

Chapter 7

FARMING HOUSEHOLDS' ADAPTATION TO CLIMATIC SHOCKS IN SOUTH ASIA

A Food Systems Perspective

Shreya Chakraborty and Anurag Banerjee

Shreya Chakraborty is a regional researcher, Climate Change Policy and Adaptation, International Water Management Institute (IWMI), Bangladesh. **Anurag Banerjee** is a research officer, IWMI, New Delhi.

KEY MESSAGES

- Climate shocks in South Asia often trigger cascading disruptions across the agrifood system – from production to markets to household consumption – highlighting the interconnected nature of system vulnerabilities.
- Household adaptation responses to shocks are not confined to farming practices; they span multiple system components, including livelihoods, consumption, credit, and risk management.
- Smallholders and resource-poor households tend to rely on short-term livelihood, risk, and consumption management coping mechanisms, while wealthier households can adopt loss-reducing investments and strategies. This difference deepens inequalities.
- National adaptation planning continues to have a sectoral focus, with a primary focus on building resilient production systems and minimal focus on other aspects of agrifood systems.
- Social safety net policies exist at scale across the region, offering complementary support to adaptation efforts for the poorest, but these policies are not yet strategically aligned or strengthened with national adaptation planning.

Climate change has critical impacts in South Asia, including growing risks from extreme events and climatic shocks expected in the near and long term. Rising temperatures are projected to increase the likelihood of heatwaves across South Asia, droughts in arid and semiarid areas, floods in monsoon regions, and glacial melt in the Himalayan region (IPCC 2023). Under high emissions scenarios, the region is projected to experience a 20 to 40 percent rise in mean annual precipitation by the end of the 21st century (Mishra et al. 2020), characterized by increased frequency and intensity of heavy rainfall events and significantly increased flood frequency, with severe consequences for lives and infrastructure (IPCC 2023). At the same time, the mean annual maximum and minimum temperatures in the region are projected to rise by 3 to 4°C and 3 to 5°C on average respectively (Mishra et al. 2020) by the end of the 21st century under a high emissions future scenario, increasing the likelihood of heatwaves, droughts, and heat stress conditions (IPCC 2023). These projected scenarios of increasing climatic risks make adaptation a central concern for the region.

Agrifood systems will be increasingly exposed and vulnerable to climate change-led shocks as the incidence, intensity, and uncertainty of extreme events increase. Agrifood systems are complex, encompassing all the interlinked elements (environment, inputs, processes, infrastructures, institutions, and so on), actors, and activities that relate to primary production processing, supply chains, and household consumption, along with the outputs of these activities, including socio-economic and environmental outcomes (HLPE-FSN 2020; FAO 2021). Thus a shock in any component can spread throughout the system (FAO 2021), impacting short- and long-term food and nutrition security. An agrifood systems perspective to understanding adaptation is therefore critical to developing policies that contribute to overall agrifood systems resilience. Yet most climate-change adaptation interventions and policies tend to be sectoral, and the resilience of agrifood systems can thus be undermined by the weakest sectoral links.

At the household level, however, people adapt in numerous sector-agnostic ways, within their capacities, to sustain income and food security in the face of climate shocks. Therefore, understanding adaptation at the local and household levels can inform an agrifood systems' lens on adaptation. This chapter looks at the ways in which households in South Asia cope and adapt to climate shocks to draw lessons for national adaptation planning and interventions.

