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

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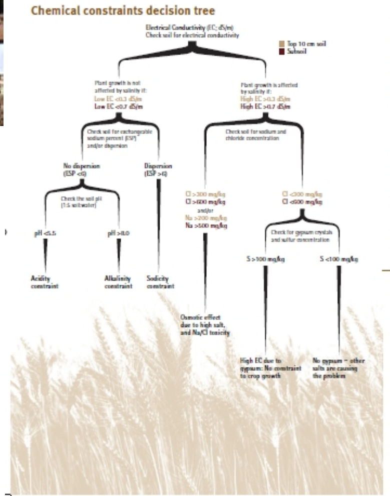
Multiple soil constraints

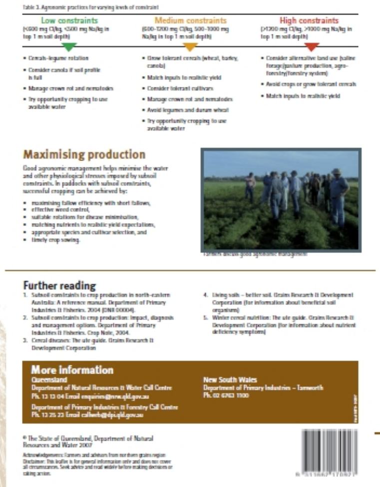
Identification is the first step!

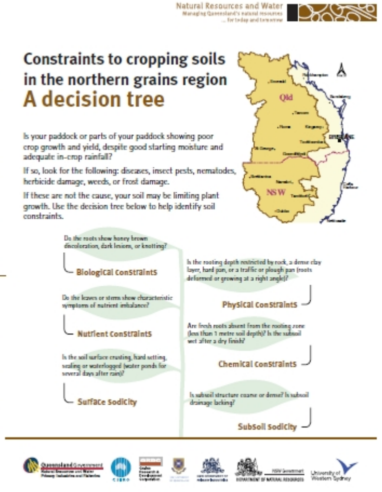
Source: National Land and Water Resources Audit 2001

