



Nitrogen cycling enhanced by conservation agriculture in a rice-based cropping system of the Eastern Indo-Gangetic Plain



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Conventional rice-based cropping systems in Eastern Indo-Gangetic Plain

- 2-3 crops per year
- Puddling and ponded soil for rice crop
- Residue burnt/removed
- Intensive tillage for dryland crop

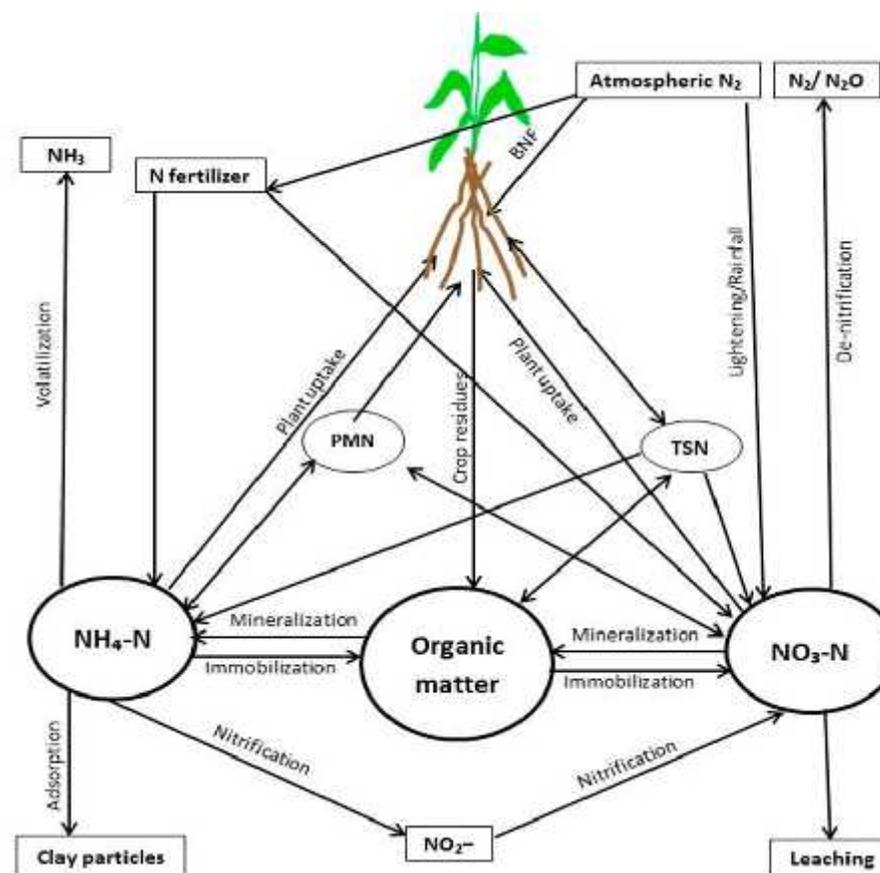




Conservation agriculture

- **Minimum soil disturbance**
- **Increased crop residue retention**
- **Change in N mineralisation in CA system**
- **Change in N balance**
- **Change in N forms**

Conservation agriculture





Research question

- **How does N cycle change in short-medium term with minimum soil disturbance and increased crop residue retention in a rice-based cropping system**



How it was tested?

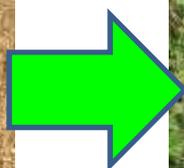
Crop rotation Lentil-mungbean-rice

Variety BARI Masur 6-BARI Mungbean 6-BINA Dhan 7

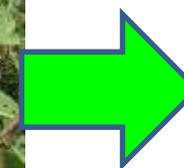
Duration 2.6 years (7 crops grown sequentially)



November-March



March-May



June-October



How it was done?

Soil disturbance

Strip-planting (SP)



Bed planting (BP)



Conventional tillage (CT)



Residue levels

High residue (HR)



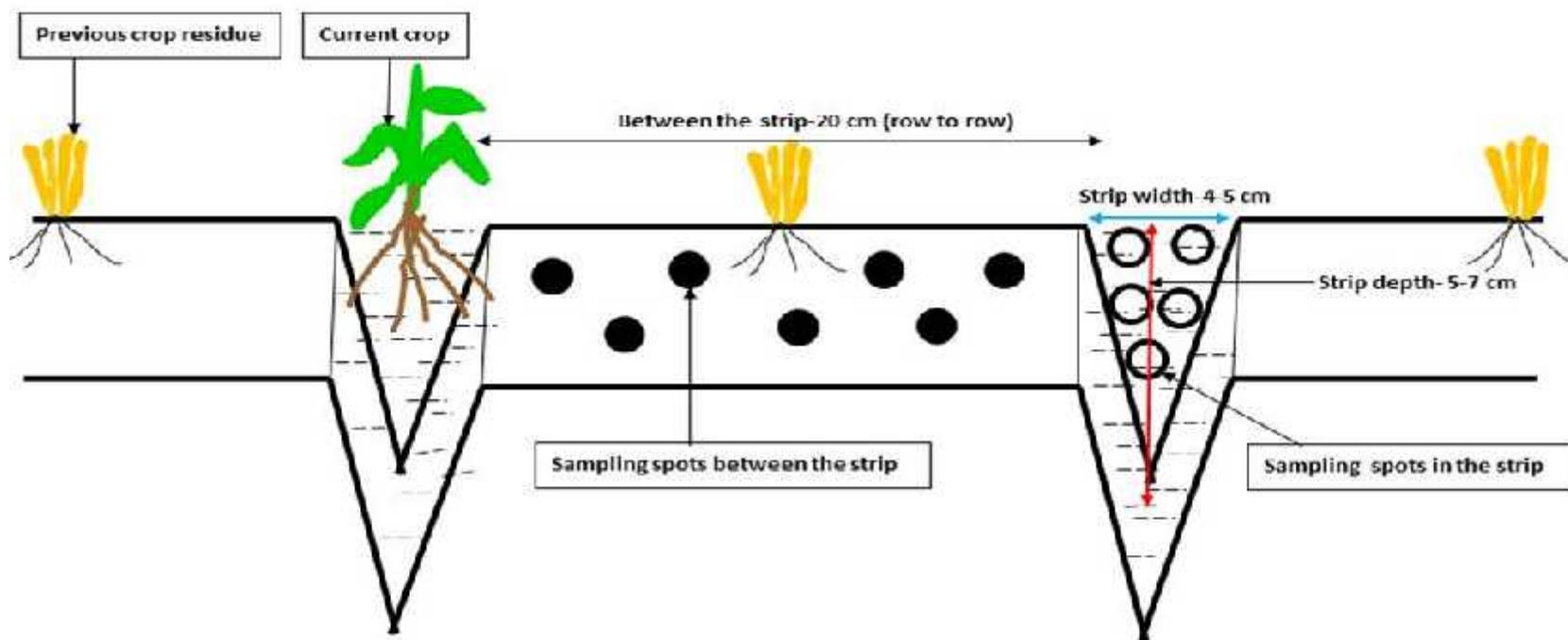
Low residue (LR)