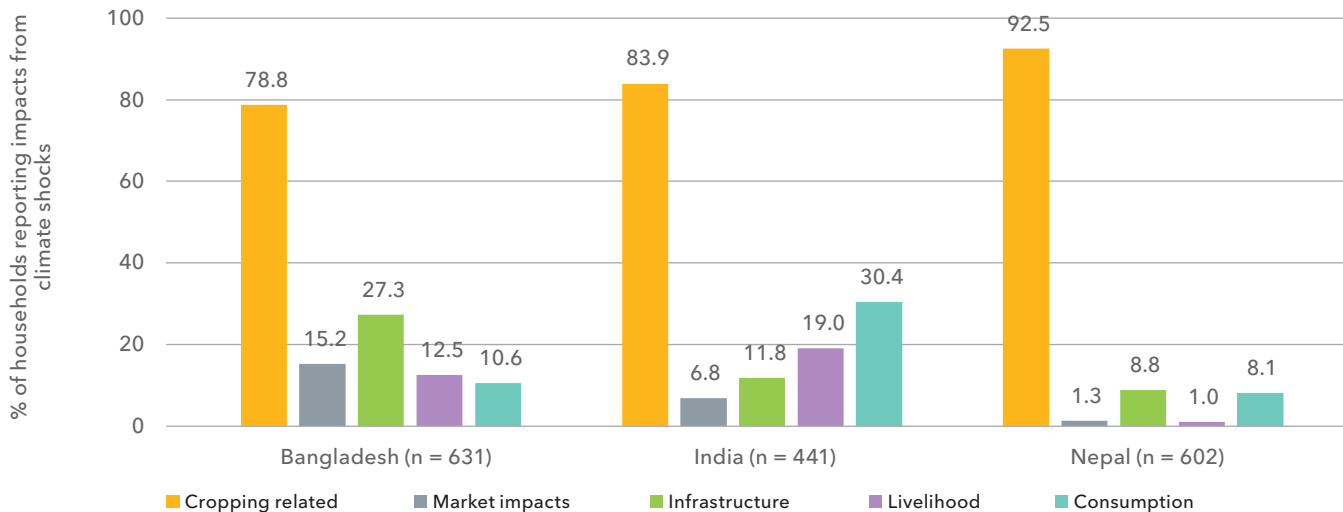
HOW HOUSEHOLDS ARE ADAPTING TO CLIMATE SHOCKS

Under the CGIAR Research Initiative on Transforming Agrifood Systems in South Asia (TAFSSA), an integrated agrifood systems assessment was carried out in five districts in three South Asian countries: Rangpur and Rajshahi in Bangladesh, Surkhet and Banke in Nepal, and Nalanda in India (TAFSSA 2024). The survey included a climate module in which households reported the major climatic shocks they had faced in the past two years, the perceived and experienced impacts, and households' coping and adaptation strategies. The survey also covered a range of variables related to different types of resource access and household endowments that allowed for an analysis of the enabling conditions that facilitate different types of adaptation.

Adaptation strategies range across agrifood system components at the household level

In the five districts assessed, households reported experiencing impacts from climate shocks across the agrifood system – including impacts on agricultural production and market access, livelihood loss, and consumption deficits in food and health services (Figure 7.1). Households' coping and adaptive responses ranged from agronomic initiatives and water management changes to risk management, livelihood responses, and consumption reduction. Although impacts related to agricultural production were the type most commonly reported, adoption of resilient agronomic practices was not always the most frequent adaptive response. Instead, most

