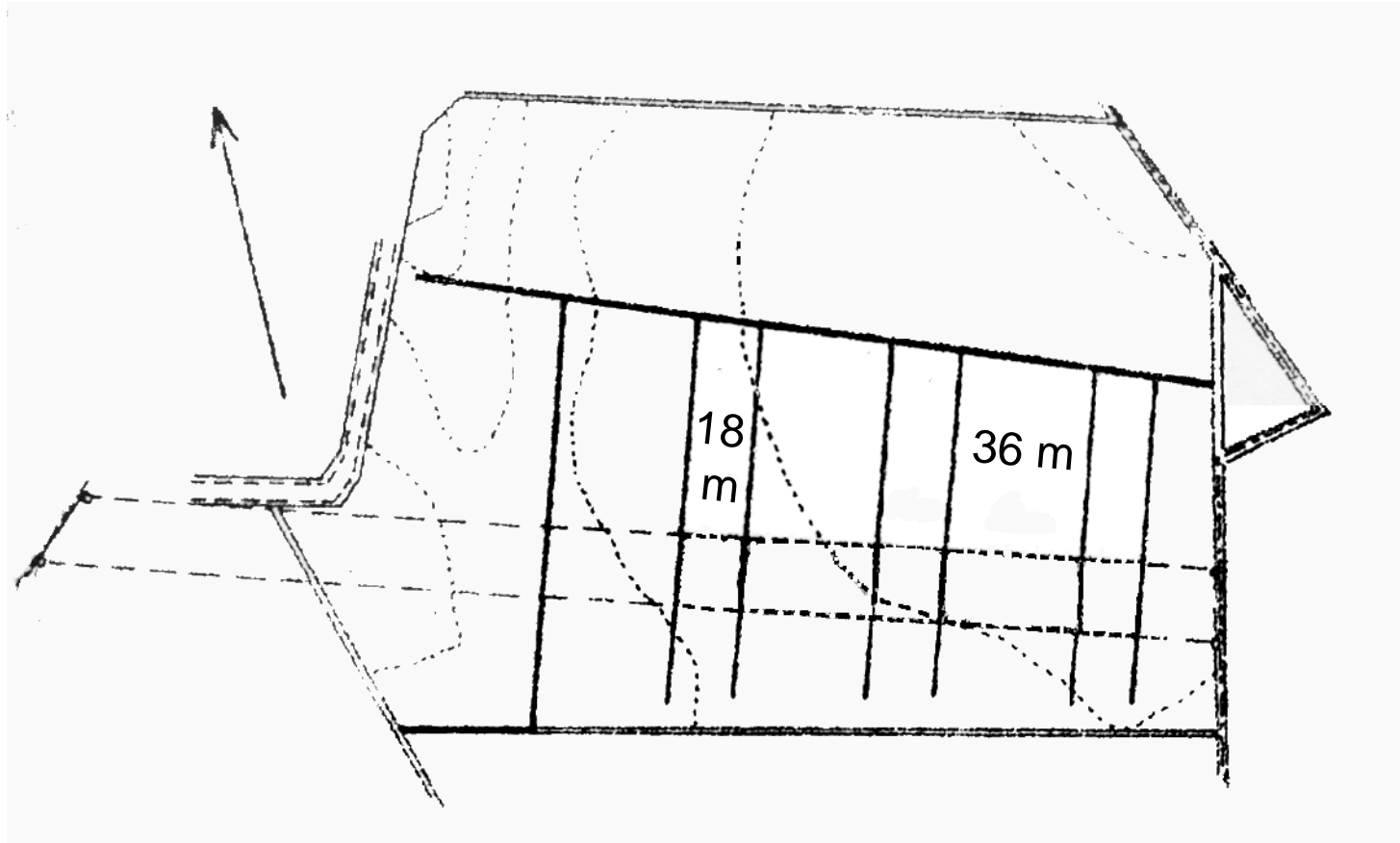
Drainage system design Bruntorp



Field site Bruntorp



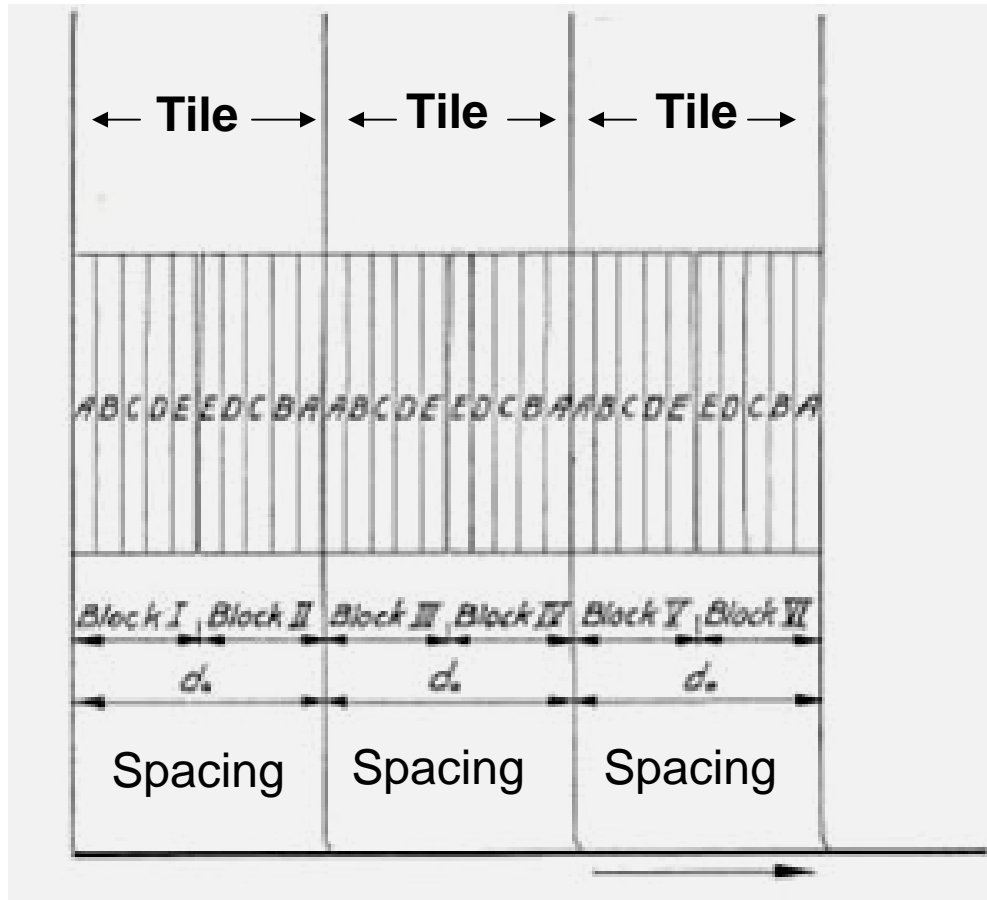
Drainage system design Krogsta



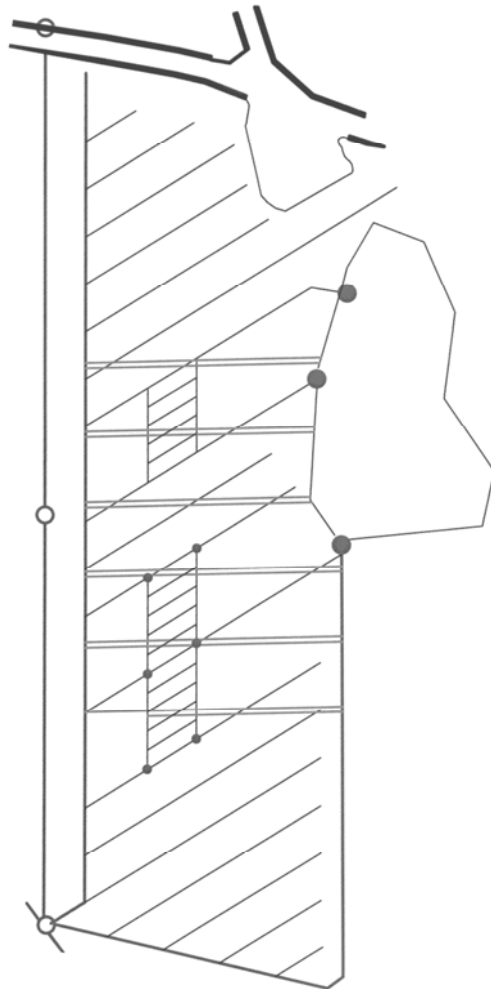
Field site Edeby



Field design of a strip-plot experiment



Field design of a strip-plot experiment, Edeby



Summary of field experiments

Site	Crop rotation	Number of blocks	Number of years
Bruntorp	Ray/winter wheat/oats/barley/	6 (1961 -1976)	10
	spring and winter oilseed	4 (2004 - 2006)	3
Edeby	Wheat/winter wheat/oats/barley/	6 (1952 -1968)	12
	spring and winter oilseed/forage crop	4 (2004, 2006)	2
Krogsta	Wheat/winter wheat/oats/mixed	6 (1952 -1965)	11
	cereal/forage crop	4 (2004 - 2006)	3