Strip Planting

Strips 5-7 cm wide and 7 cm deep

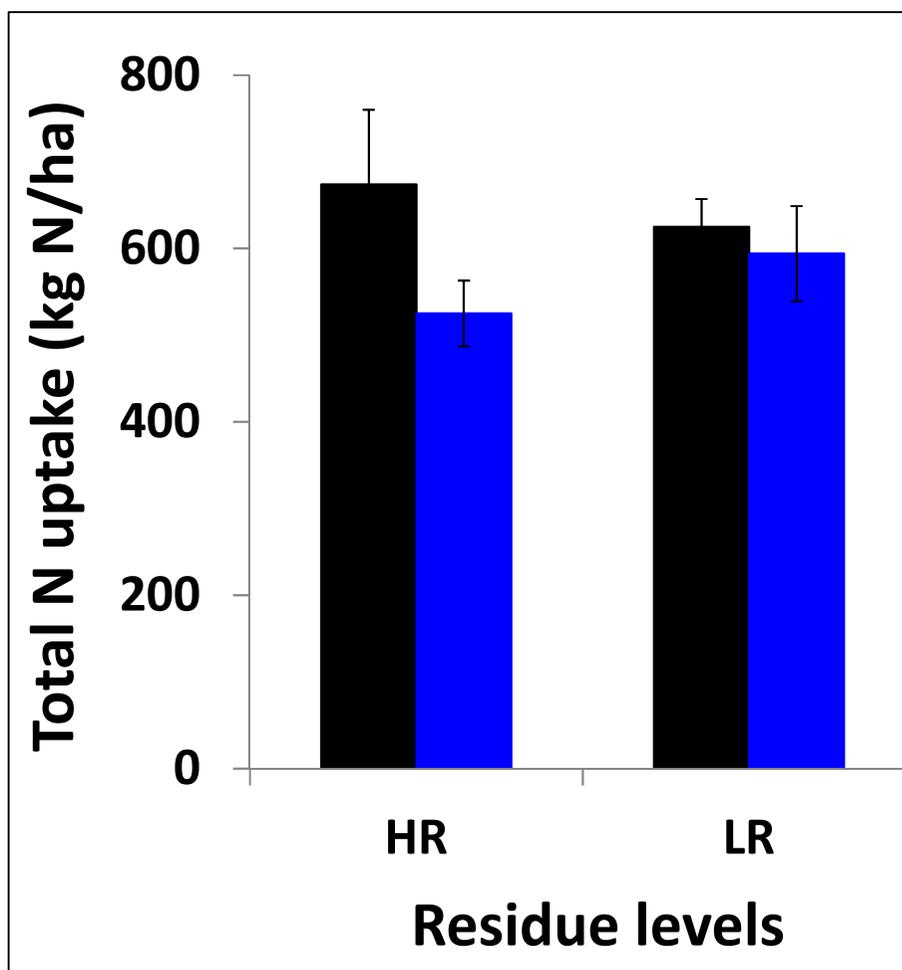
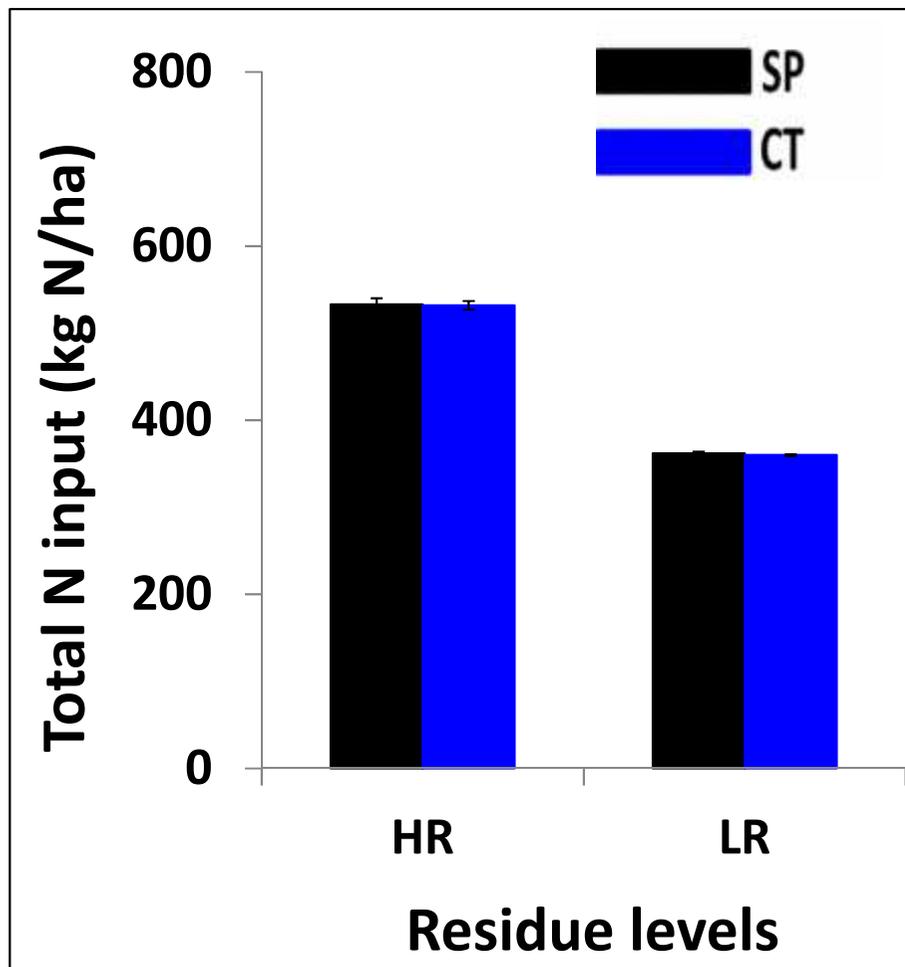


