Department of Soil Science
Soil Management Group

Murdoch UNIVERSITY

Strip planting decreases nitrogen fertilizer requirements while retention of more residue increases them in a rice-wheat-mungbean sequence on a subtropical floodplain soil

MA Kader* M Jahiruddin, M S Hasan, MR Islam, ME Haque, MS Hasan, S Karmaker, MM Ali, Richard Bell

Characteristics of South-Asian Farming

- Intensive cultivation: 2-3 crops annually

- Small, subsistence and mostly non-mechanized
- Crop residues are exported to use as fuel and animal feed
- Requires puddling

Adoption of CA in Rice Based Farming?

- Puddling?

- Huge Crop residues (5.5+4.5+3.5=13.5 t/ha)

Risk of N immobilization

Research Question??

To examine whether minimum tillage with residue retention altered nitrogen requirement for crops in a rice-wheat-mungbean sequence

How it was tested?

Experiment Brief

Location	BAU farm, Mymensingh
Soil	Aeric Haplaquept
Crop	Rice-wheat-mungbean
Variety	BINA dhan7 –BARI gom25-BINA mung8
Design	Split–plot, Replication : 3 Main plots : Tillage, Sub-plots : Residue retention Sub-sub-plots :N rates
Unit plot	7m x 7m
Duration	Three years (9 crops sequentially)

How it was done?

Treatments

Three factorial expt- Tillage, residue retentions and N rates

Factor A: Tillage (2)

Strip Planting (SP)

Conventional tillage (CT)

Factor B: Residue retention (2)