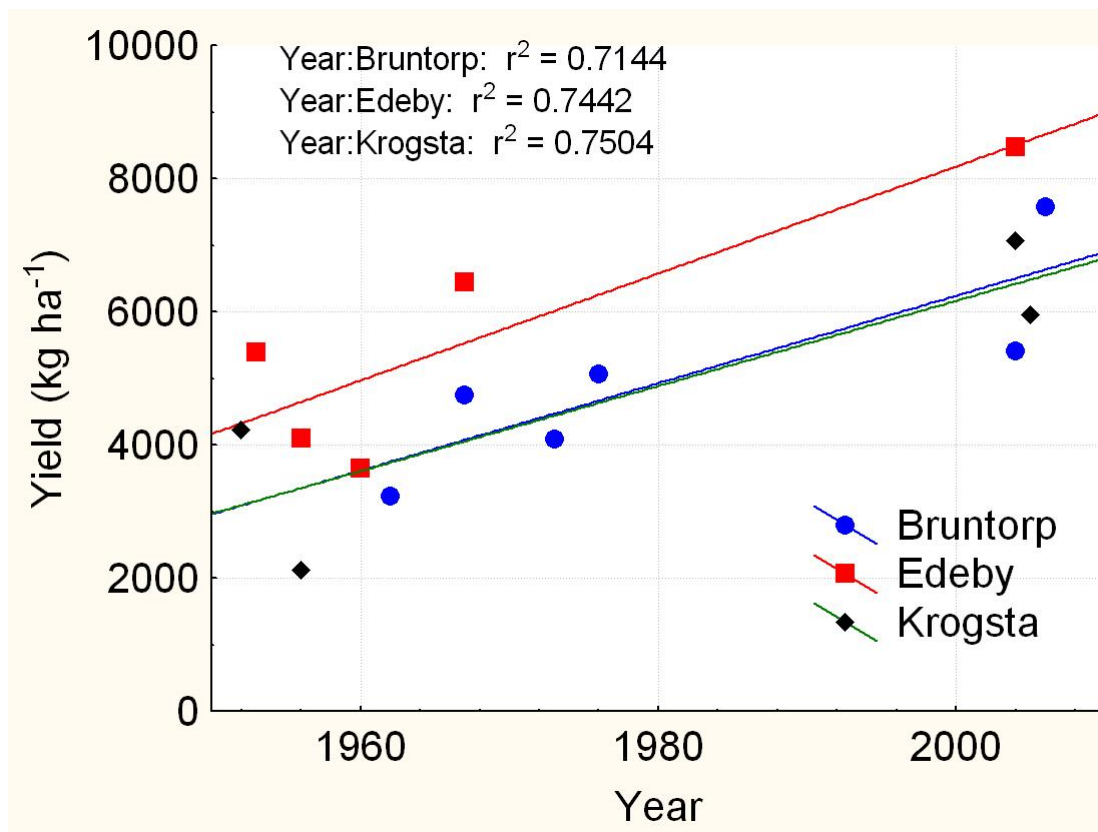
Measurements

- Seed bed preparation properties
- Yield
- Soil physical properties
 - Saturated hydraulic conductivity
 - Bulk and particle density
 - Drainable porosity
- Groundwater levels in field
- Soil penetration resistance