Strips 5-7 cm wide and 7 cm deep



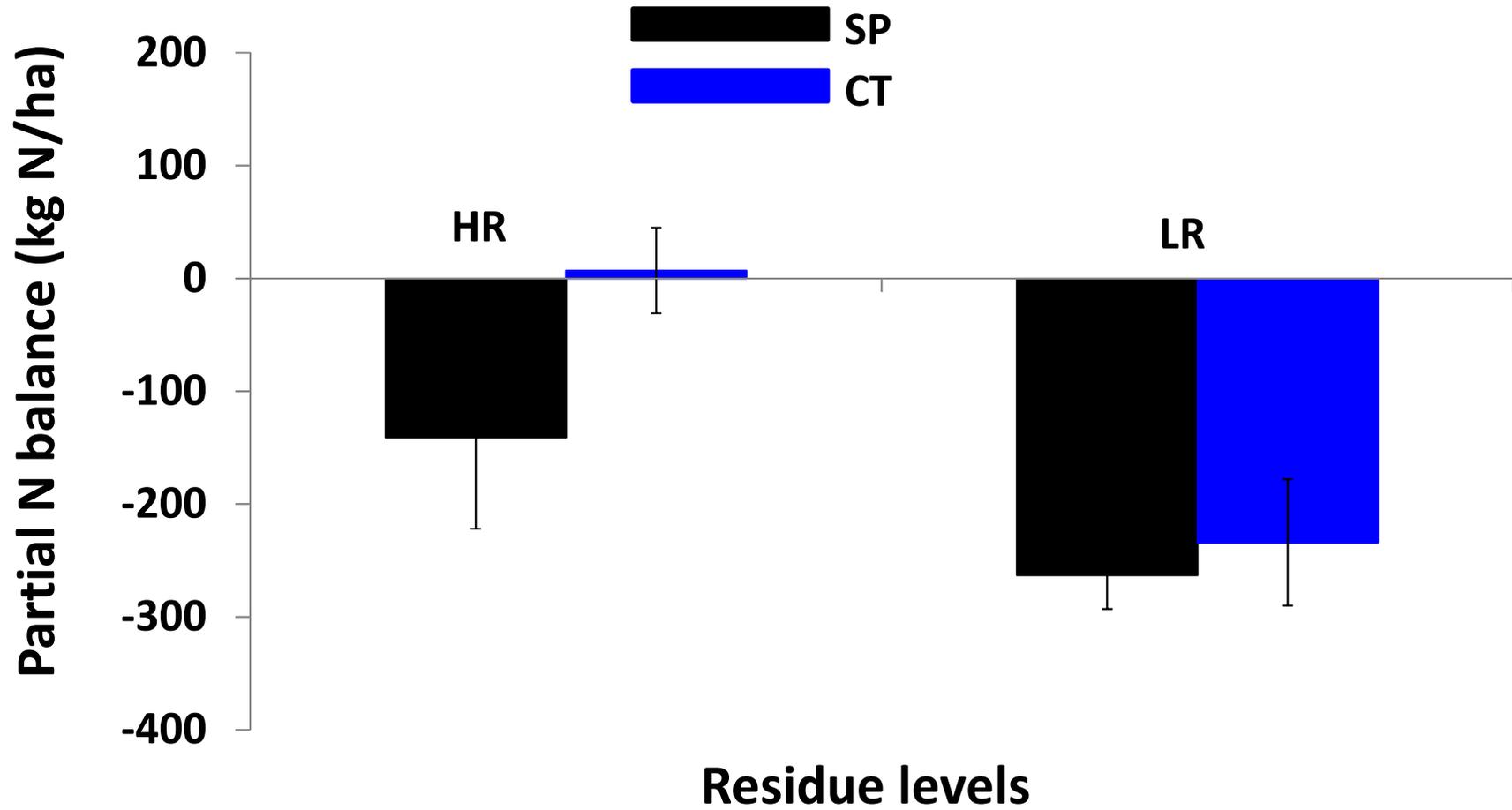


Total N input and uptake (7 crops)





Partial N Balance after 7 crops (inputs – outputs)

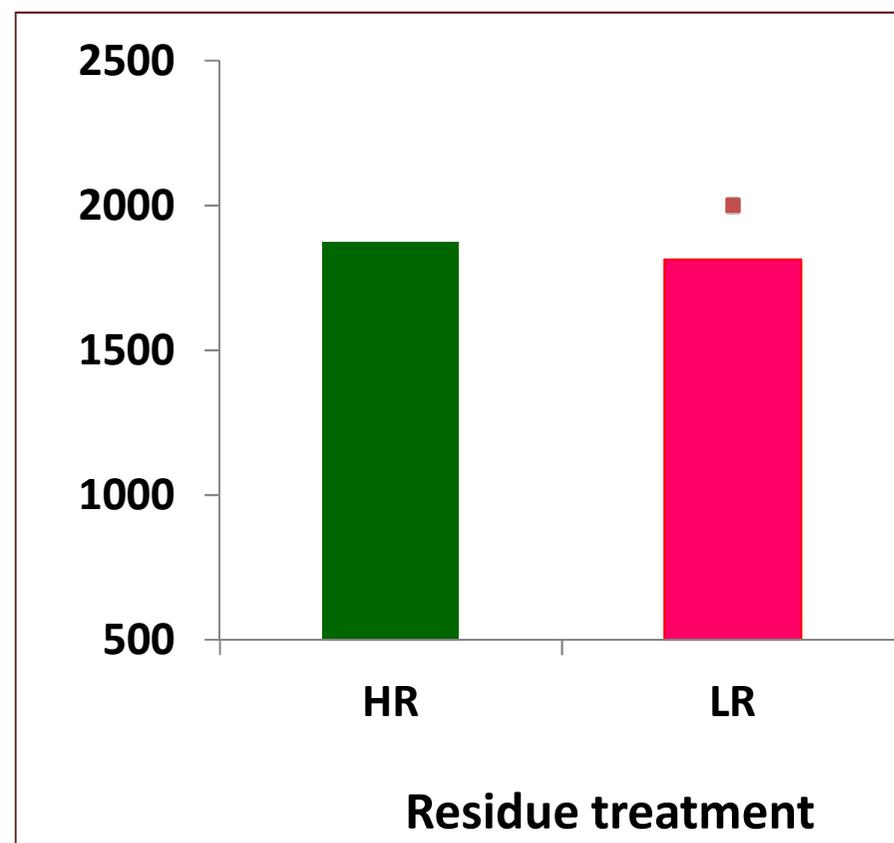
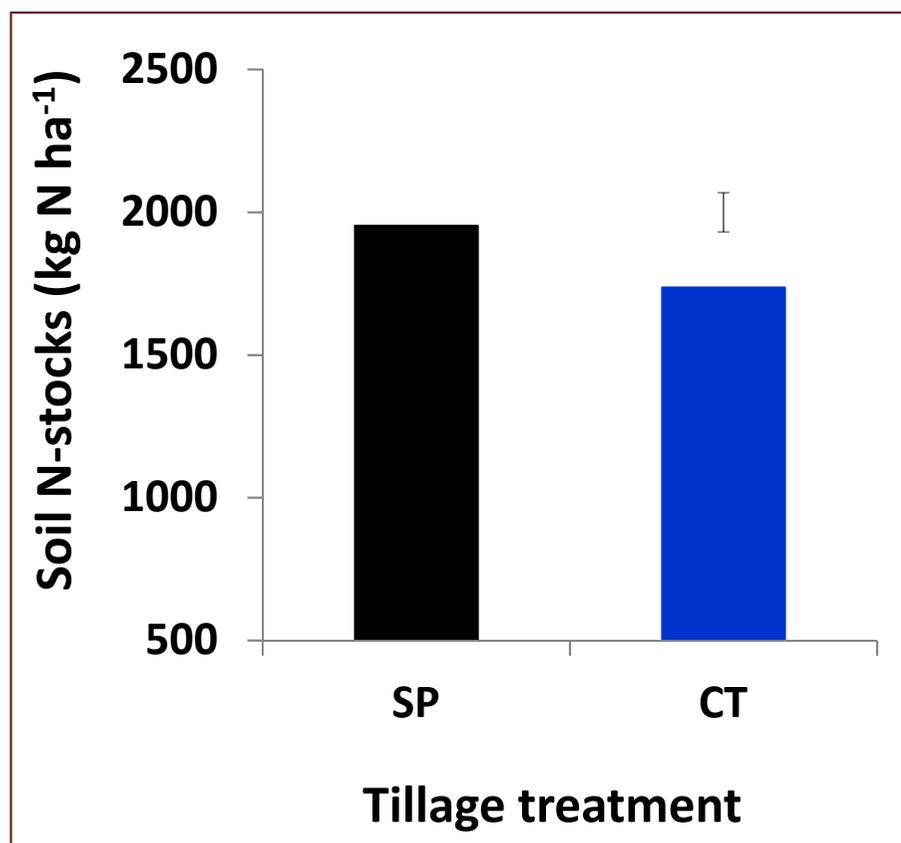




