

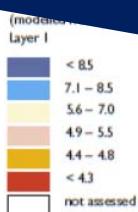
Identifying soil constraints using multi-year remote sensing for site-specific management



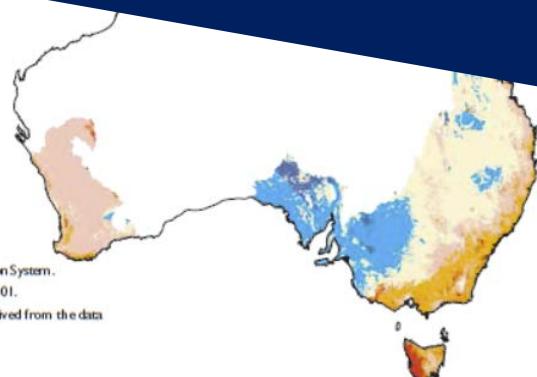
THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

Multiple soil constraints

Identification is the first step!



Source: Australian Soil Resources Information System.
National Land and Water Resources Audit 2001.
Data used are assumed to be correct as received from the data suppliers.
© Commonwealth of Australia 2001



GRDC



Approximate area covering grain production
during 1998/99 (source ABARE)

Dryland areas that have or are likely to have between
about 1% and 10% of land affected by seepage salting

Areas where there is a potential for transient salinity and
subsoil constraints such as sodicity, alkalinity and toxicity
due to aluminium, boron, carbonate and bicarbonate

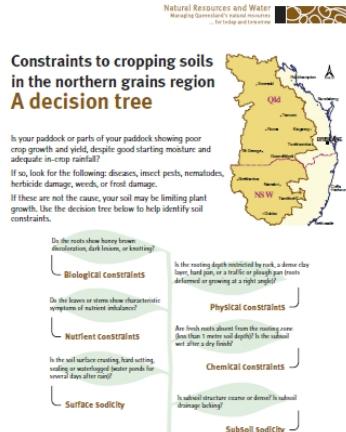
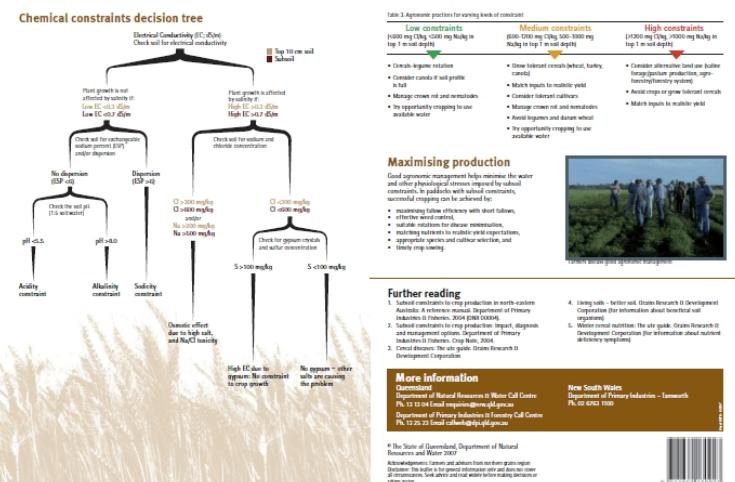
Source: National Resource Information Centre
Northcote & Sleath 1972
Salinity Hazard, Decade of Land Degradation, 1981