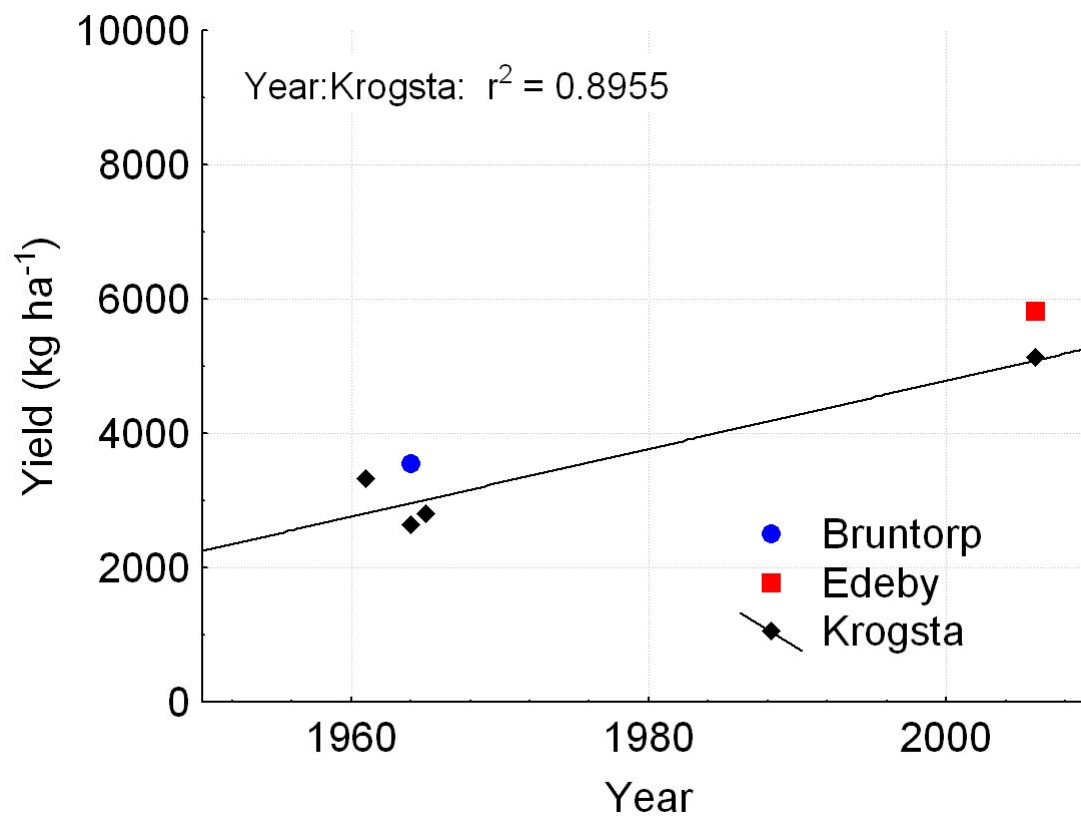
Results

Yield development of winter wheat



Results

Yield development of oats



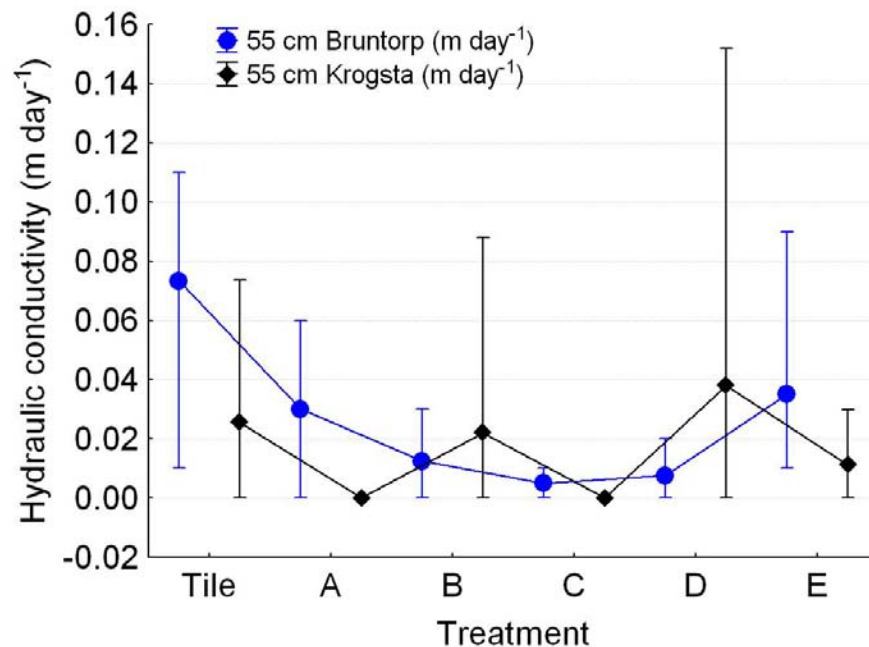
