Crop–livestock integration and smallholder livelihood resilience in South Asia

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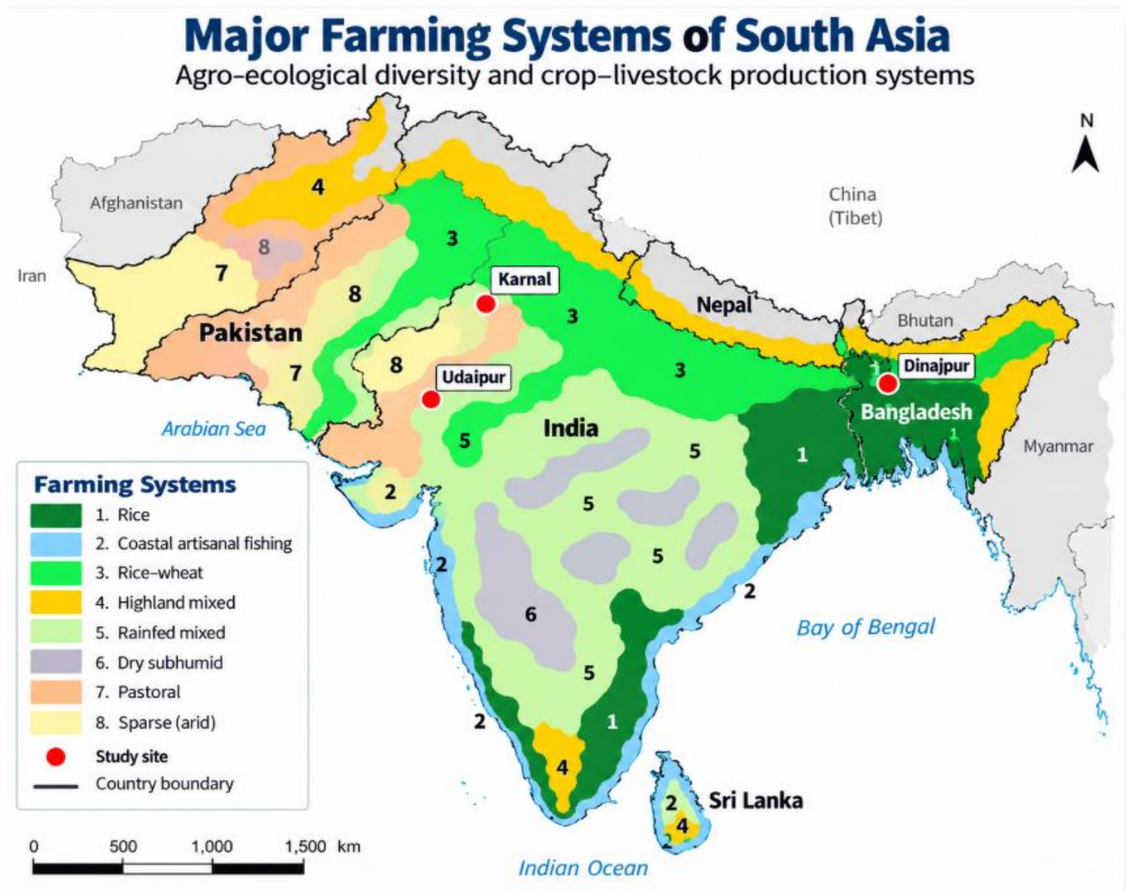
Background

- **Climate risks are rising:** Higher temperatures, erratic rainfall, droughts and extreme weather increasingly threaten smallholder livelihoods in South Asia *(IPCC, 2022; Aryal et al., 2020).*
- **Livelihoods are under pressure:** Climate shocks reduce crop and livestock productivity, increase water and feed insecurity, and destabilize farm incomes.
- **Crop–livestock integration builds resilience: Diversified incomes + resource recycling + efficient resource use + livestock** as a financial buffer help farmers withstand climate shocks *(Swain and Teufel, 2016; Singh et al., 2020).*



Objectives

- To assess how different levels of integrated crop–livestock farming influence smallholder livelihood outcomes and resilience to changing climatic conditions.

Materials and Methods

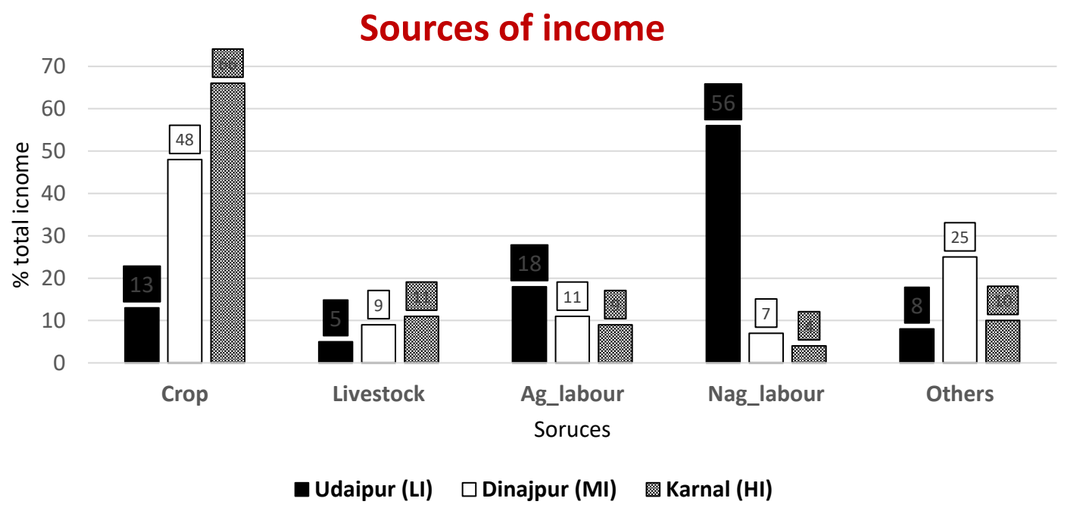
- 480 households | 3 sites | 2 countries
- 160hhs/site | 4 village per site
- GPS and distance method were followed for village selection