0 250 500 750 1000 km

Source: National Land and Water Resources Audit 2001

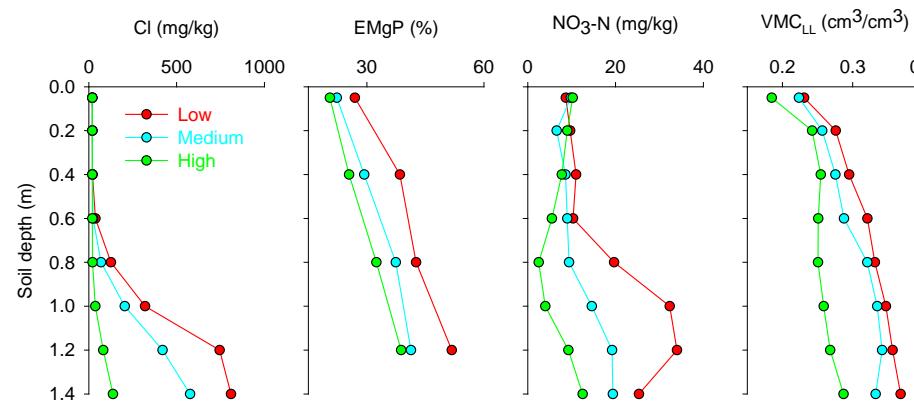
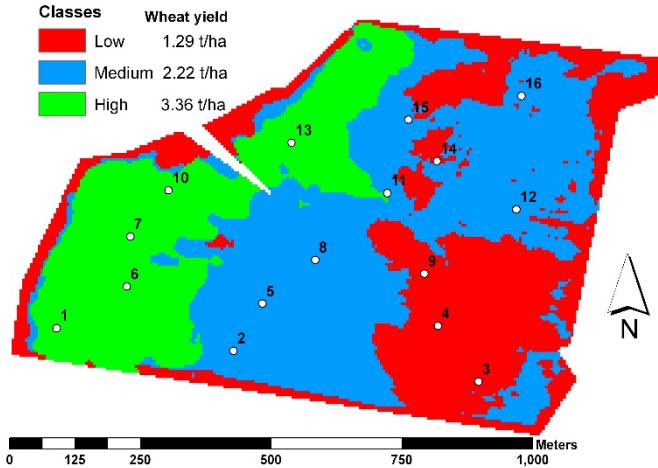
Identification of Soil Constraints

Point scale

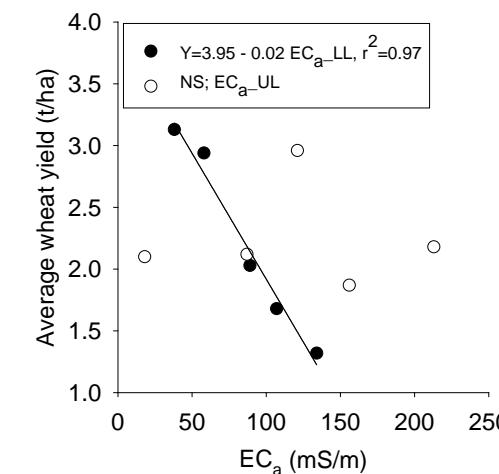
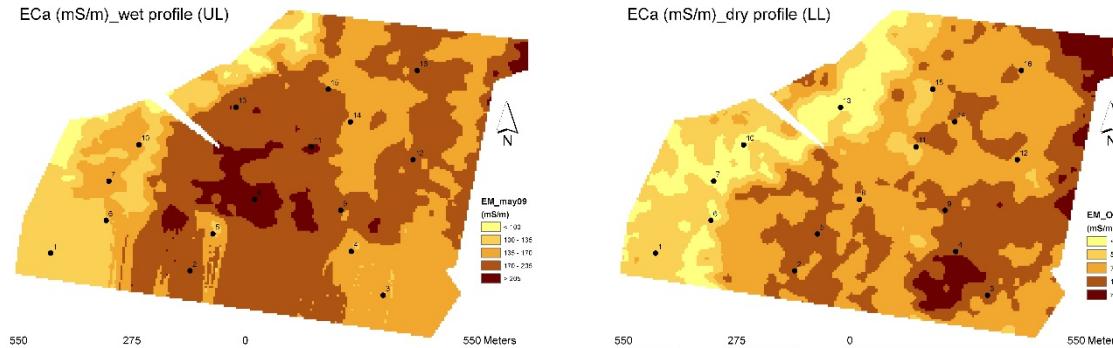