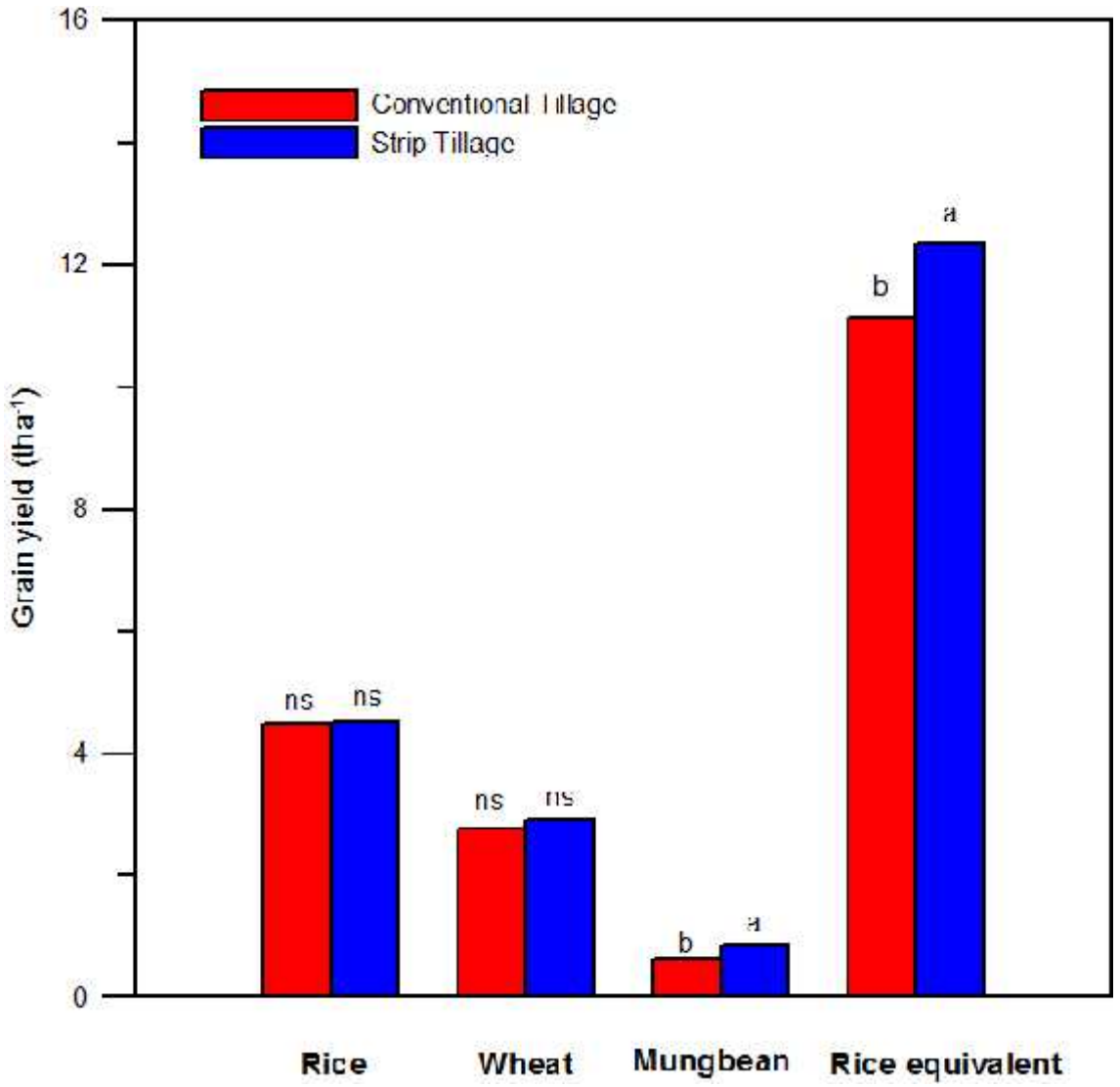
20 and 60% residue retention

Factor C: N rates (5)

60, 80, 100, 120 & 140% Recommended N

