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Determinants of livestock management adaptation to perceived climate change among agro-pastoralists of the Koh-e-Suleiman range, Pakistan

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Abstract

Agro-pastoral households in Pakistan's Koh-e-Suleiman range face intensifying climate pressures, yet the socioeconomic, ecological, and socio-cultural determinants of their livestock adaptation choices remain largely undocumented. This study investigates what drives the adoption of six adaptive livestock management strategies, namely destocking, transhumance, supplementary feed purchasing, feed stockpiling, hired herder use, and prolonged grazing among 198 Baloch tribal households. The survey was conducted in Dera Ghazi Khan and Rajanpur districts from October 2023 to February 2024. Respondents were from three tribes, namely Buzdar ($n = 107$), Lighari ($n = 47$), and Gurchani ($n = 44$). Adaptation choices were modelled using a binary logistic regression for each strategy and a Poisson regression for the total adaptation count. The predictors were of socioeconomic (herd size, income), ecological (water stress, grazing access), sociocultural (tribe, herder arrangements), and perceptual (composite climate-perception accuracy) nature and were tested in sequential blocks. Gurchani households owned the largest herds (mean = 128 head) compared to Lighari (77) and Buzdar (72) ($p < 0.001$), reported the highest median livestock income (1750 USD versus 1430 USD for Buzdar and 1140 USD for Lighari; $p < 0.002$), and occupied the most water-stressed zones, experiencing on average 2.6 months of annual drinking-water shortage. These structural differences were mirrored in the adaptive strategies, with 66 % of Gurchani practicing transhumance versus 38 % Lighari and 25 % Buzdar ($p < 0.001$). In contrast, Buzdar preferentially stockpiled feed (52 % versus 17 % and 16 % among Lighari and Gurchani; $p < 0.001$), revealing a clear storage-for-mobility substitution. While the counts of total adaptations differed significantly between tribes ($p = 0.005$), composite climate perception accuracy was similar among tribes ($p = 0.792$), implying that behavioural differences in terms of adaptation practices cannot be attributed to dissimilar climate awareness. These findings indicate that resource endowments and tribal affiliation, rather than differences in climate awareness, shape adaptation choices among Baloch agro-pastoralists. The results provide a preliminary evidence base to inform context-specific management advice to livestock keepers faced with climate change effects in Pakistan's semi-arid mountain regions.

Keywords: Adaptation determinants, agro-pastoralism, Baloch pastoralists, climate adaptation, Koh-e-Suleiman range, Pakistan

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