Identification of Soil Constraints

Point scale



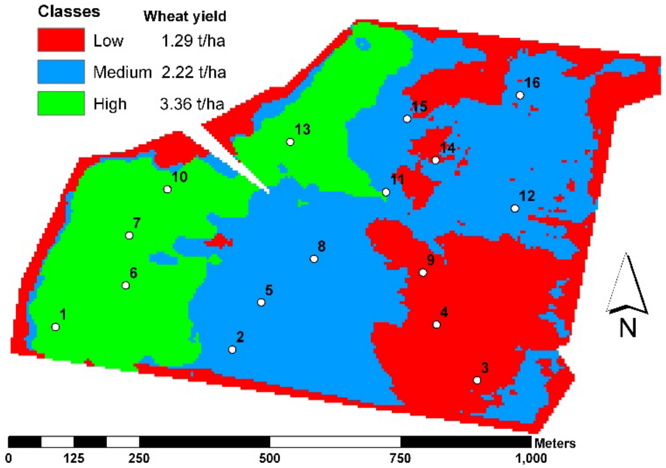


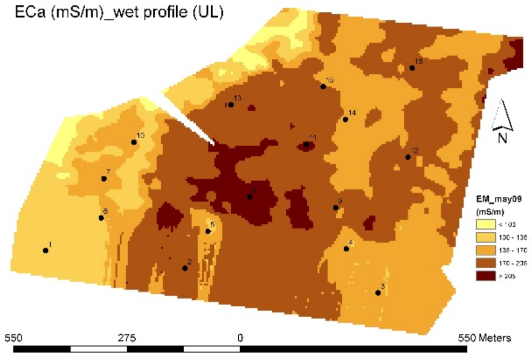


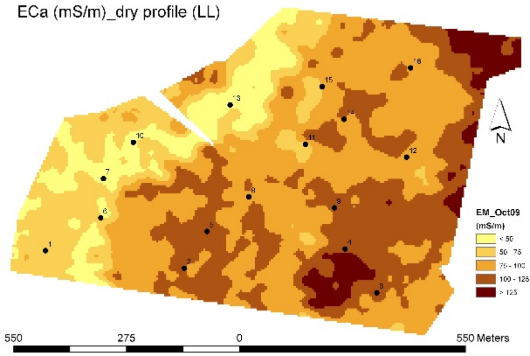
Identification of Soil Constraints