Soil N-stock

at 0-15 cm

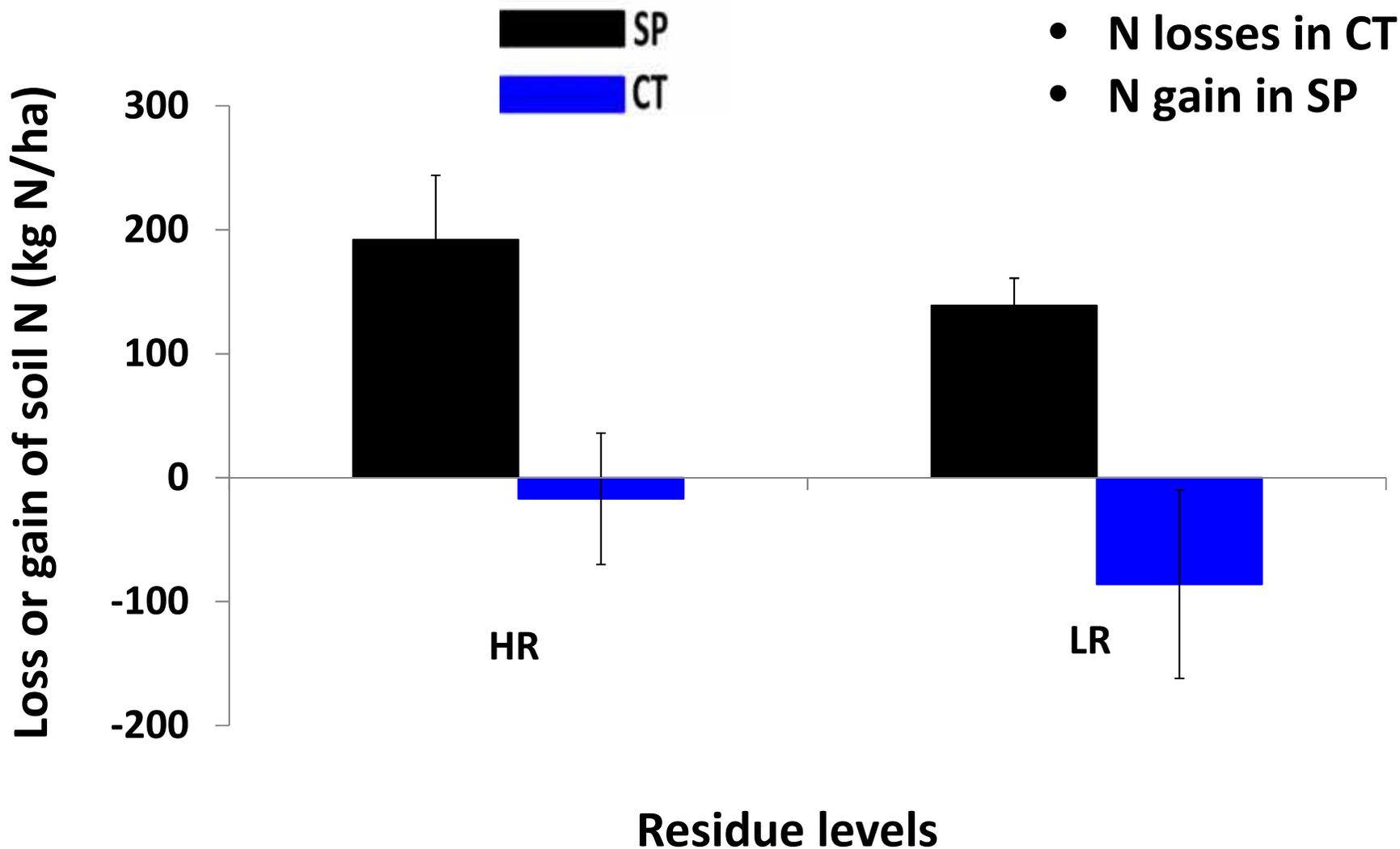
Initial N-stocks-1787 kg N ha⁻¹





Gain or loss of soil N

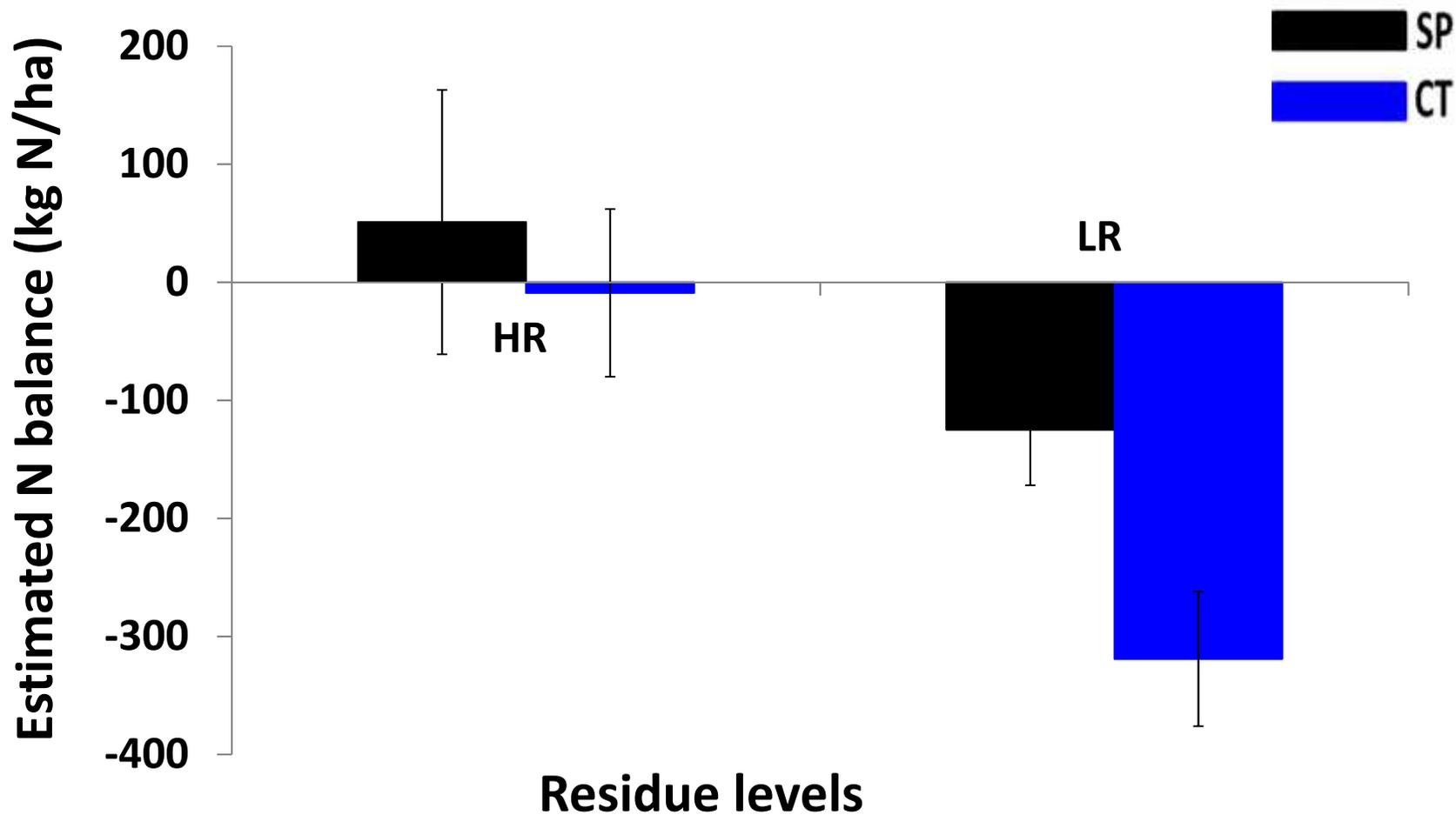
(Final, 2013 minus initial, 2010 N-stocks)