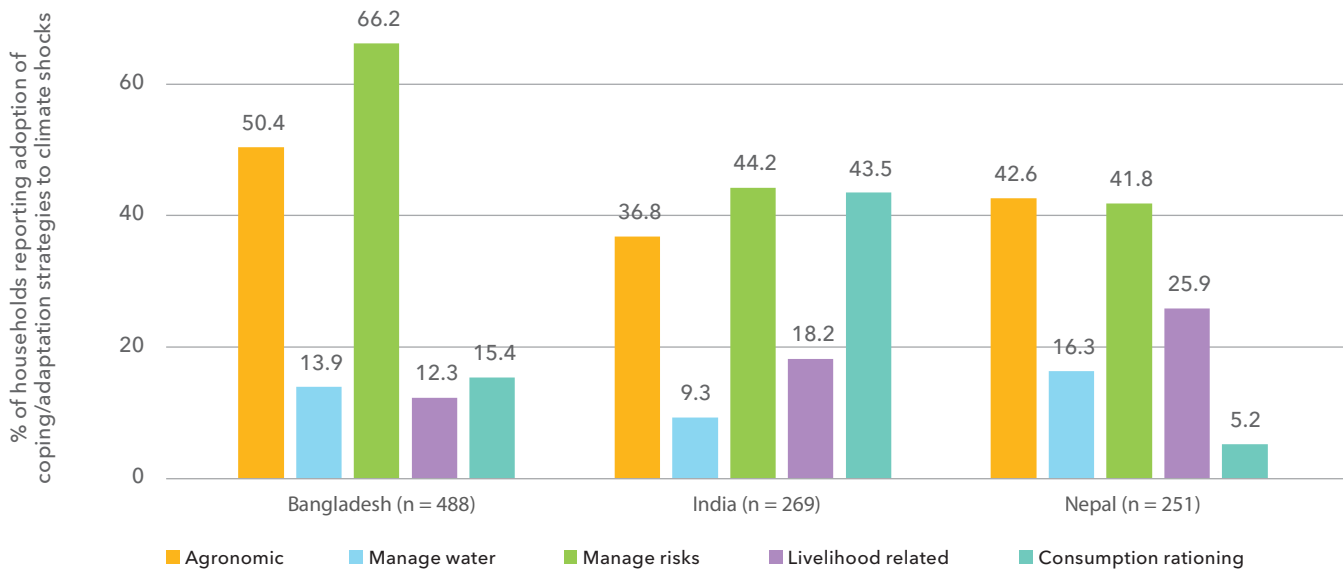
FIGURE 7.1 Types of impacts of climate shocks over last two years reported by survey households in South Asia



Source: Data from TAFSSA agrifood systems assessment.

Note: The survey was conducted in the Rajshahi and Rangpur divisions in Bangladesh, the Banke and Surkhet districts in Nepal, and the Nalanda district in India.

FIGURE 7.2 Adaptive and coping strategies adopted by survey households in South Asia



Source: Data from TAFSSA agrifood systems assessment.

Note: The survey was conducted in the Rajshahi and Rangpur divisions in Bangladesh, the Banke and Surkhet districts in Nepal, and the Nalanda district in India.

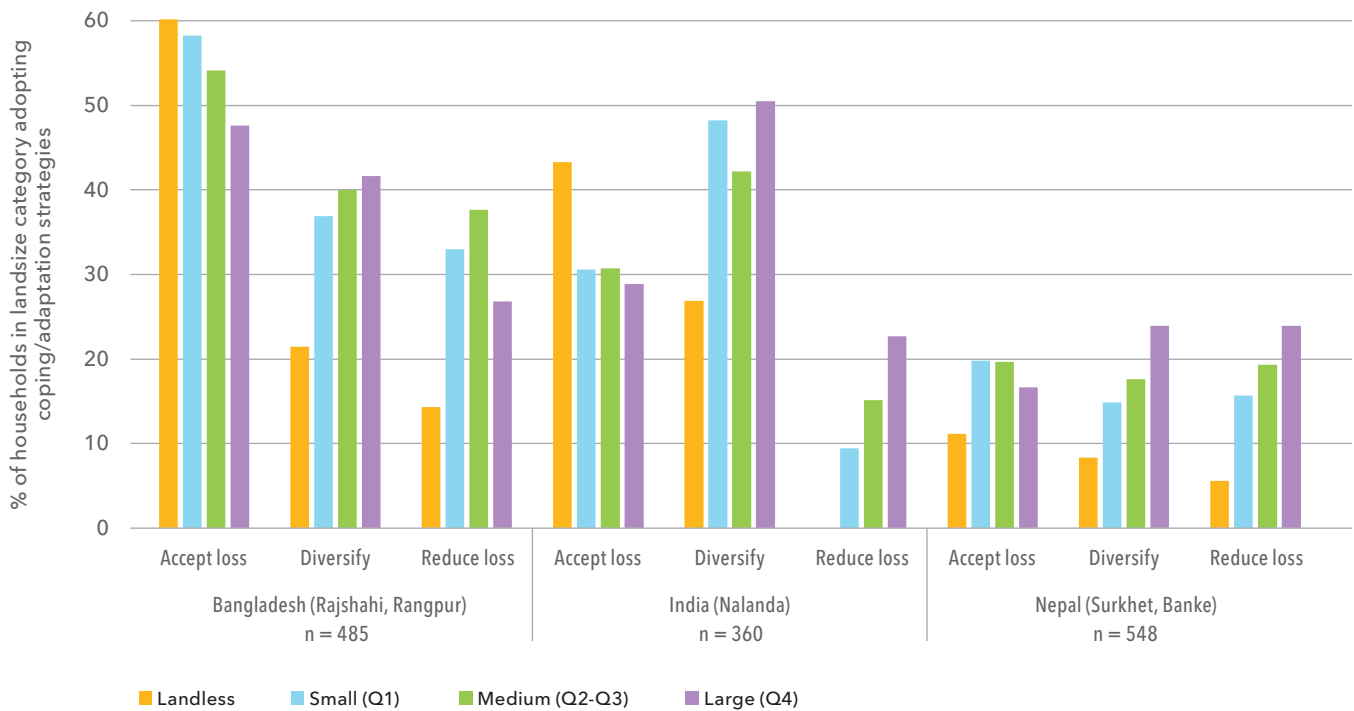
households depended largely on short-term risk management and consumption-related adjustments (Figure 7.2). This indicates that sectoral interventions alone, such as changes in cropping or conservation practices, may not be adequate to address household vulnerabilities. Complementary improvements are also needed in other parts of the system – including risk management mechanisms such as crop insurance and credit access, social safety nets, food rations, medical and health support systems, and livelihood supports, such as employment guarantee programs – to address consumption deficits among smallholder households.