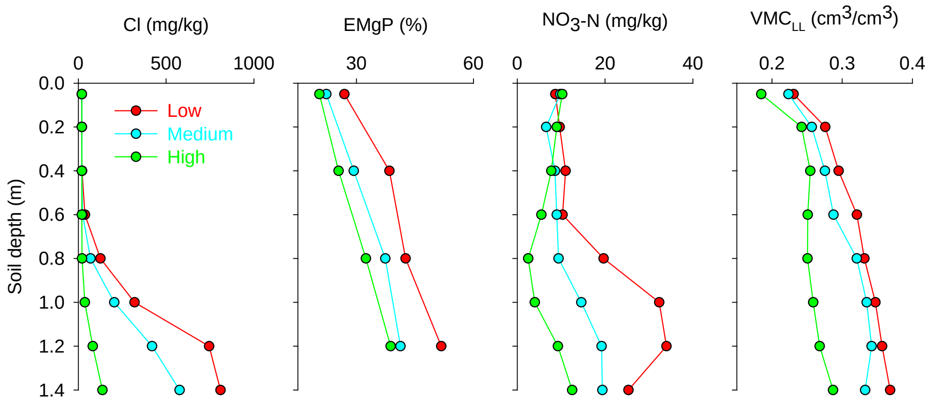
Field Scale

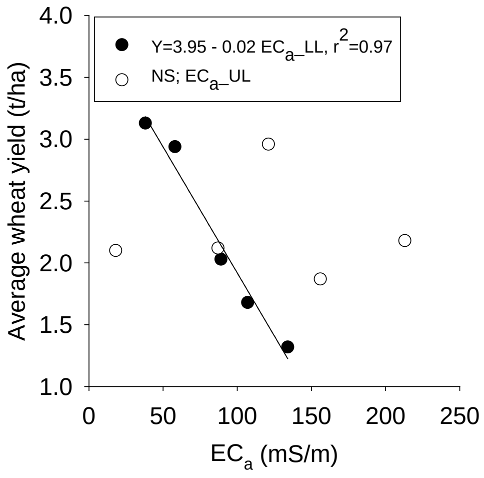
Proximal sensing











Identification of Soil Constraints: Farm scale

Historical yield maps

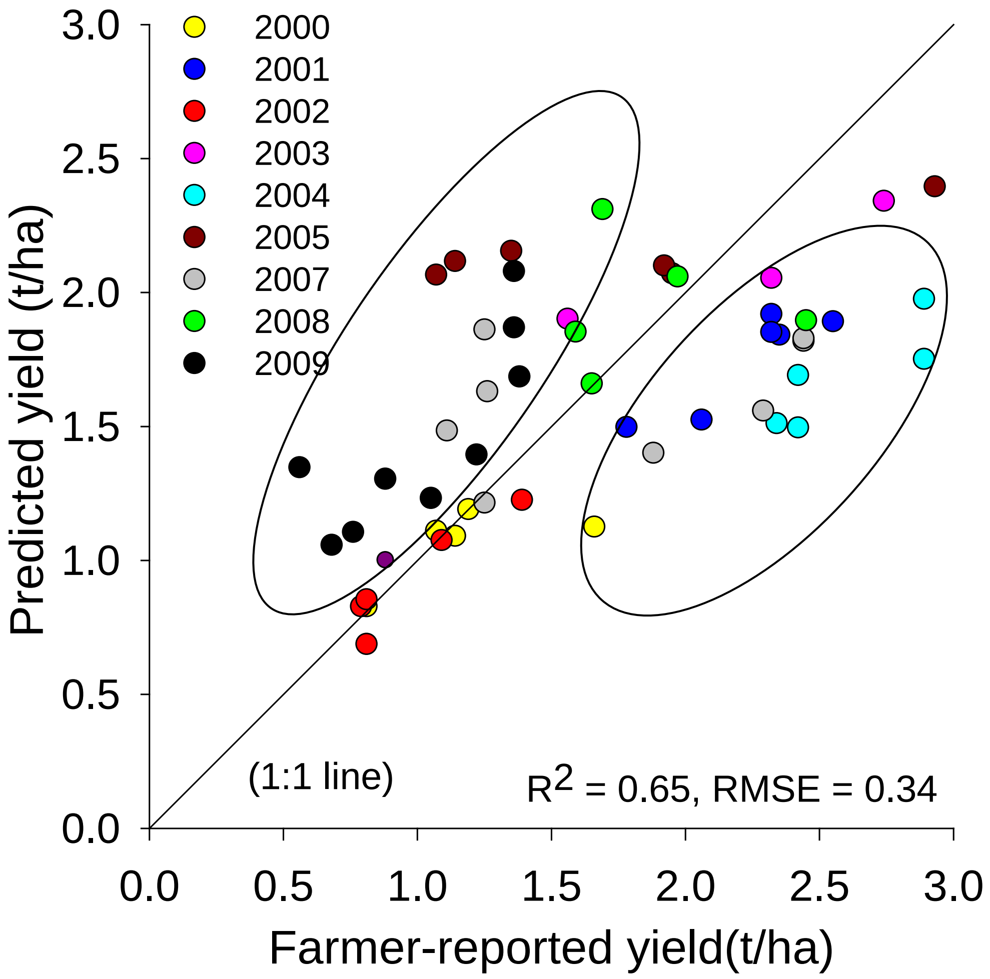