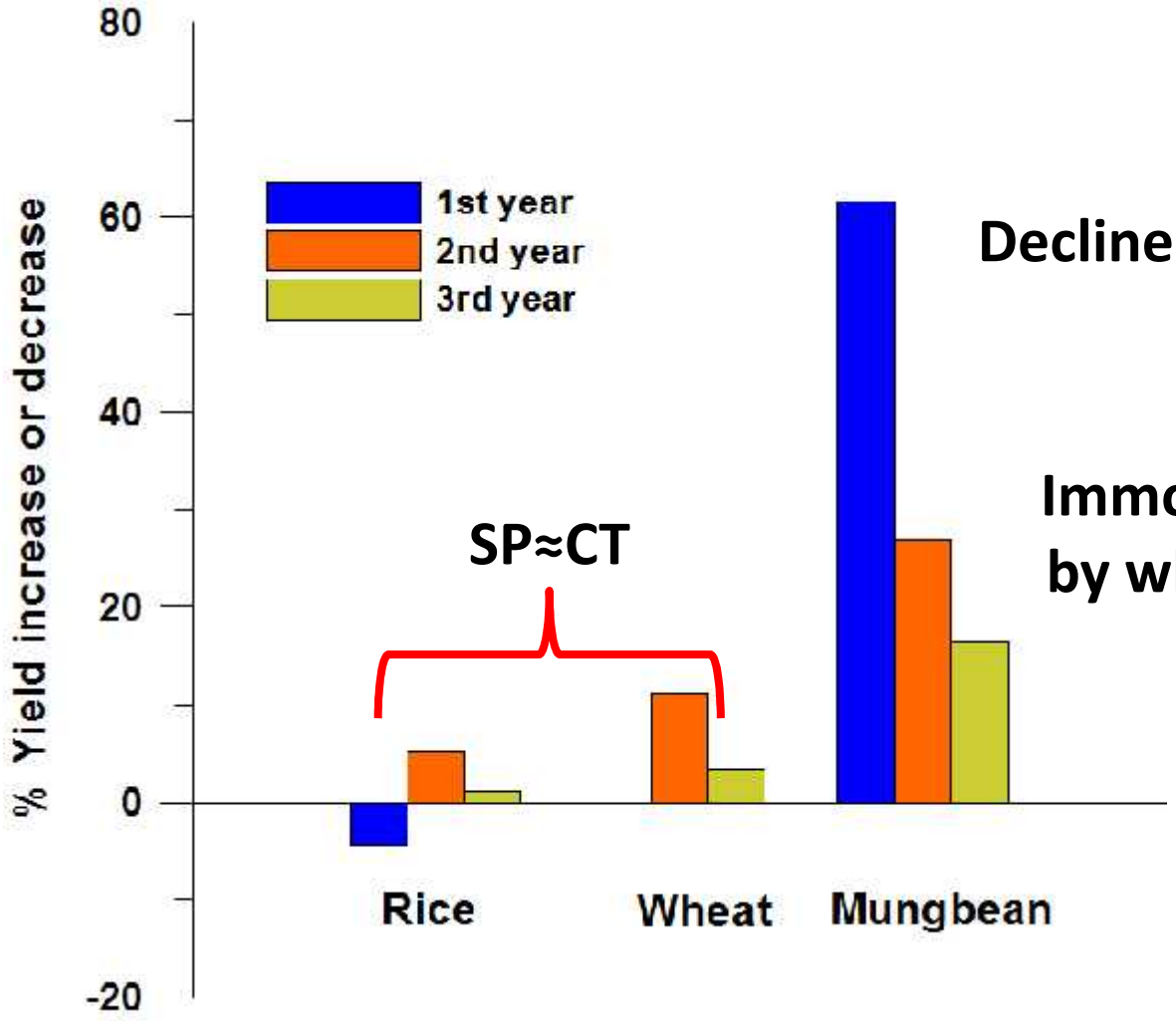
100% N rate: 75, 100 & 20 kg N ha^{-1} for rice, wheat & mungbean