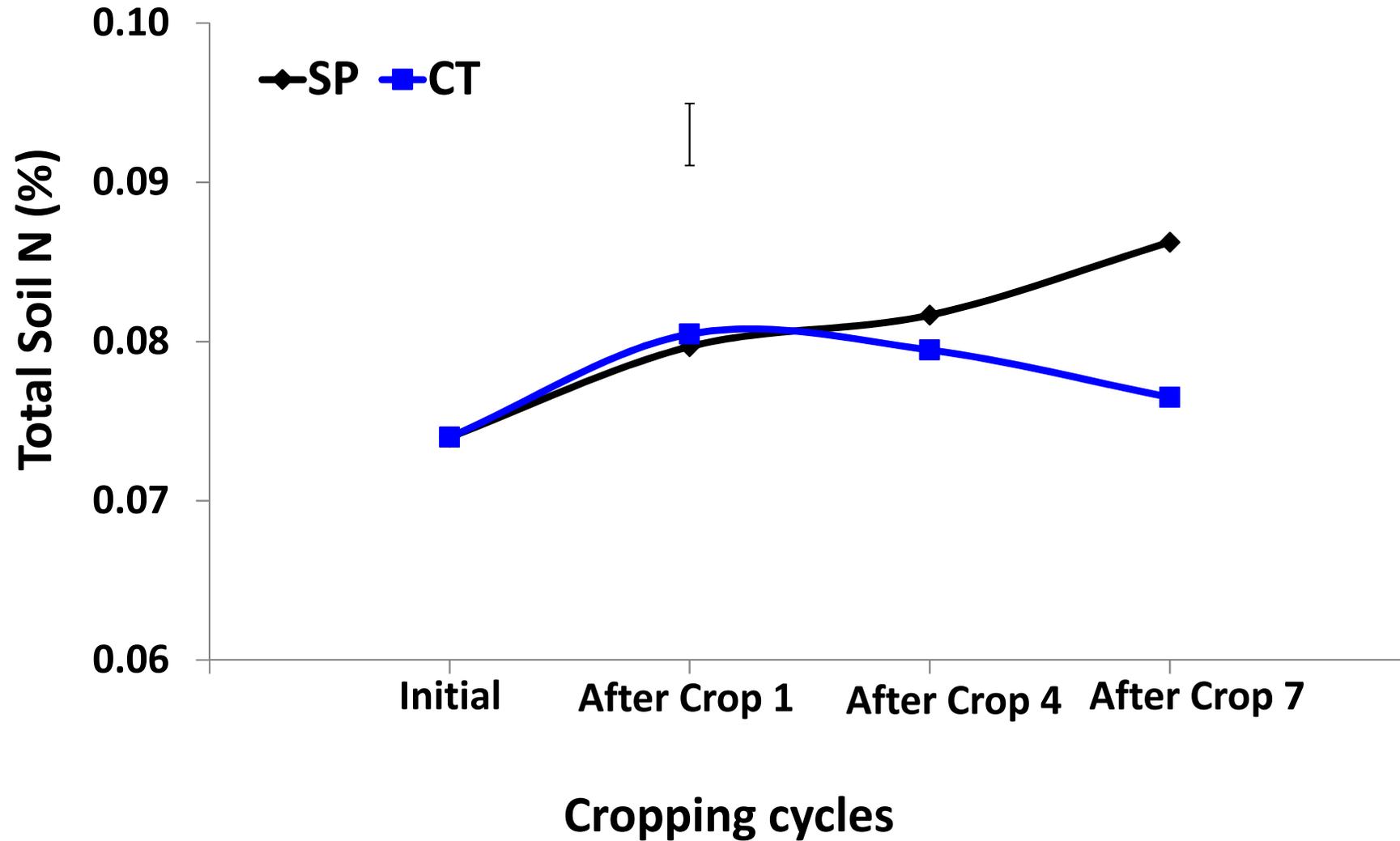
Estimated N Balance

(Final N stock and total inputs – Initial N-stocks and total outputs)





Soil N status overtime (at 0-15 cm)

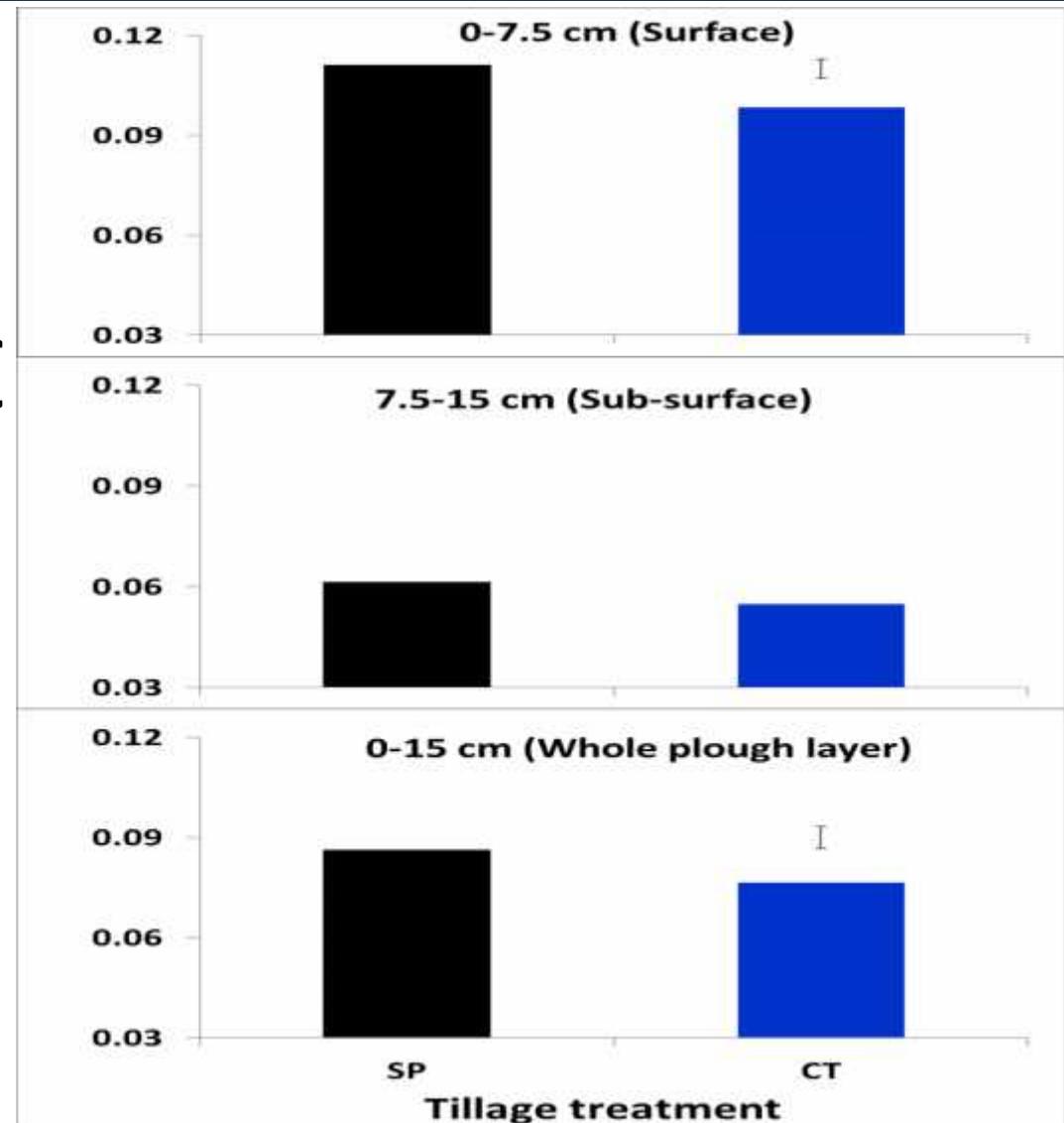




Total soil N (%)

Soil disturbance effects

Total Soil N (%)