Identification of Soil Constraints

Field Scale



Proximal sensing



Identification of Soil Constraints: Farm scale



Historical yield maps

2800-hectare

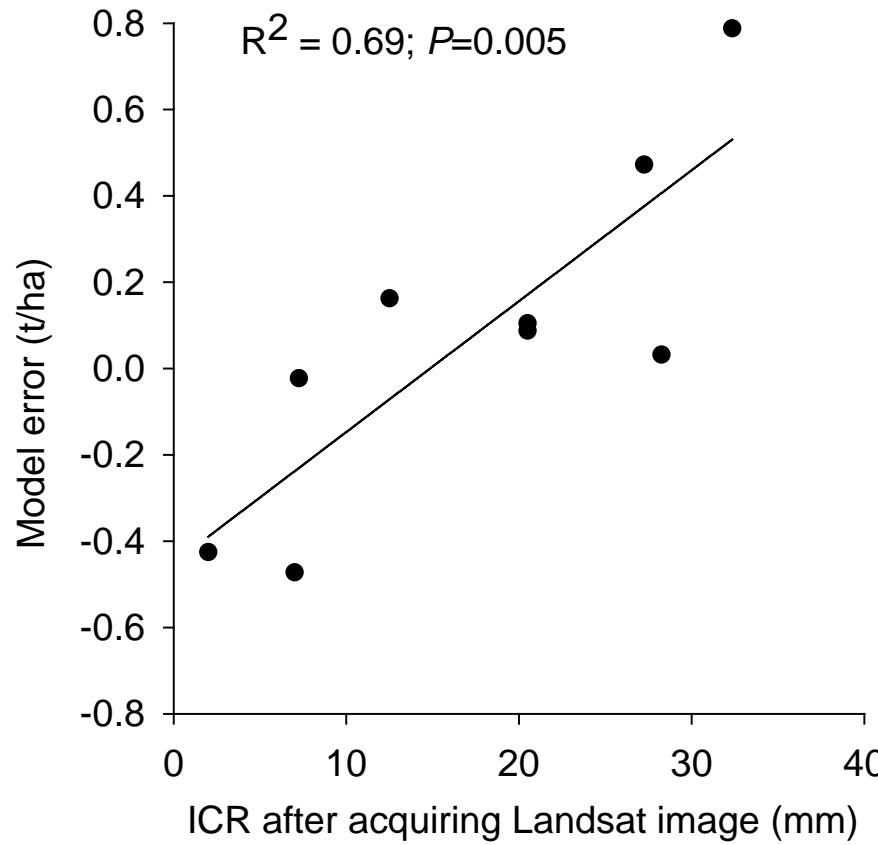
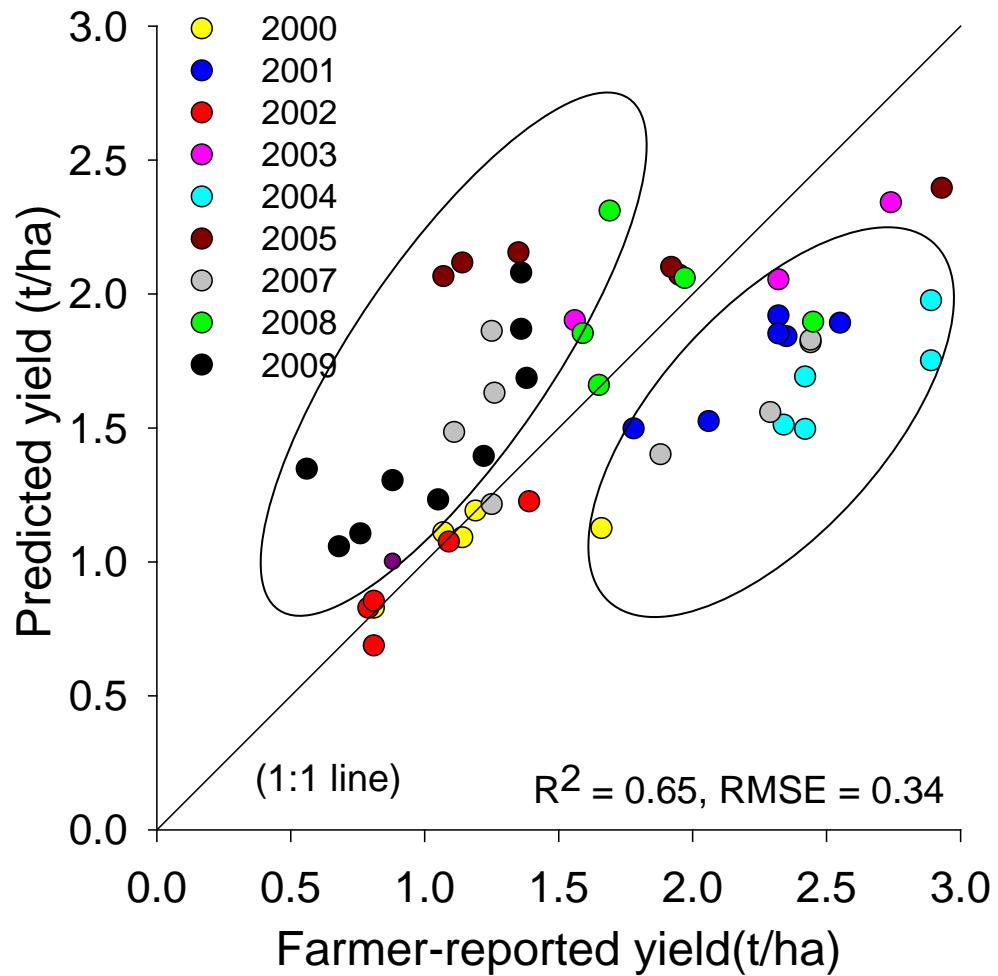
17 paddocks

