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Crop–livestock integration and smallholder livelihood resilience in South Asia

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Abstract

Smallholder livelihoods in South Asia are increasingly vulnerable to climate change, driven by rising temperatures, erratic rainfall, droughts, and extreme weather events. Integrated crop–livestock systems offer a critical pathway to enhance resilience by diversifying income sources, improving resource-use efficiency, and supporting ecological sustainability. Despite a broader trend toward agricultural specialisation, mixed crop–livestock systems remain widespread, with varying levels of intensification across agro-ecological contexts, resulting in uneven livelihood outcomes. This study examines how crop–livestock integration sustains smallholder livelihoods under changing climatic conditions and evaluates the role of sustainable intensification in strengthening resilience.

The analysis draws on a trans-regional survey of 480 households across three sites in two countries: India (Udaipur and Karnal) and Bangladesh (Dinajpur). These sites represent distinct levels of crop–livestock intensification under contrasting agro-ecological and socio-economic conditions. Udaipur represents a low-intensity system, characterised by limited institutional support, poor irrigation, weak market access, and low adoption of improved technologies, with nearly 70 % of land under forest or pasture. Karnal reflects a high-intensity system, supported by robust irrigation infrastructure, strong institutional linkages, efficient market access, and widespread use of modern technologies. Dinajpur represents a medium-intensity system, with moderate access to markets, irrigation, and technologies, alongside high population density.

Results show that higher levels of crop–livestock intensification are associated with improved livelihood outcomes, including higher farm incomes, diversified income portfolios, and lower poverty incidence. In high-intensity systems such as Karnal, farmers derive substantial returns from both crop and livestock enterprises. In contrast, in low-intensity systems like Udaipur, nearly 60 % of household income originates from off-farm activities. Livestock plays a crucial buffering role, particularly during crop failure, when households sell animals (e.g., goats) and reinvest in farming, including irrigation improvements. In Dinajpur, crops and livestock contribute nearly equally to household income, reflecting balanced integration. Non-farm income also supports gradual intensification across systems.

Overall, the findings highlight the need for context-specific crop–livestock integration pathways that enhance livelihood resilience while maintaining ecological sustainability under climate change.

Keywords: Crop-livestock farms and livelihood, intensification

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