2800-hectare

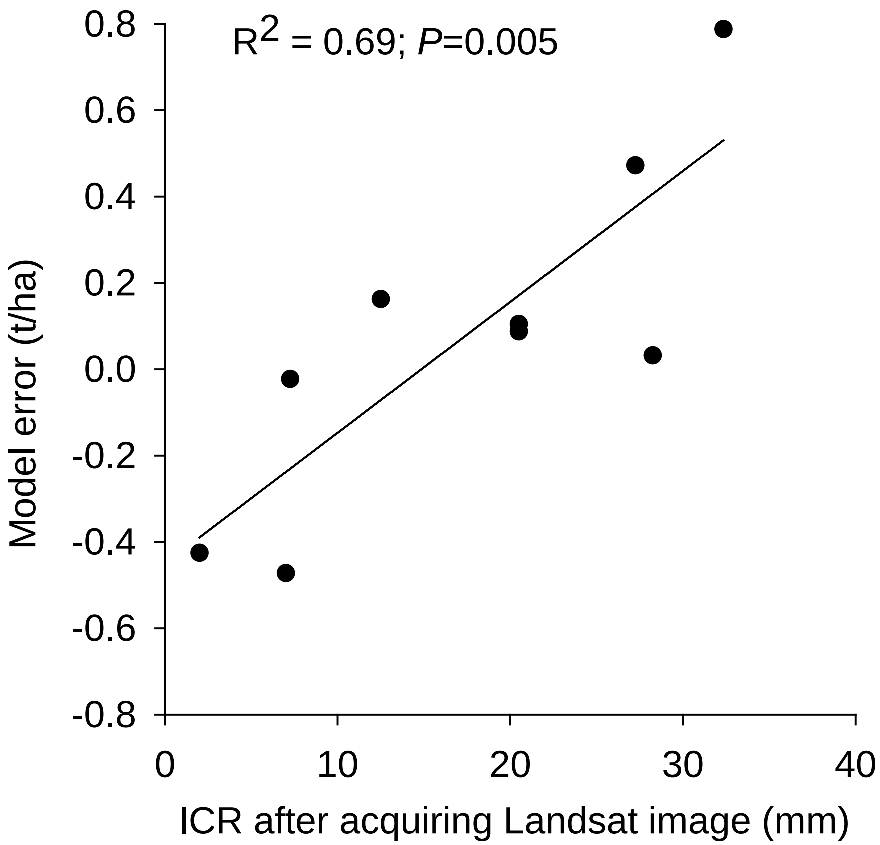
17 paddocks

64 wheat crops grown between 2000 and 2009

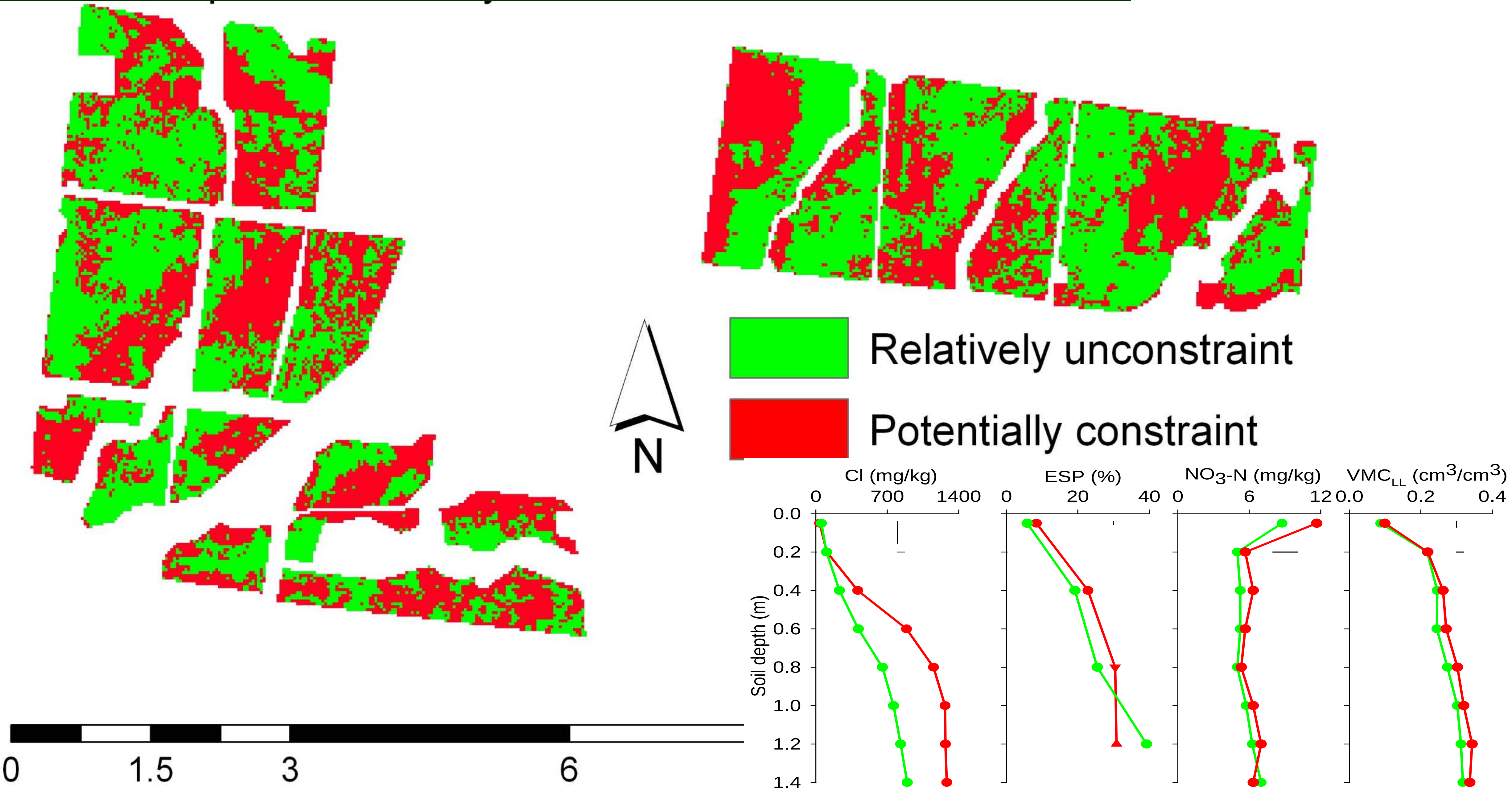
38 of the 64 crops were yield mapped

Grain Yield and Remote Sensing (Landsat)