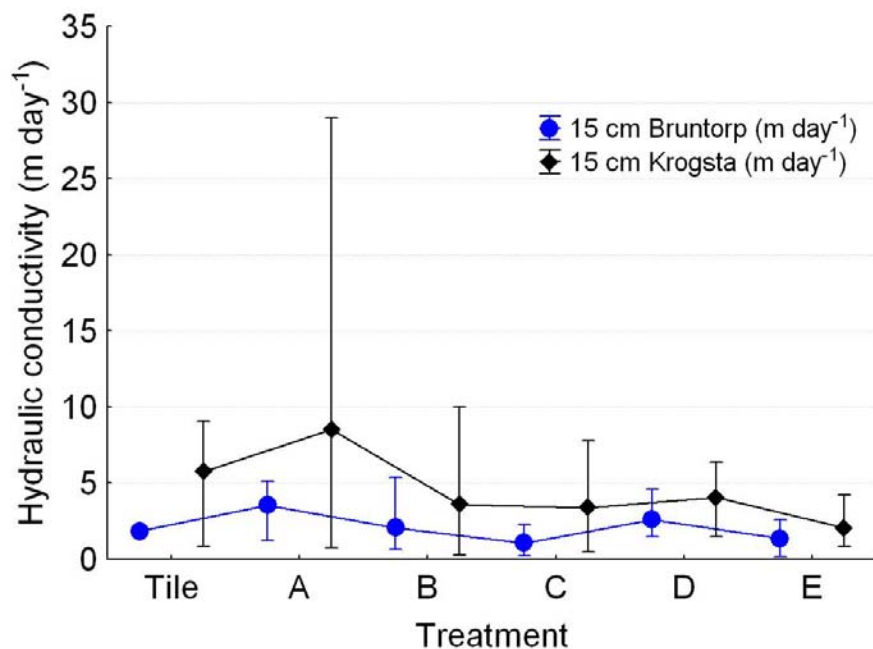
Results

Relative yield in different treatment

Treatment	Least square means	Standard error
A	100.000	-
B	94.268	2.112
C	93.782	2.112
D	93.582	2.112
E	92.580	2.114

