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Factors influencing adaptation practices among smallholder farmers in multi-hazard regions: Evidence from Bali, Indonesia

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Abstract

The increasing frequency and severity of natural hazards, particularly climate-induced disasters, put growing pressure on agricultural systems, especially in disaster-prone regions such as Indonesia. Repeated and overlapping shocks are affecting smallholder farmers, challenging their ability to sustain their livelihoods and recover. Extensive research has demonstrated that protective motivation can influence farmers' adaptation practices; however, existing studies focus on single hazards or isolated event contexts. This study examines farmers' adaptation practices in Bali, an Indonesian island characterized by multi-hazard conditions. A quantitative survey was conducted among 367 farming households across three districts between June and August 2025. For analysis, the study adopted a typology-first approach using Latent Class Analysis, and the resulting classes were further analysed using Multinomial Logistic Regression.

The class analysis resulted in three adoption categories: (i) No adoption strategy (81.52 %), (ii) On-farm disaster risk reduction (DRR) and seed strategy (13.75 %), and (iii) Off-farm and water strategy (4.73 %). The multinomial logit results indicate that farmers' adaptation behavior is highly dynamic and offer a more complex understanding than a simple adopter-versus-non-adopter classification. In particular, multi-hazard experience is strongly associated with the adoption of on-farm disaster risk reduction practices and seed-saving strategies. Consistent with previous studies, household income is positively associated with both active adaptation strategies, suggesting that greater economic capacity facilitates farmers' ability to respond to disaster risk. Education, farming experience, and farm size also appear to increase the likelihood of adopting on-farm DRR-oriented practices. In the context of motivation to protect livelihoods, the results show that coping appraisal significantly increases the likelihood of not adopting on-farm practices, suggesting that social support functions more as an informal coping mechanism after shocks, and doesn't necessarily translate into the adoption of more proactive on-farm DRR measures.

The findings highlight the need for greater focus and support for farm resilience against geophysical and climate-related extreme weather events.

Keywords: Adaptation practises, climate change, disaster, disaster risk reduction, Indonesia, multi-hazard

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