Table S1: Initial soil properties of the experimental field at 0-15 cm soil layer.

Parameter	Method of Analysis	Value
pH	Saturation Extract	7.6
EC (dS m^{-1})	Water suspension	0.34
Organic Carbon (%)	Rapid titration method	0.50
Available Nitrogen (kg ha^{-1})	Alkaline permanganate	95
Available Phosphorous (kg ha^{-1})	Olsen's colorimeter method	16
Available Potassium (kg ha^{-1})	Flame photometer method	281
Available Sulphur (kg ha^{-1})	Turbidometry method	16
Available Iron (ppm)	Atomic absorption spectrophotometer	13.04

Table S2: Summary of the tillage, crop establishment, residue management and legume integration under various treatments in the study.

Treatments Abbreviation	Tillage and crop establishment		Residue management
	Rice	Wheat	Both crops
CTR-CTW	3 passes of dry tillage with harrow, 2 passes of cultivator in ponded water followed by 1 planking. Rice seedlings were manually transplanted in random geometry	2 passes of harrow, 1 pass of cultivator followed by 1 planking. Wheat seeds were broadcasted in random geometry	All removed
CTR-CTW+GG	Same as CTR-CTW	Same as CTR-CTW. Green gram seeds soaked overnight and broadcasted at last irrigation of wheat	All removed
ZTR-ZTW	No preparatory tillage. Dry rice seeds were directly seeded on flat soil in row geometry using no-till seed-cum-fertilizer drill.	No preparatory tillage. Wheat seeds are directly seeded on flat soil in row geometry using no-till seed-cum-fertilizer drill	All removed
ZTR-ZTW+GG	Same as ZTR-ZTW	Same as ZTR-ZTW. Green gram seeds soaked overnight and broadcasted at last irrigation of wheat	All removed
ZTR-ZTW+R	Same as in ZTR-ZTW except that seeding was done with 'turbo-happy	Same as in ZTR-ZTW except that seeding was done with 'turbo-happy seeder'	All retained

	seeder' a no-till drill that can seed in presence of crop residues		
ZTR-ZTW+R+GG	Same as ZTR-ZTW+R	Same as ZTR-ZTW+R. Green gram seeds soaked overnight and broadcasted at last irrigation of wheat	All retained

Table S3: Estimates of carbon emissions for a range of farm operations and agricultural inputs and energy use.

Agronomic inputs/Farm operation	Unit	Equivalent CO_2 emission (kg CO_2-eq per unit)	References
Seed (Rice and Wheat)	kg	0.48	(West and Marland, 2002)
Harrowing	ha	21.27	(Lal, 2004)
Puddling (wet tillage)	ha	21.27	(Lal, 2004)
Planking	ha	7.33	(Lal, 2004)
Field cultivation	ha	14.67	(Lal, 2004)
No-till drilling	ha	13.93	(Lal, 2004)
Energy use	MJ	0.97	(GHG protocol, 2003)
Herbicide	kg/L	23.10	(Lal, 2004)
Fungicide	kg/L	14.30	(Lal, 2004)
Insecticide	kg/L	18.70	(Lal, 2004)
N fertilizer	kg	4.77	(Lal, 2004)
P_2O_5 fertilizer	kg	0.73	(Lal, 2004)
K_2O fertilizer	kg	0.55	(Lal, 2004)