

Determinants of Adaptive Capacity in Climate-Stressed Dairy Systems: A Bayesian Model Averaging Case Study from Mullaitivu District, Sri Lanka

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Understanding the determinants of adaptive capacity is vital for enhancing the sustainability of dairy farming systems in climate-stressed tropical drylands. This study investigates the factors influencing the adaptive capacity of dairy cattle farmers in the Mullaitivu District, a heat-stressed and climate-vulnerable region in northern Sri Lanka. Primary data were collected from 391 cattle-farming households across six Veterinary Service ranges. A weighted Adaptive Capacity Index (ACI) was constructed using 14 parameters grouped into seven components—socio-demographics, education, economy, animal husbandry, awareness, food security, and sanitation. Factor analysis ($|\text{loading}| \geq 0.30$) provided data-driven weights, and Bayesian Model Averaging (BMA) was applied across 64 possible model combinations to address model uncertainty and identify the most credible predictors. Six explanatory variables—farmer age, number of improved cattle, crop diversification, nature of farming, distance to grazing land, and freshwater salinity—were analysed. Crop diversification (PIP = 1.00) and farmer age (PIP = 0.9875) emerged as the strongest positive determinants, underscoring the importance of livelihood diversity and experience in coping with climatic stress. Access to grazing land (PIP = 0.6670) and improved cattle (PIP = 0.4260) also showed positive effects. In contrast, freshwater salinity (PIP = 0.6469) had a consistently negative impact and exhibited strong negative jointness with crop diversification (−6.99), suggesting that diversified systems can buffer the effects of salinity. The nature of farming (PIP = 0.5441) showed a modest negative association. Results, confirmed through robust OLS estimation, emphasize integrating water-quality management and diversified farming strategies into climate adaptation policies for livestock-dependent dry land communities.

Keywords: Cattle farmers, Climate adaptation strategies, Dryland livelihoods, Factor analysis weighting, Model uncertainty

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