64 wheat crops grown between 2000 and 2009

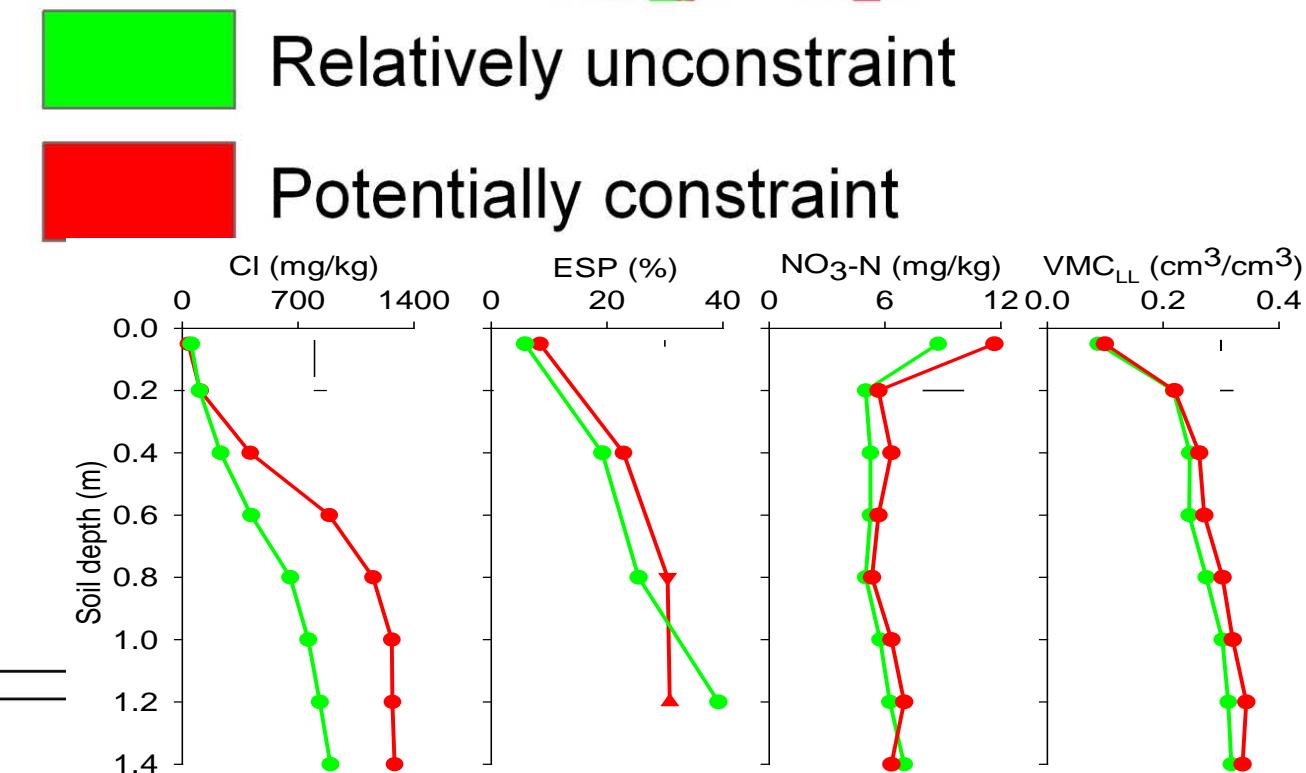