Tillage effect



SP>CT

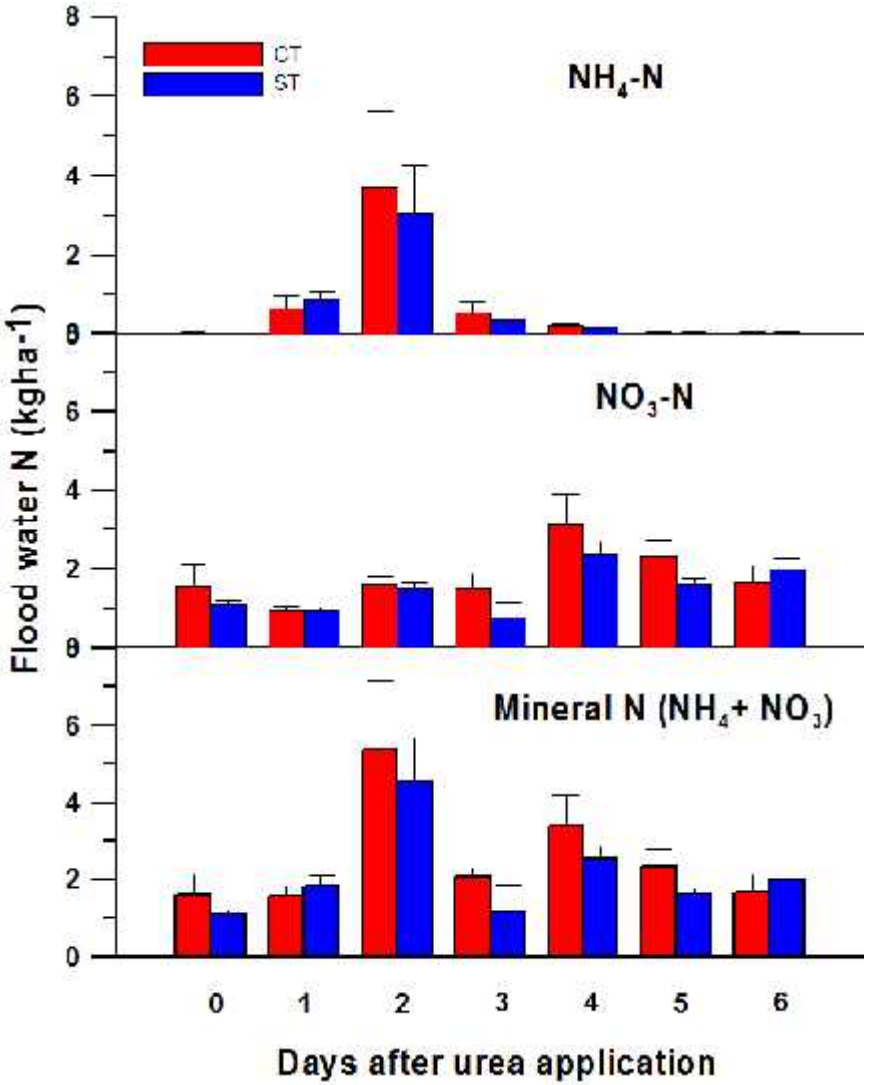
Tillage effect



Declined over time

Immobilization of N by wheat residues?