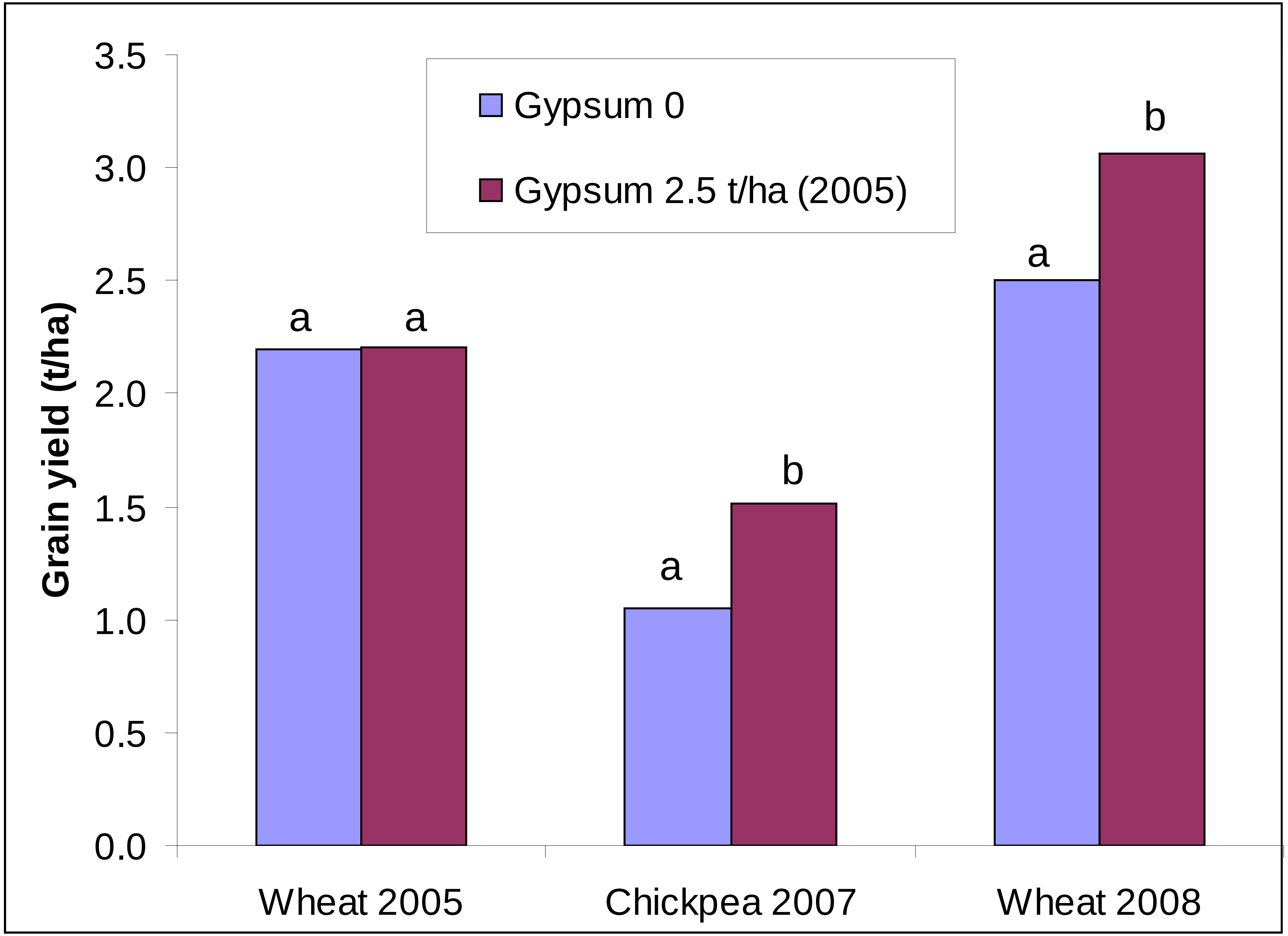




Spatial Variability of Predicted Soil Constraints

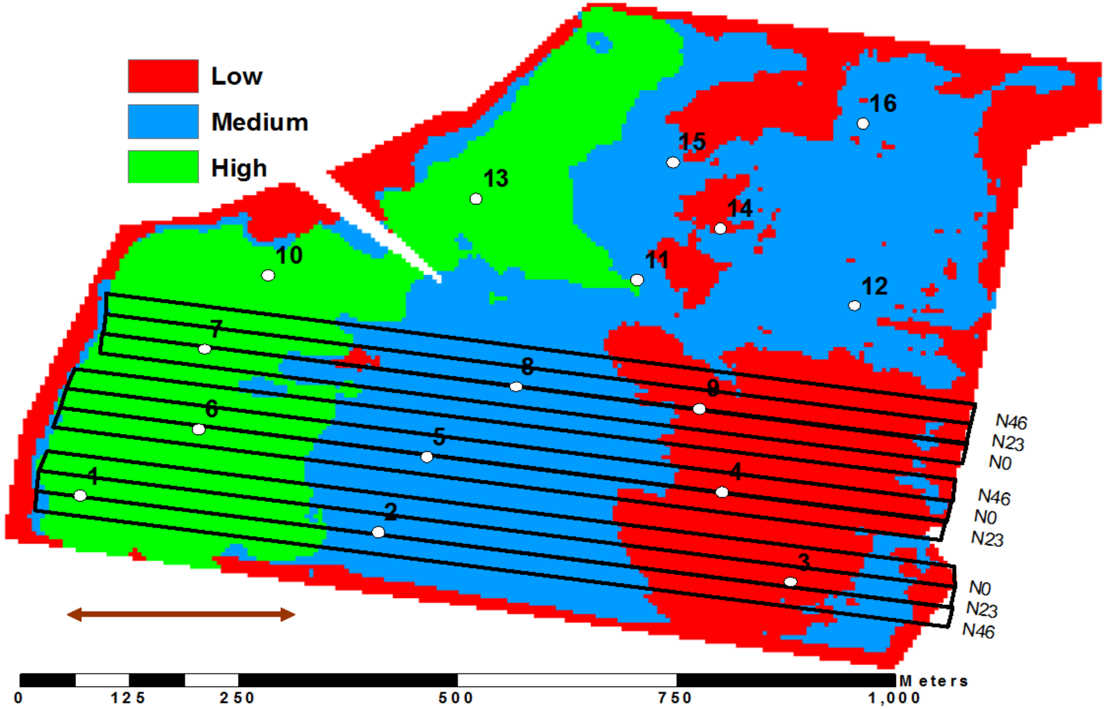