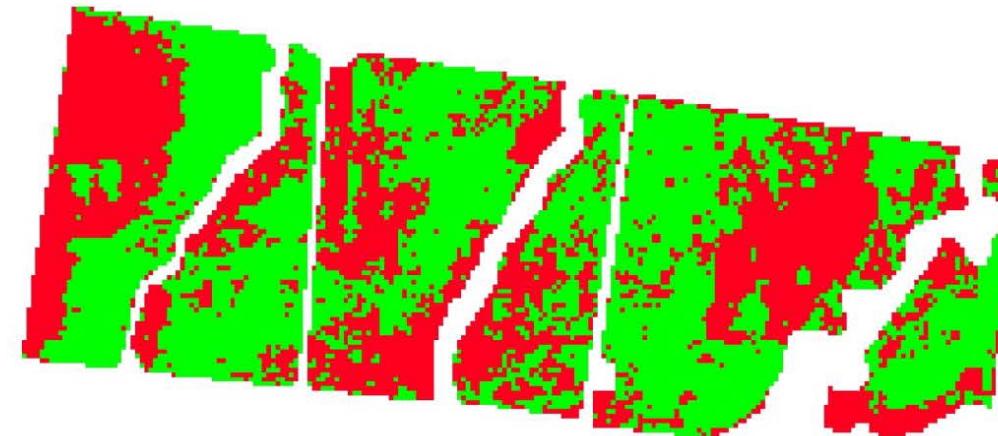
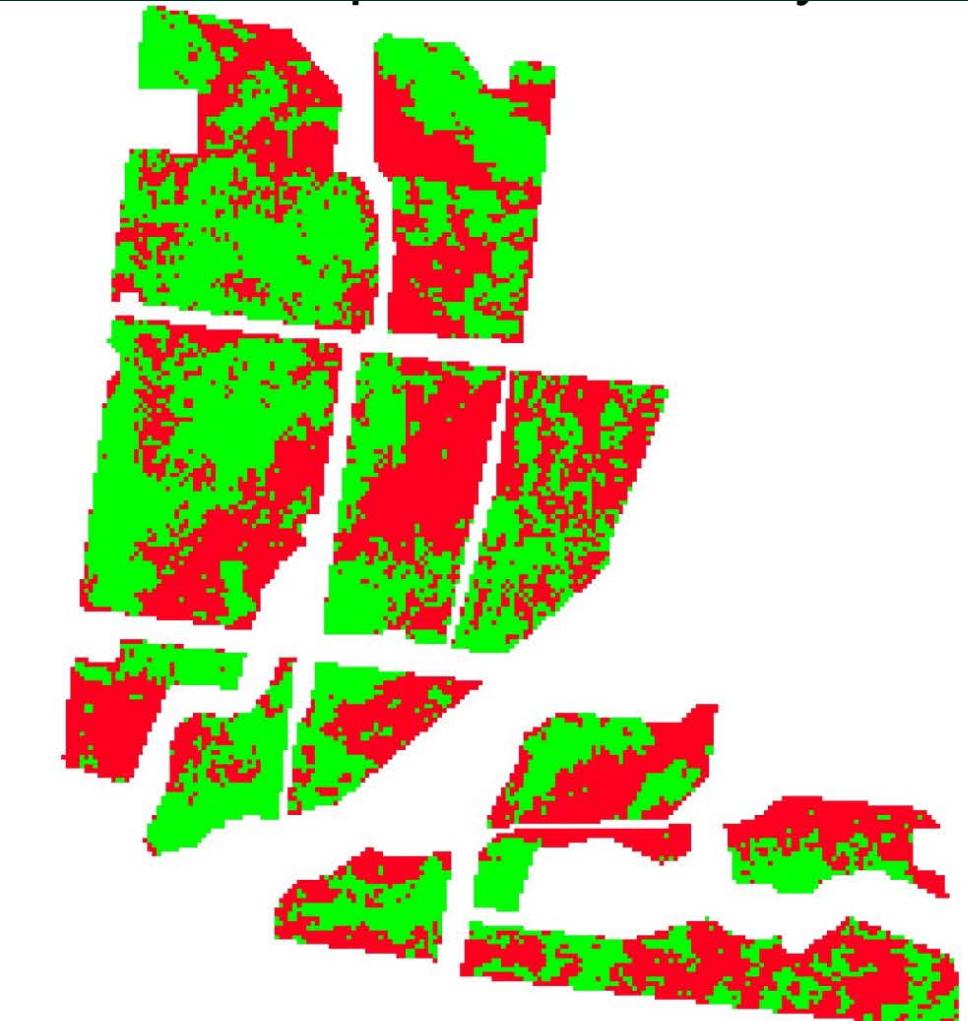
38 of the 64 crops were yield mapped



