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Changing trends in management practices and their implications for production under different rice-based systems in coastal Bangladesh

MD AMIRUL ISLAM¹, SHYAM PARIYAR¹, TIMOTHY J. KRUPNIK², MATHIAS BECKER¹

¹University of Bonn, Inst. Crop Sci. and Res. Conserv. (INRES) - Plant Nutrition, Germany

²International Maize and Wheat Improvement Center (CIMMYT), Sustainable Intensification Program, Bangladesh

Abstract

The predominant rice-based systems in coastal areas of South and Southeast Asia are at risk by effects of climate change and tidal salt intrusion. The combined external and internal factors influence farmers to intensify or diversify their production systems. Thus, the resulting emergence of new cropping patterns and associated practices may require changes in input use and crop management practices. We aimed to understand current and likely future change trends in agronomic practices and yield, and to identify likely causes and drivers of change. Through a diachronic household survey (comparing 2021 with 2011) in two contrasting coastal districts of southern Bangladesh i.e., i) marginal & saline, and ii) more favourable, we examined change trends from 240 farms in three rice-based cropping systems: (1) extensive rice-fallow, (2) intensified double rice, and (3) diversified rice-mungbean rotations. Survey data were complemented by soil samples for physio-chemical attributes analysis. Results reveal that recent change trends concern mainly the mechanisation of tillage operations and increased application rates of mineral fertilisers. Such changes were more at the favourable sites (61% of farmers shifting to mechanisation and 63% increasing fertiliser application rates) than at the marginal site (18% increase in mechanisation and 36% in fertiliser use). The three cropping systems also differed, with largest variations in mechanisation levels in intensive double cropped, and highest diversity in fertiliser use in single rice and diversified systems. Change trends in agronomic practices were more in the dry than in the wet season, irrespective of the site. Despite notable differences in agronomic practices, rice yields did not differ significantly between season and sites. However, yield (rice equivalent) variability, and thus the uncertainty in the outcome of farmers' investments, was higher in the dry than in the wet season, with rice yields of 3.5–7.8 t ha⁻¹ and mungbean yields of 1.0–4.1 t ha⁻¹. The study highlights that recent change trends differ between sites and seasons, while the resulting yields and yield variabilities differ mainly between seasons and production systems. Consequently, there is a need for site, system, and season-specific assessments of change trends and their implications in coastal rice production areas.

Keywords: Diversification, intensification, mechanisation, *Oryza sativa*, salinity, *Vigna radiata*