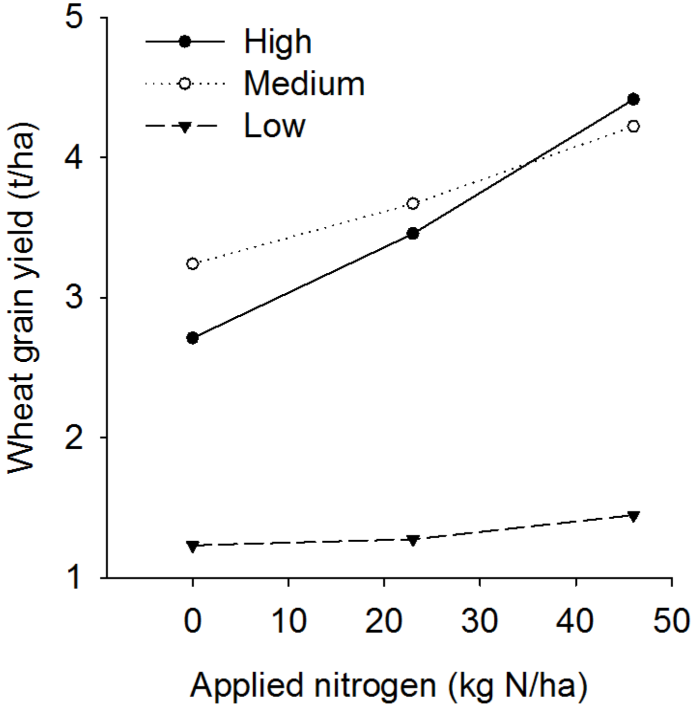
Amelioration



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. NO_3-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