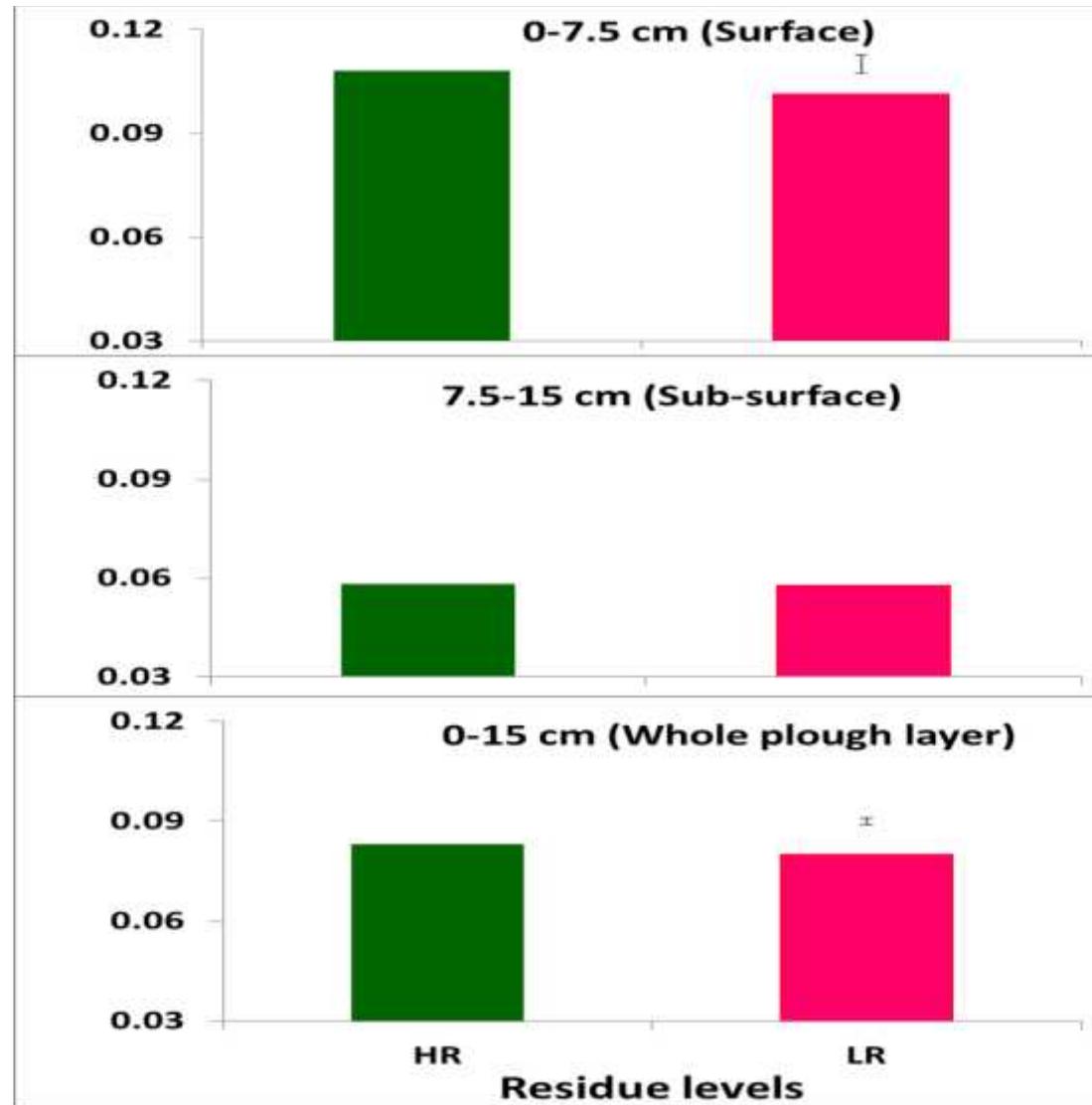


Total soil N (%)

Residue effects

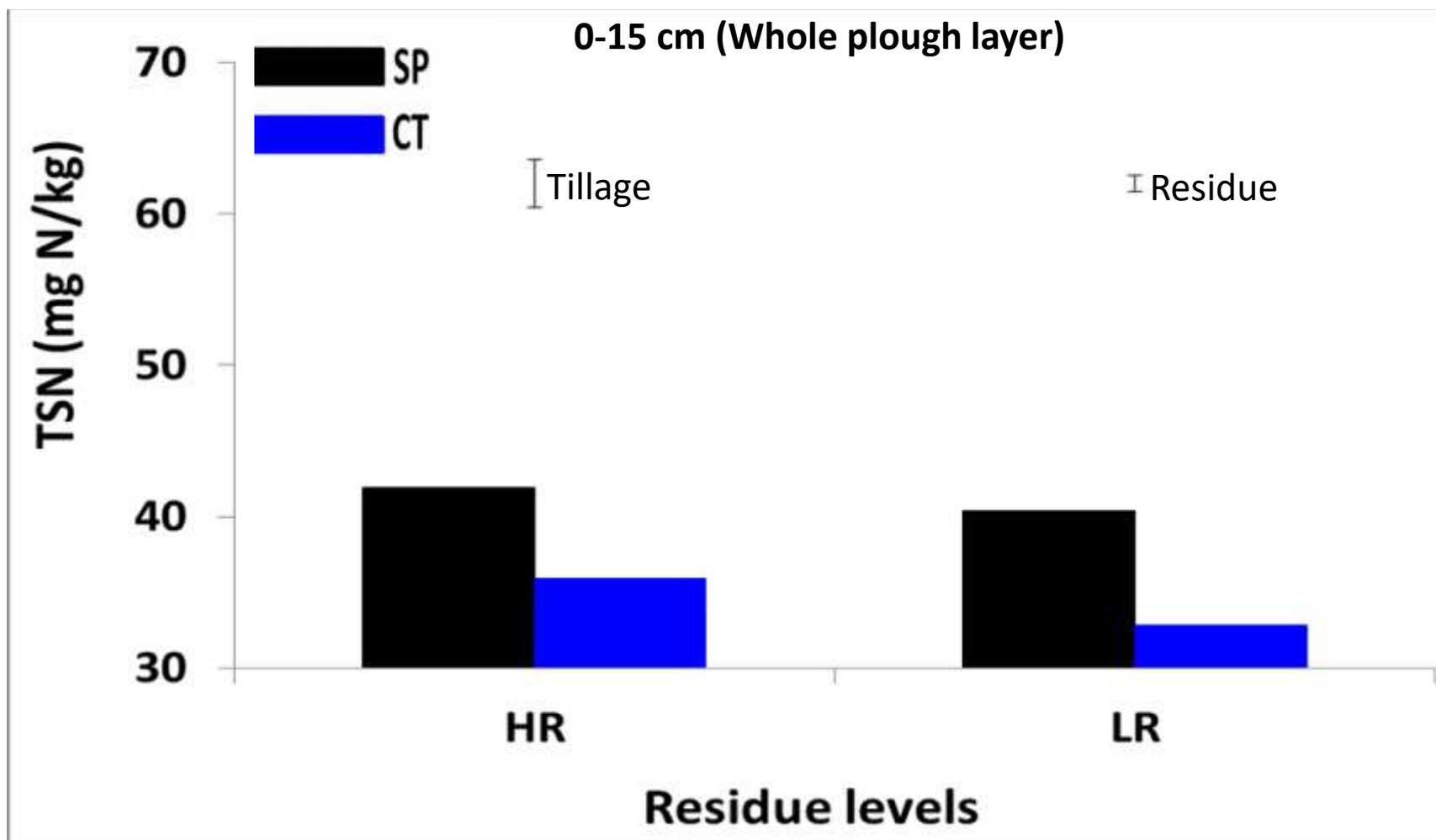


Total Soil N (%)





Total soluble N (after Crop 7)