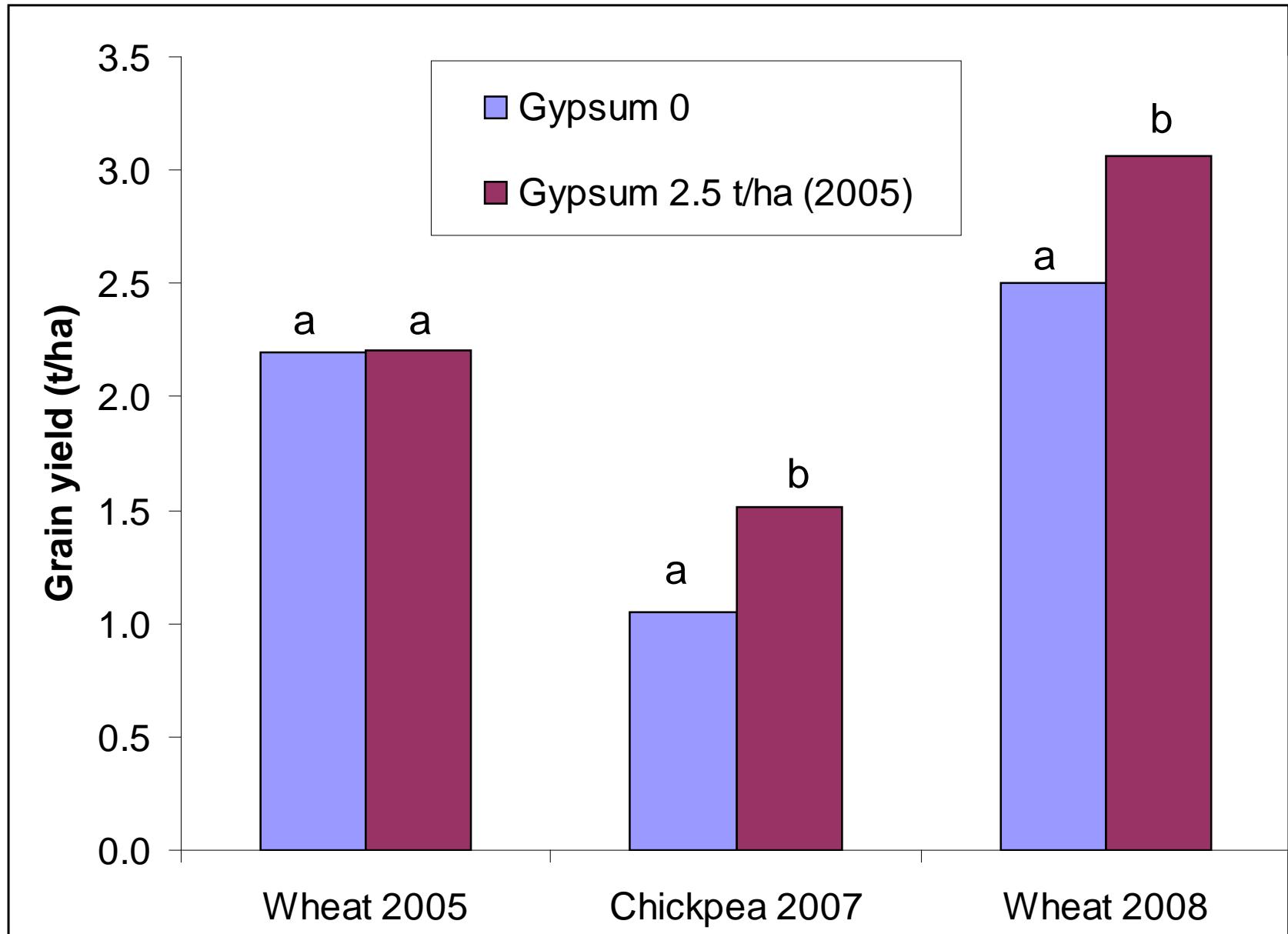
Grain Yield and Remote Sensing (Landsat)