Floodwater mineral N: CT *vs* SP



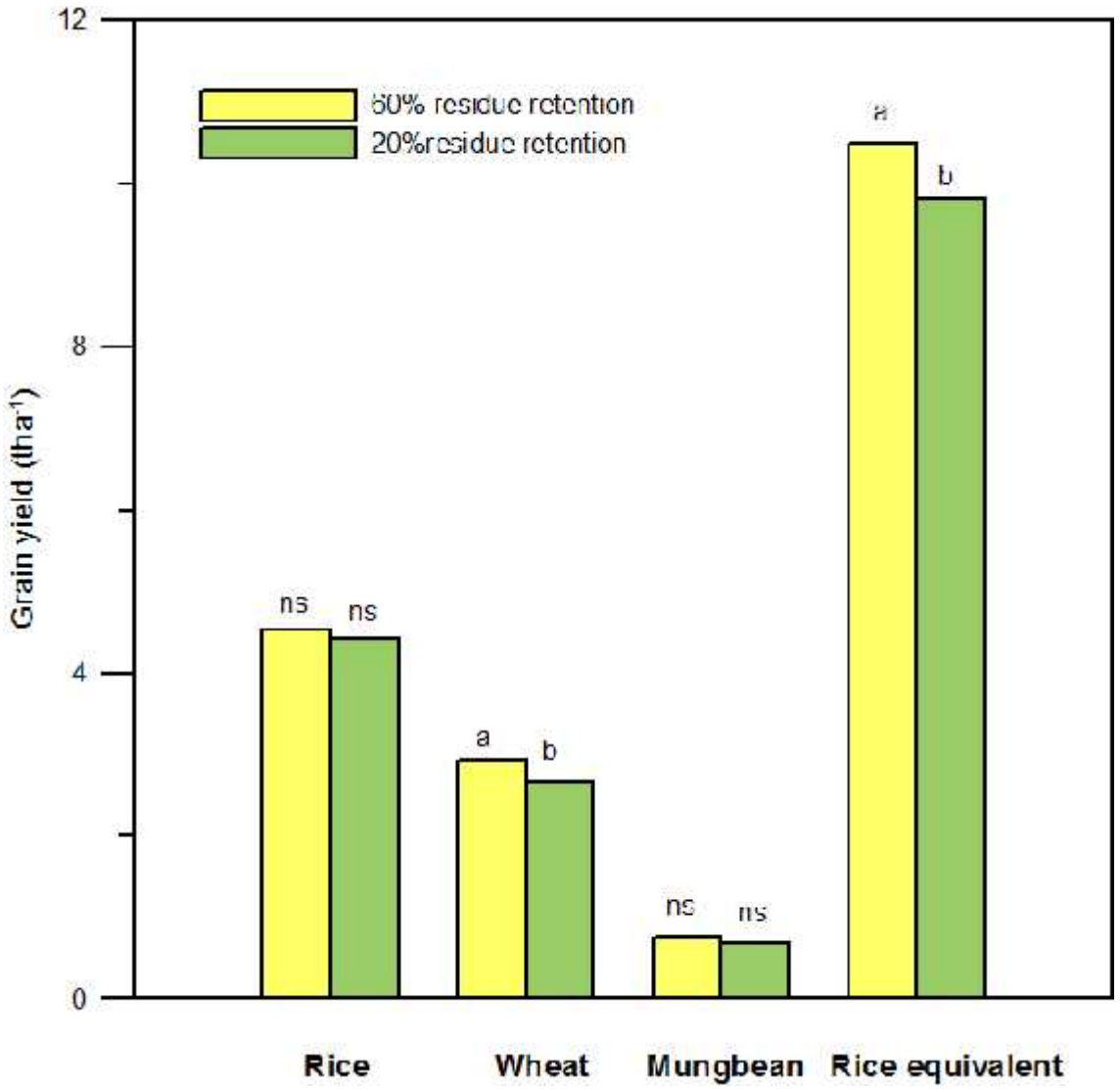
CT>SP

CT>SP

CT>SP

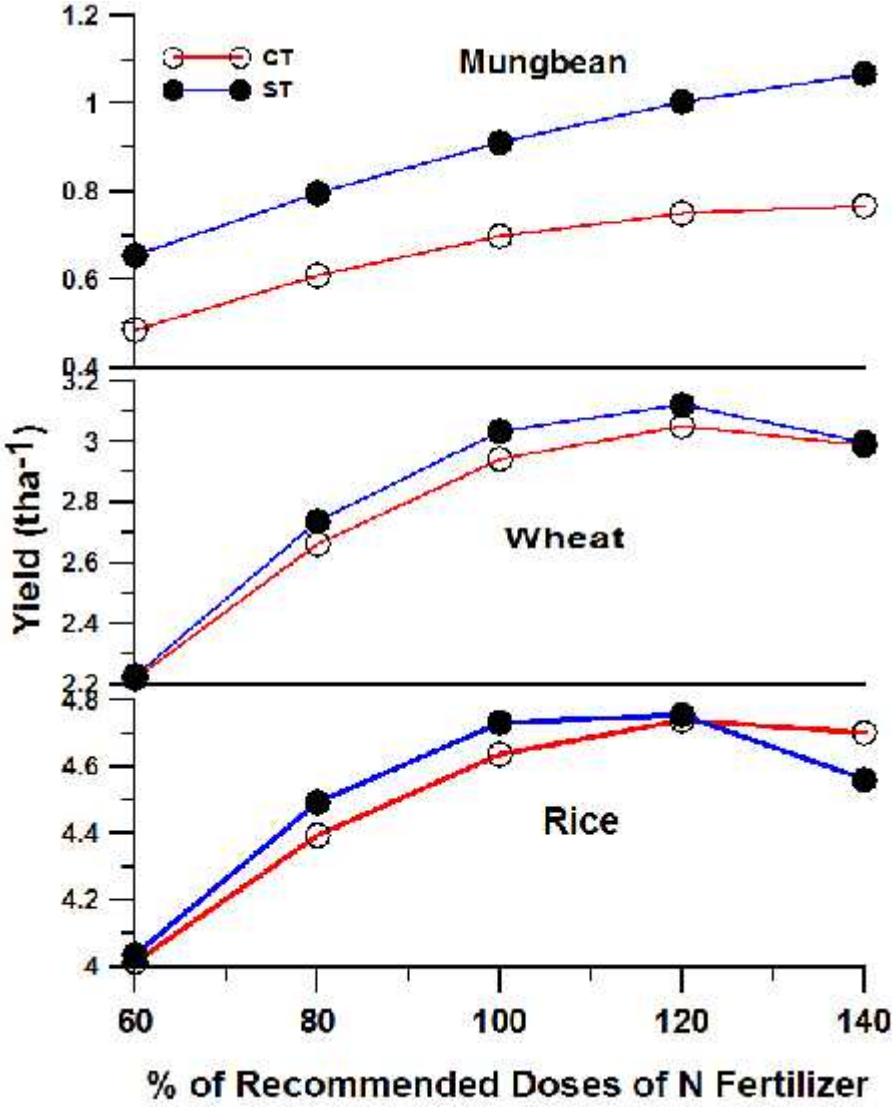
Higher risk of N loss in CT

Residue retention effect



60%>20%

Crop response curve for N



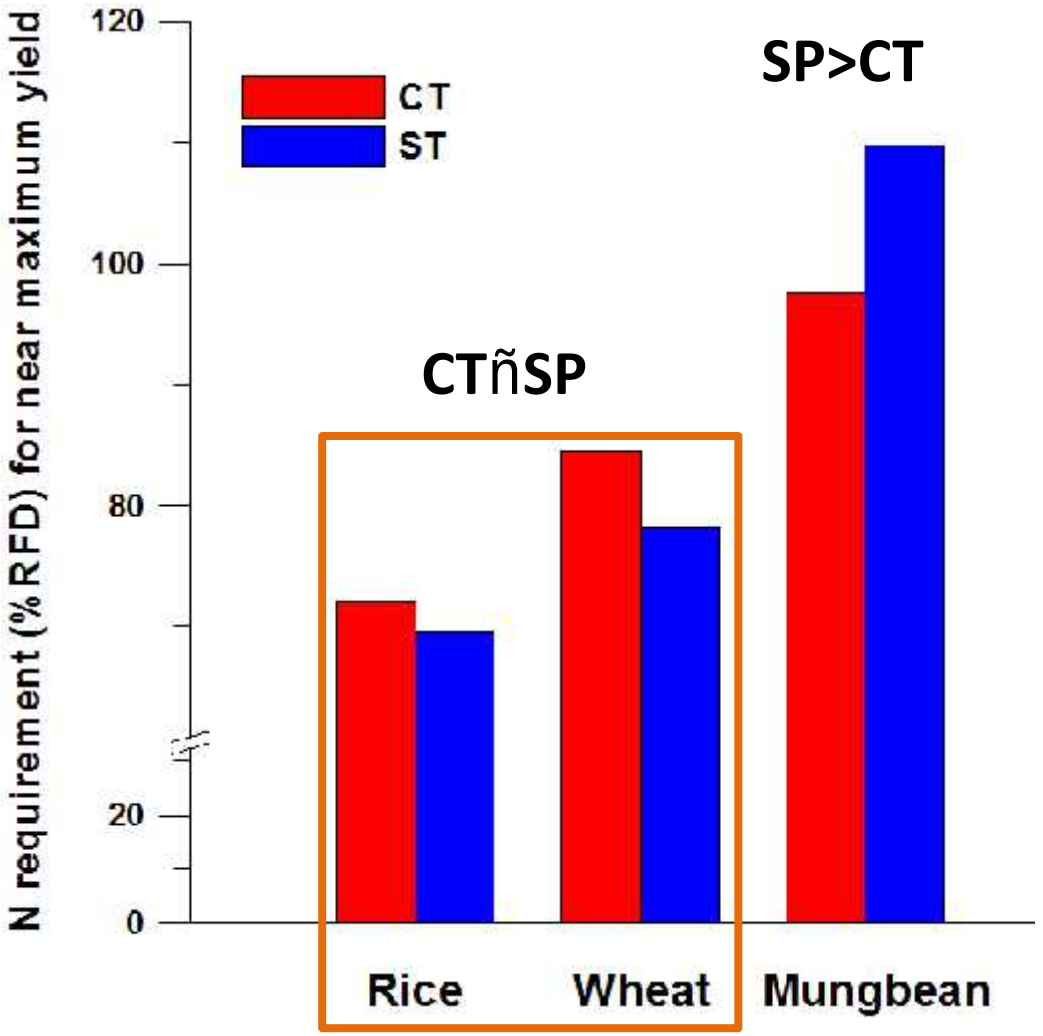
SP response to N > CT

