



Change trends in management practices and their implications on rice-based systems in coastal Bangladesh

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Background

The sustainability of rice based systems in coastal areas of Bangladesh is at risk by effects of climate change and saltwater intrusion, requiring changes in production systems. The adaptive capacity to meet such requirements depends on environmental conditions and farmers' resource endowment. Thus, agronomic practices change between sites, seasons and households.

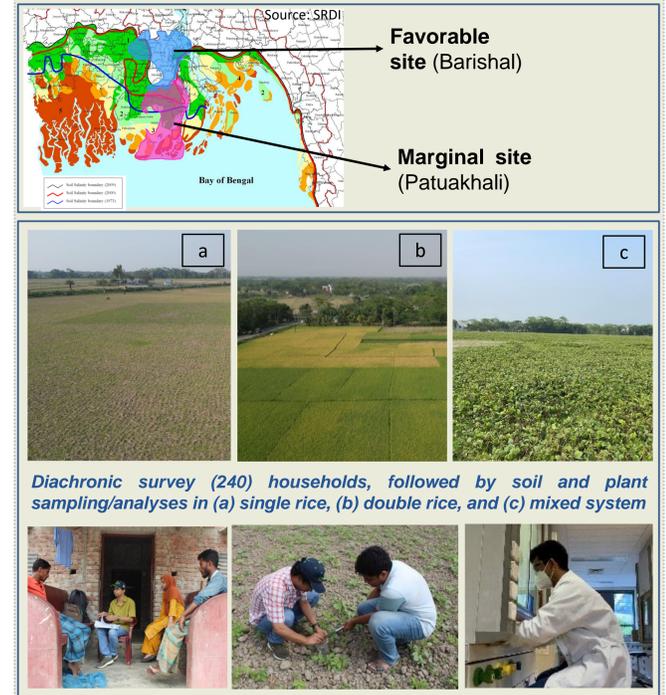
We hypothesize that understanding recent effects of external pressures and system-immanent drivers on agronomic practices and performance attributes will permit forecasting future trends. Consequently, we addressed the following objectives:

- Quantify recent change trends (2011 vs. 2021) in management practices and yield of major rice-based systems
- Assess differences between favorable and marginal sites.
- Relate observed changes to site conditions and farmer attributes.



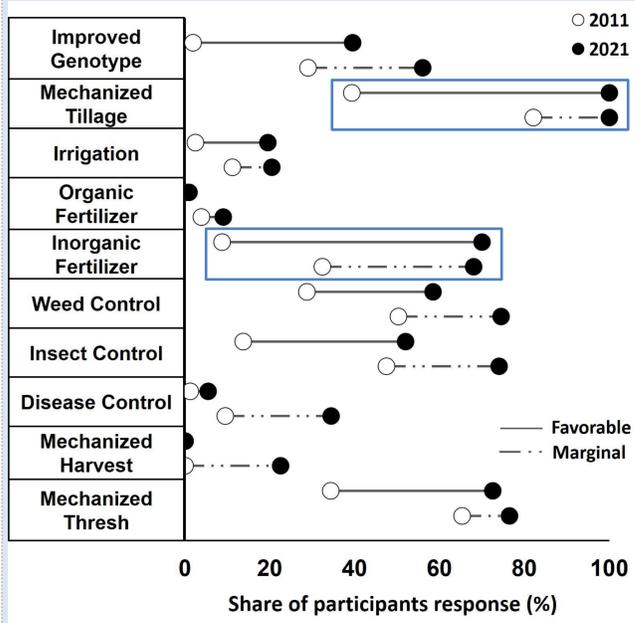
Coastal zone of Bangladesh; a) Saline soil ; b) sea water intrusion

Materials and methods



Diachronic survey (240) households, followed by soil and plant sampling/analyses in (a) single rice, (b) double rice, and (c) mixed system