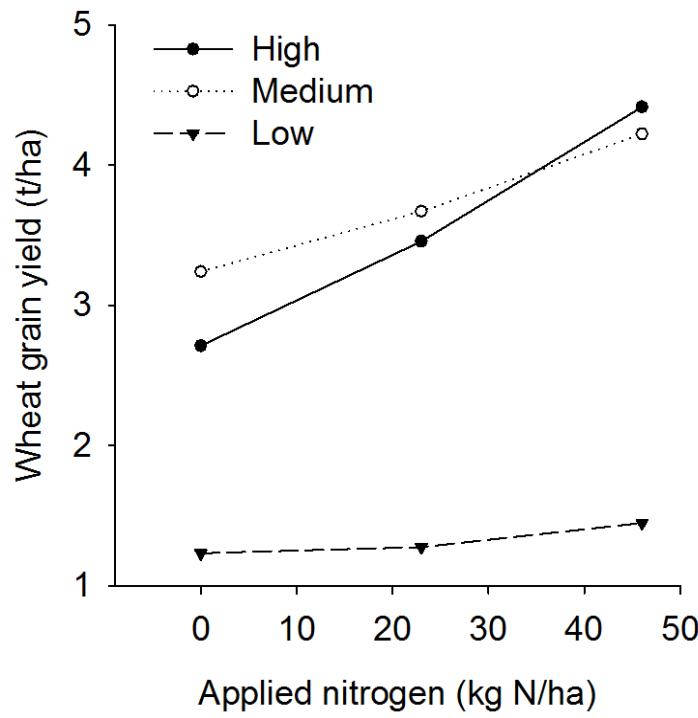
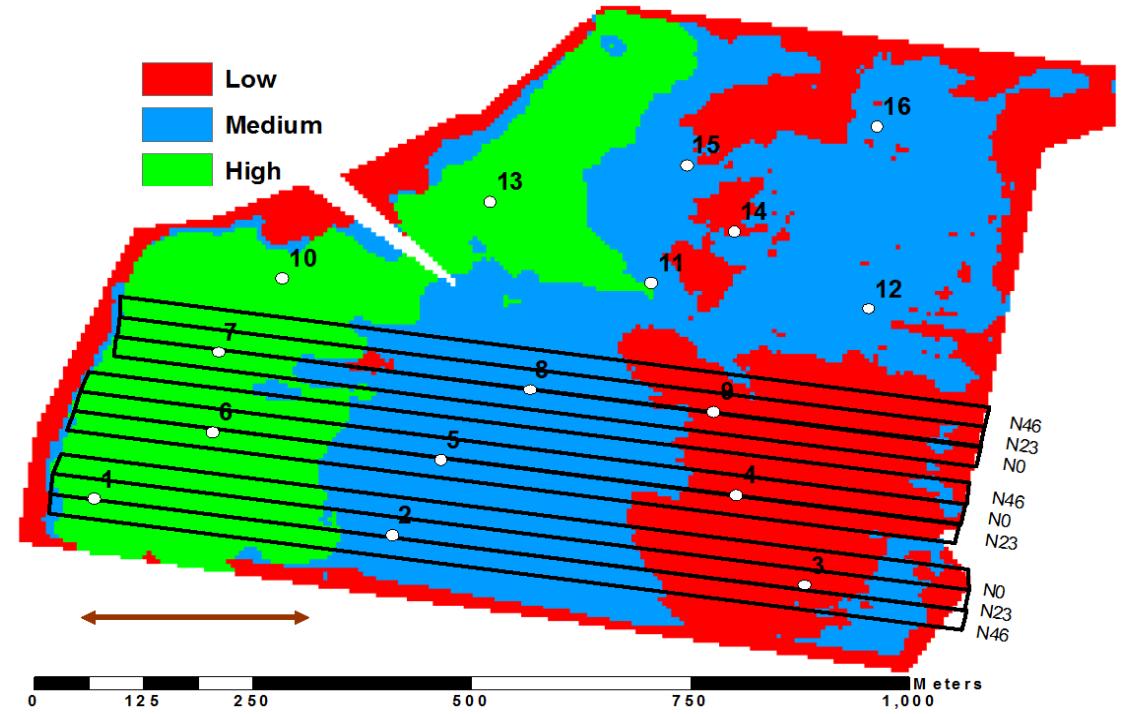
Spatial Variability of Predicted Soil Constraints



Amelioration



Cumulative gross margin for surface applied gypsum \$143/ha over 3-4 years



Matching Nitrogen Fertilizer: Economics

	Zone 1 (20 ha) Low	Zone 2 (28 ha) Medium	Zone 3 (16 ha) High	Average (64 ha)
Realistic yield potential (t/ha)	1.29	2.22	3.36	2.21
Nitrogen requirement (kg N/ha)	59	100	150	101
Average available N in the soil (kg N/ha)	119	55	36	70
Farmer's rate (kg N/ha)	46	46	46	46
Actual N required (kg N/ha)	0	45	114	31
Consequence of uniform N application	2.0 t urea waste	0.06 t urea waste	3.9 t urea required	2.0 t urea waste

N required (kg/ha) = (RYP x protein goal x 1.75 x 2) - Av. NO₃-N to 0.9 m

In Summary

- Remote sensing offer opportunity to map spatial variability of soil constraints
- Evaluate sustainable development goals (economic, environmental and social) for site-specific soil and nutrient management