Results

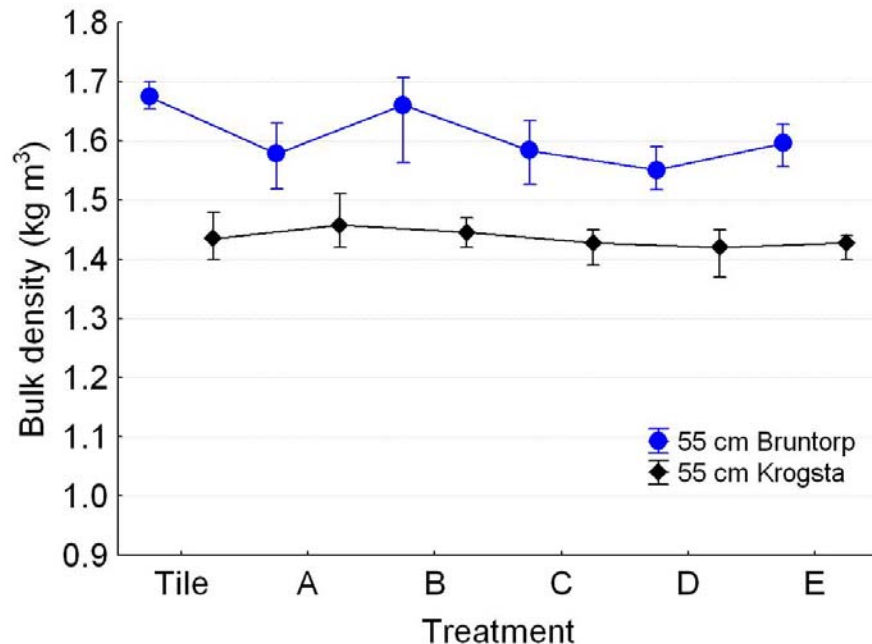
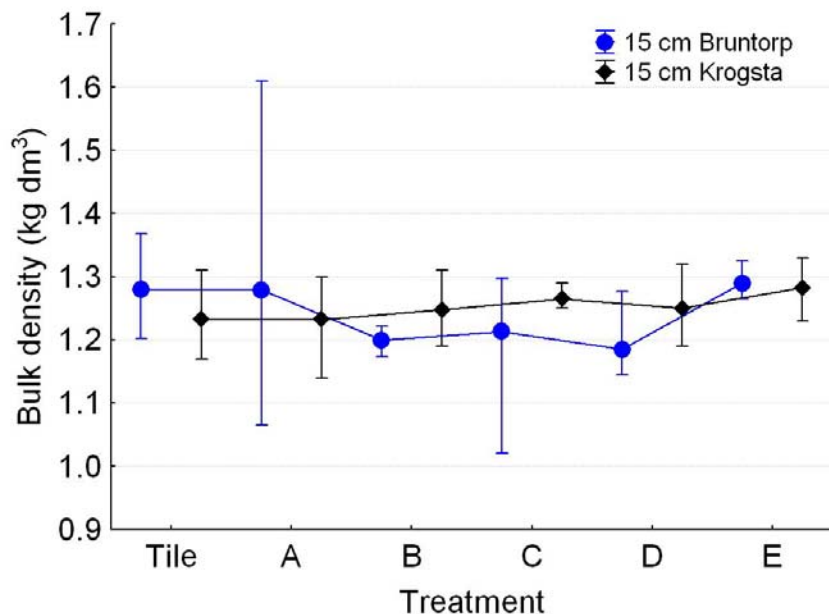
Soil physical properties



Mean, minimum and maximum values of hydraulic conductivity at 15 and 55 cm depths.

Results

Soil physical properties



Mean, minimum and maximum values of bulk density at 15 and 55 cm depths.

Summary

- The average yields of winter wheat and oats have increased by 130 respectively 95% in the past 40 years
- Higher yields close to drains and decreasing yields with increasing distance from drains (drain spacing 30 to 36 m)
- Tendency of higher hydraulic conductivity in the subsoil but no effects on bulk density in the vicinity of drains
- Positive effects on yields in the trench backfill zone remains for 50 years after installation of the drainage systems



Thank you for your attention!