Characteristics of Study Site

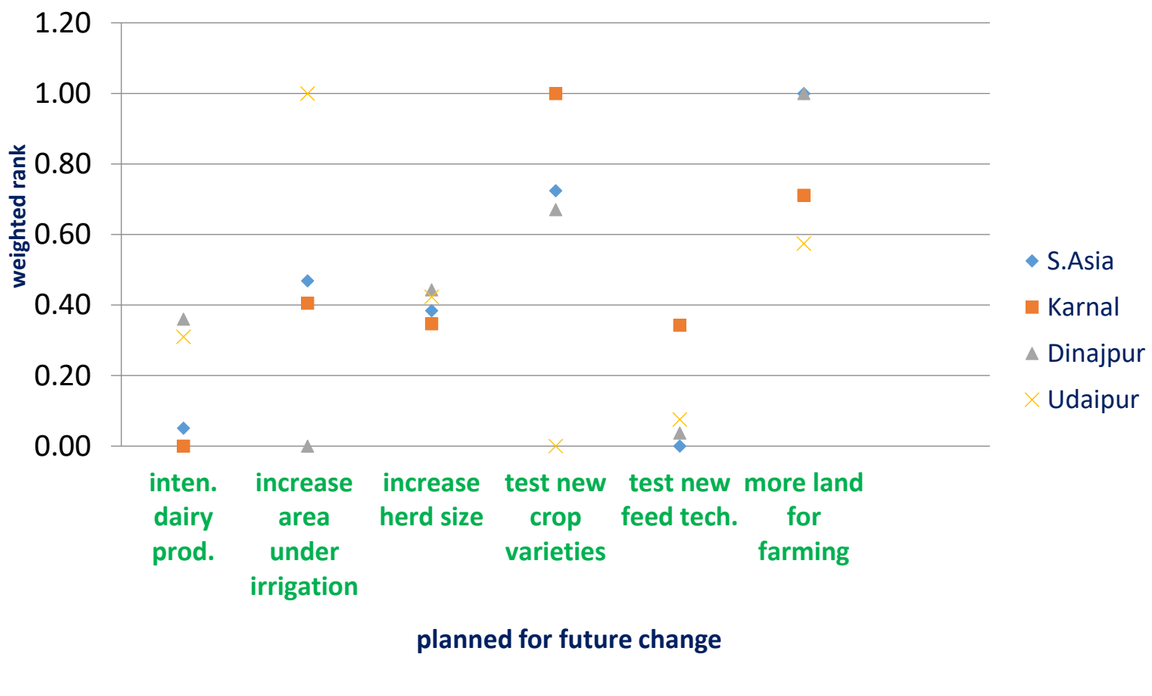
Indicators	Udaipur, India	Dinajpur, Bangladesh	Karnal, India
Intensification	Low	Medium	High
Irrigation	Poor	Moderate	Strong
Market access	Weak	Moderate	Efficient
Institutional support	Weak	Moderate	Strong
Technology adoption	Low	Moderate	High
Land characteristics	70% forest/pasture	High population	Intensive farming
Average herd size (TLU/hh)	3.55	2.99	6.38
Average cultivated land [ha/hh]	0.31	0.52	2.92

Results and Discussion

- Greater crop–livestock integration, coupled with higher farming intensity, is associated with improved farm incomes, diversified livelihoods, and enhanced resilience to climate-related shocks.
  - Karnal: Highly integrated and intensified systems generate strong returns from both crop and livestock, and resilience to climate shocks.
  - Dinajpur: Crop production remains important, while livestock contributes about **9% of** household income; high population pressure and erratic rainfall make livelihoods increasingly vulnerable.
  - Udaipur: The system rely heavily on off-farm income (i.e., daily wage labour), while the livelihood is prone to climatic shock and external environment.



- **More land → improved crop varieties → technology → expanded irrigation** emerge as the leading priorities for future farm development.
  - Karnal: New crop varieties, improved feed technology and access to more land
  - Dinajpur: More land, new crop varieties and larger herds
  - Udaipur: Irrigation, more land and better feed



Conclusion:

- **Crop–livestock integration enhances resilience:** Greater integration and farming intensity improve incomes, livelihood diversification, and climate resilience.
- **Enabling factors matter:** Improved crop and livestock technologies, irrigation, and market access support greater integration and intensification.
- **Context-specific approaches are needed:** Investments should be tailored to local agro-ecological conditions to promote sustainable intensification and climate-resilient livelihoods.

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