SP N response similar to CT

Nitrogen requirements

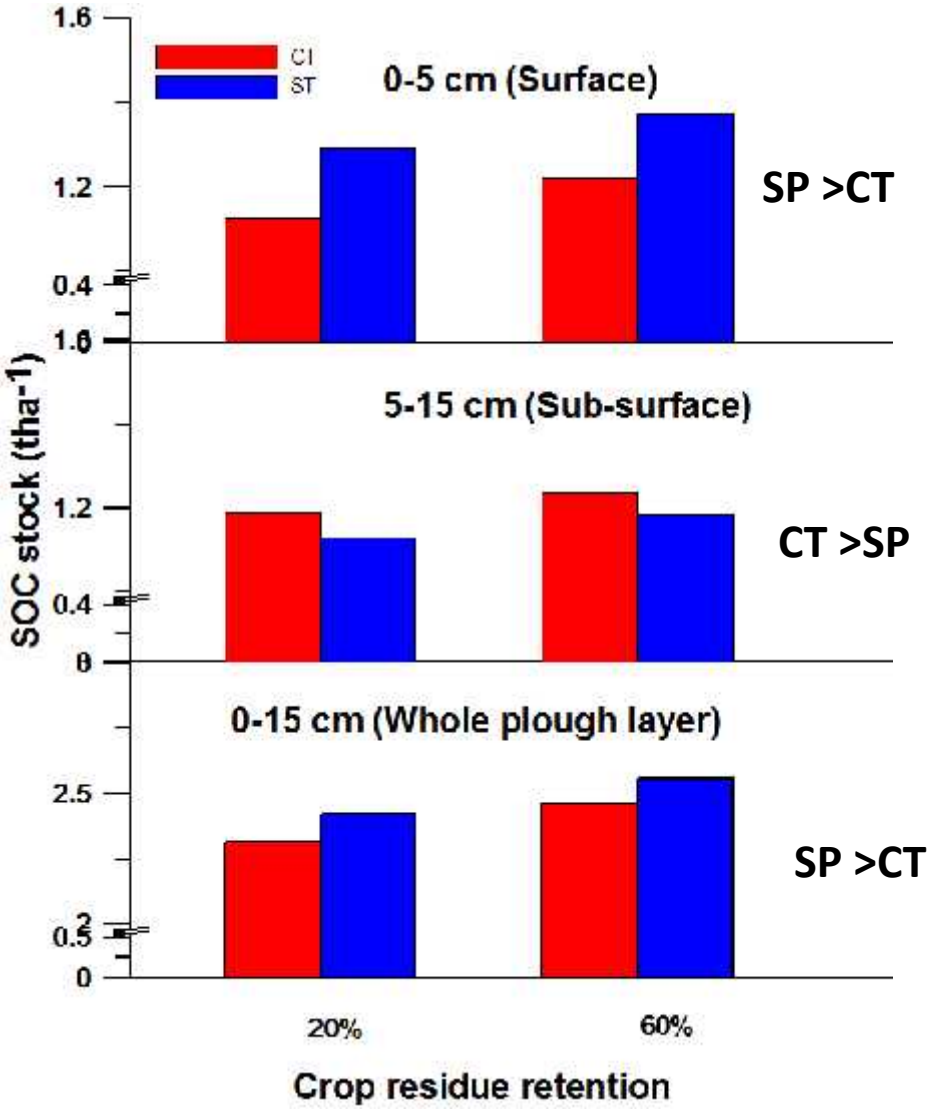
Quadratic equation

$$ax^2 + bx + c = 0$$



Soil Organic Carbon

- Redistribution of SOC
- Net increase of SOC



Key Findings

- ✓ SP and increased residue retention increase crop yield
- ✓ SP and increased residue retention did not alter N requirements of rice and wheat
- ✓ The retained wheat residue immobilized N and increased N requirement for mungbean in SP
- ✓ SP and increased residue retention increased SOC

Thank you

Australian Government
Department of Education

ACIAR

Murdoch
UNIVERSITY

Residue retention effect