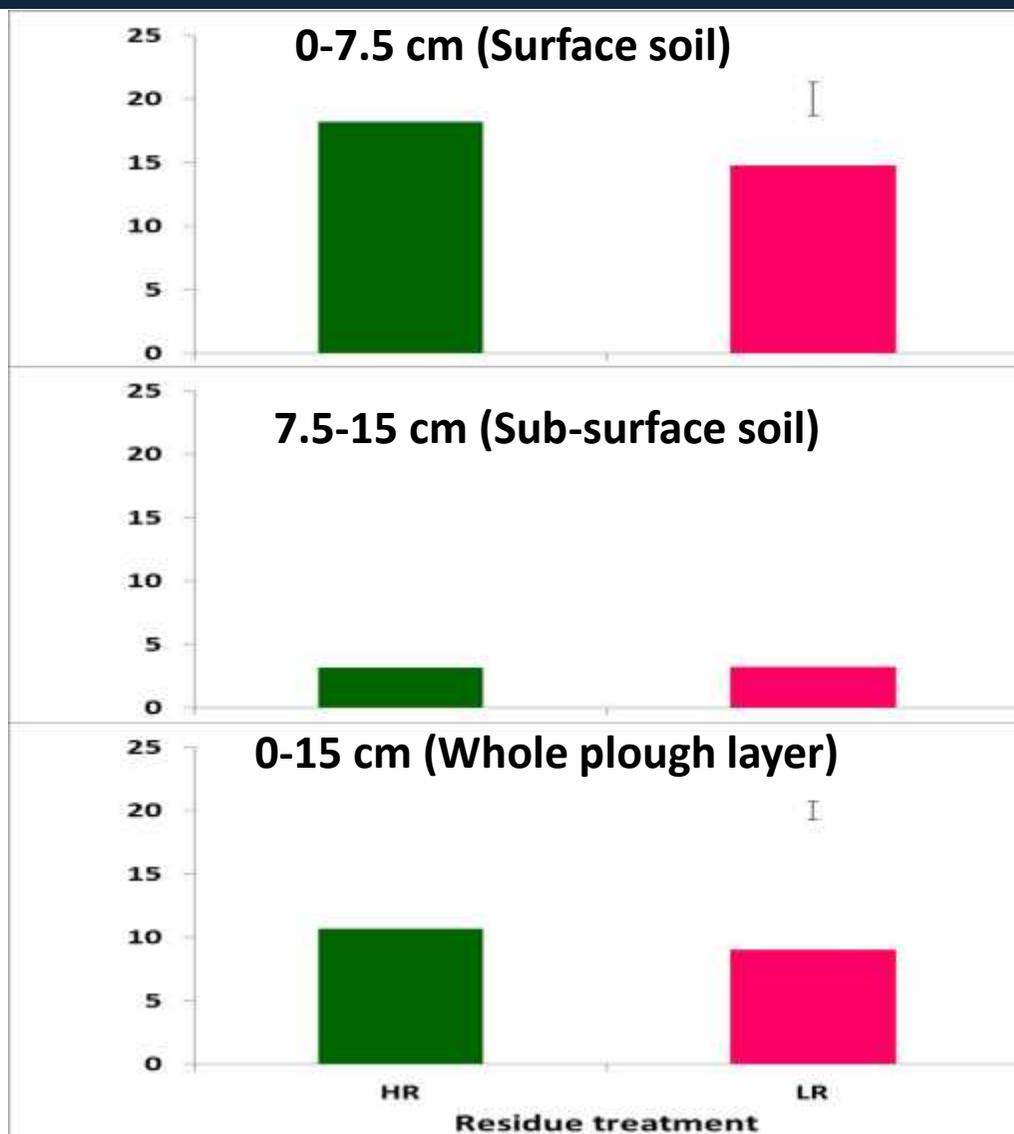


Potentially Mineralizable N

(at 60 DAS during Crop 7)

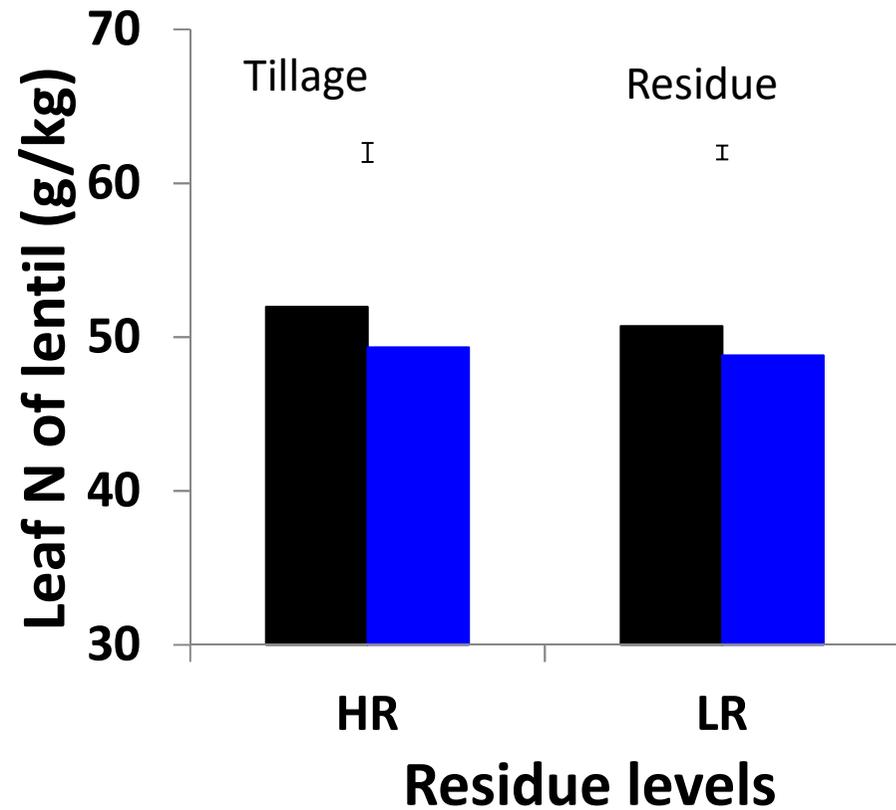
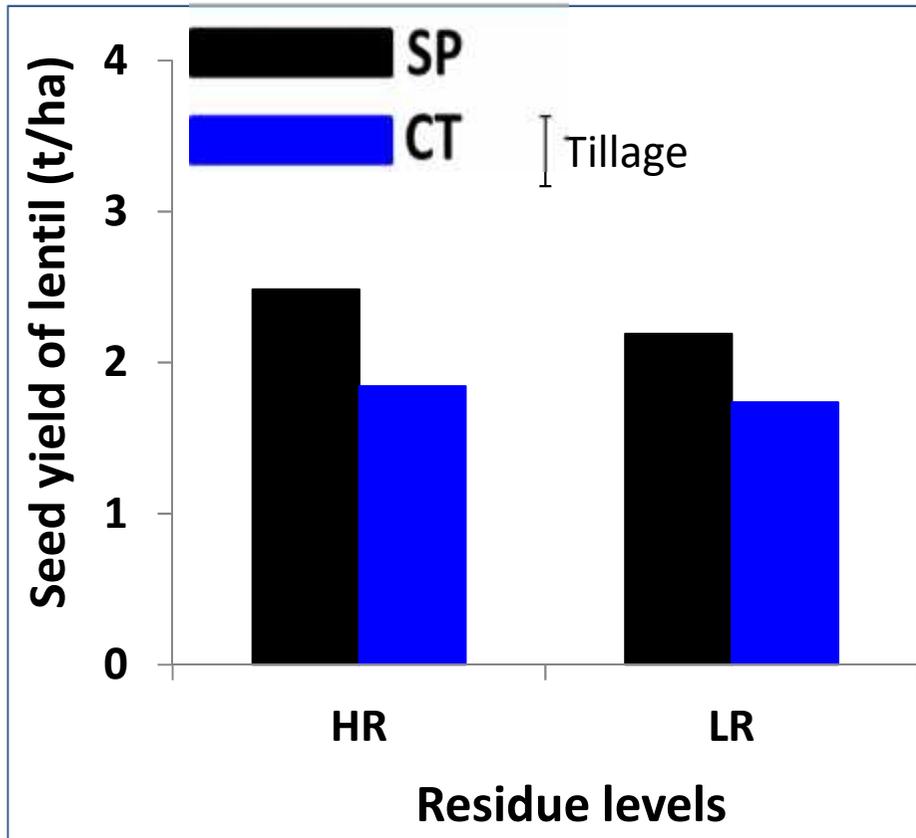