Shift in agronomic practices

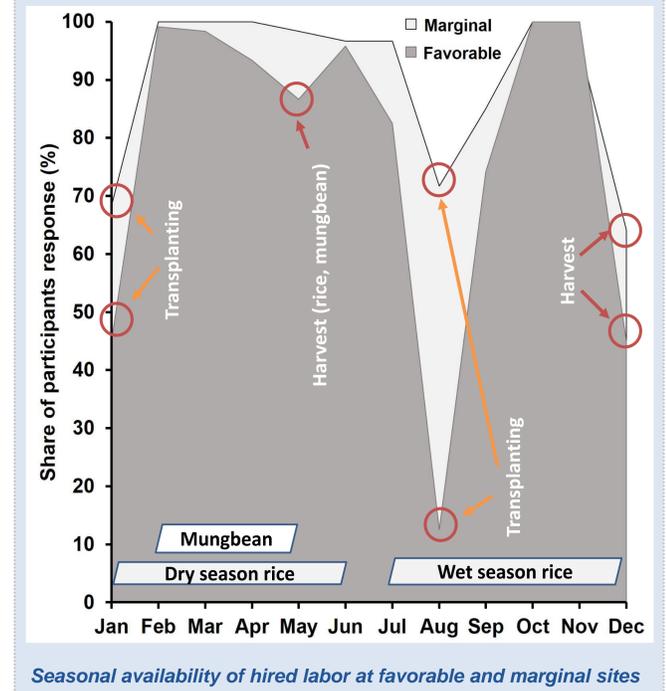


Trends in production practices (2011 vs. 2021) at favorable and marginal sites

Conclusions

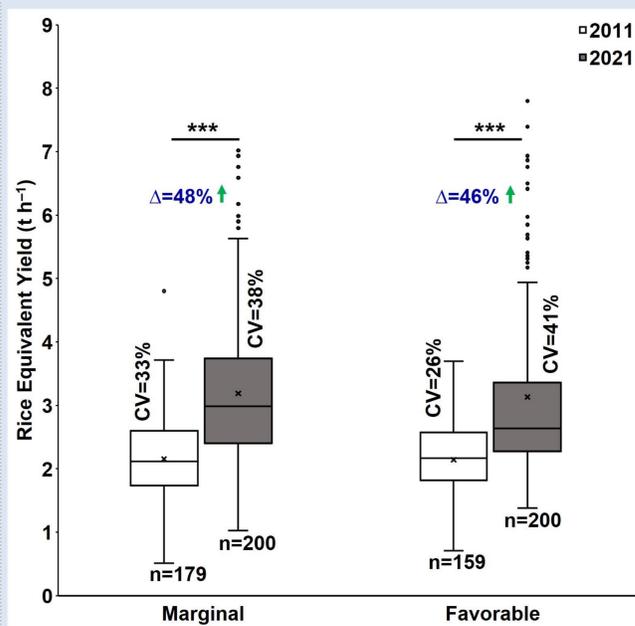
- Recent change trends were more at the favorable than at the marginal site
- Most pronounced were changes in mechanization and mineral fertilizer N use.
- Changes were driven by labor shortage (favorable site) and low soil fertility (marginal site)
- Grain yields were similar between seasons and sites, despite higher input use at the marginal site

Seasonal labor shortage



Seasonal availability of hired labor at favorable and marginal sites

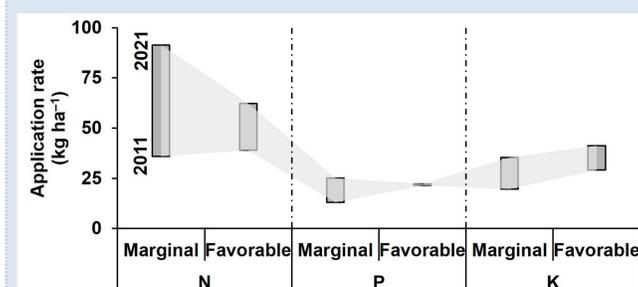
Grain yields



Changes in rice grain yield (2011 vs. 2021) at both favorable and marginal sites ($p < 0.001$, Tukey's test)

Soil fertility & fertilizer use

Attributes	Marginal	Favorable	P value
pH	4.8 ± 0.1	5.4 ± 0.21	0.020
EC (µS/cm)	504 ± 61	85 ± 5	0.000
C (%)	1.00 ± 0.03	1.4 ± 0.09	0.000
N (%)	0.12 ± 0.01	0.11 ± 0.01	0.000
CN ratio	8.9 ± 0.19	9.4 ± 0.15	0.020
P (mg/kg)	44 ± 0.9	45 ± 0.92	0.499
K (mg/kg)	101 ± 0.8	58 ± 0.4	0.000



Differences in fertility attributes (upper) and mineral fertilizer use (2011 vs. 2021) at both favorable and marginal sites

Implications of labor shortage



Changes towards mechanization with emerging labor shortage. a) oxen vs. tiller ploughing, b) manual vs. combine harvester