PMN (mg N/kg)





Yield and leaf N of Crop 7





Key Findings

- **Strip planting and HR increased the total soil N, N-stocks , N accumulation rate, plant N, and crop yield**
- **High residue retention produced a positive N balance**
- **Labile N – PMN and TSN increased in SP and HR**



Implications

- **Increase in soil N pool may decrease N requirements overtime in SP and HR**
- **Continue to study effect of soil disturbance and residue on N dynamics in this legume-dominant and in cereal dominant rice-based systems of Bangladesh**



Acknowledgements

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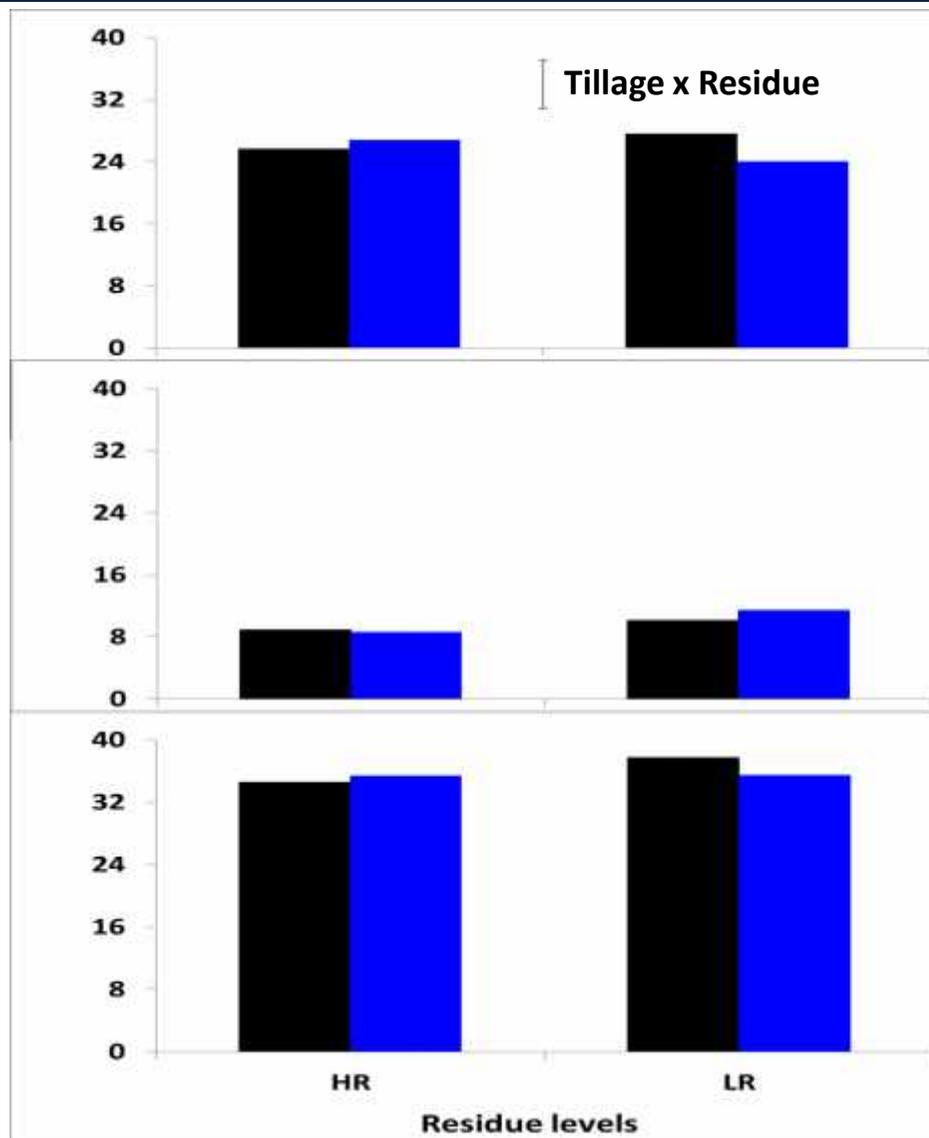
Questions





Mineral N

(at 60 DAS during Crop 7)



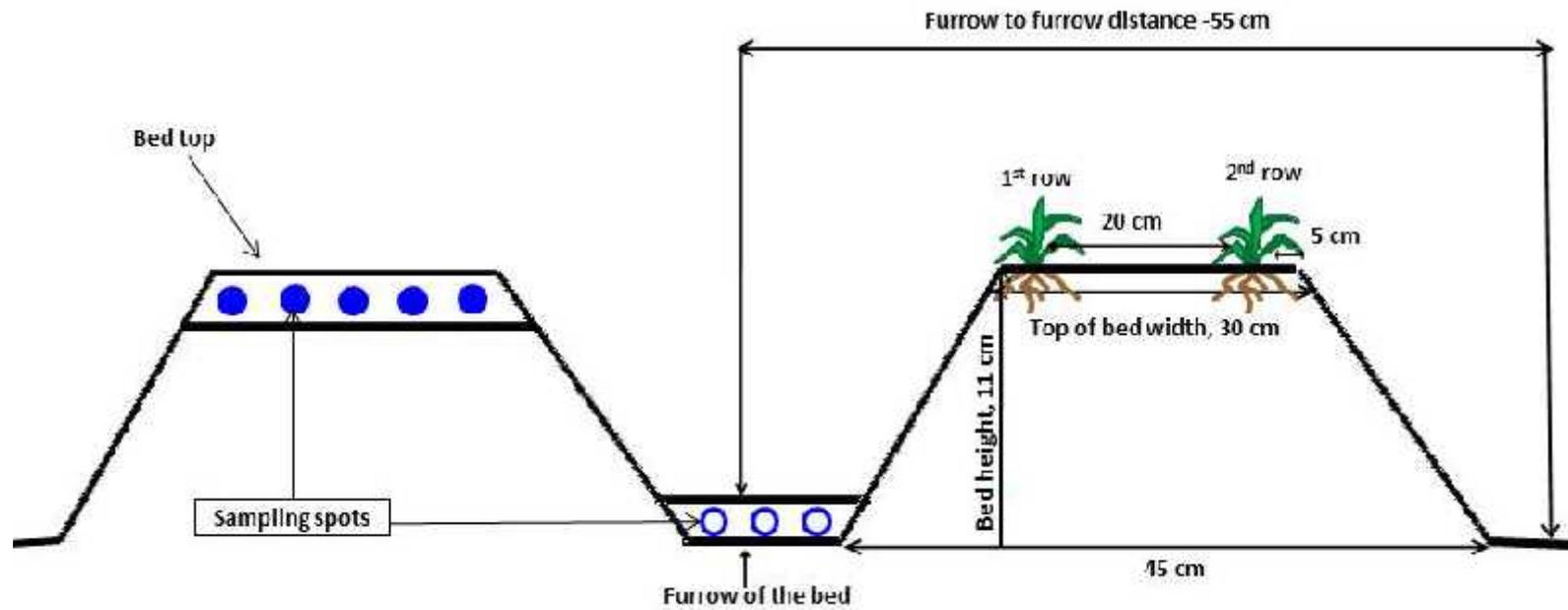
NH₄-N

NO₃-N

Mineral N (NH₄-N + NO₃-N)



Bed planting





Annual N accumulation rate at 0-15 cm