Different households adapt differently

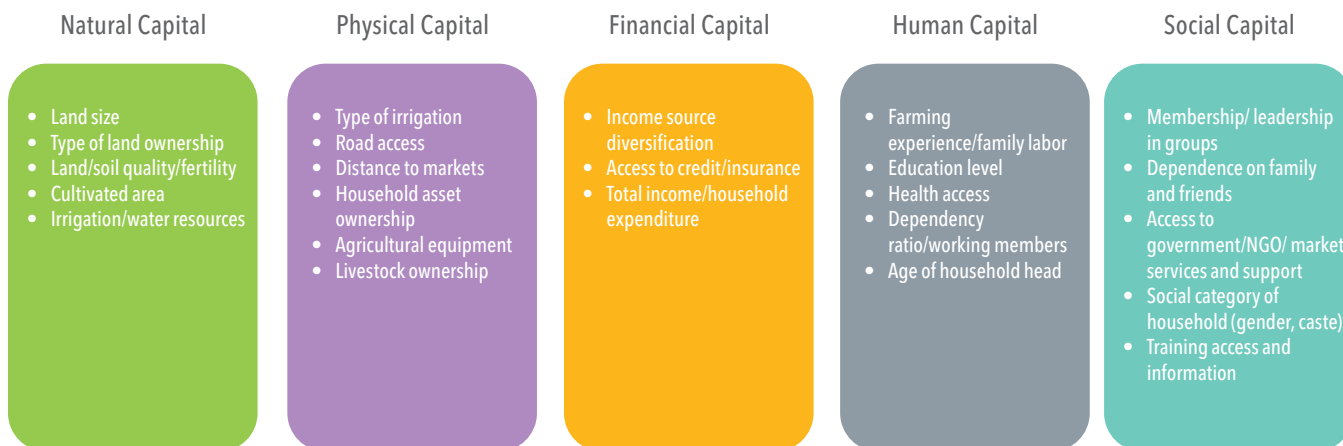
An agrifood systems perspective on adaptation is also required because not all households adapt in the same way. Households have access to different

sets of adaptation solutions depending on their resource endowment and capacity to absorb shocks. For instance, strategies that require capital investments in land, technology, or other resource-intensive assets may not be affordable or accessible to smallholder or landless households. Drawing on a framework adapted from Burton et al. (1993), this chapter identifies three levels of adjustment (Figure 7.3). In the absence of capacity to absorb shock, individuals may be compelled to accept their losses, either bearing these losses entirely or sharing them. With some capacity, they may be able to diversify practices, economic activities, or location to redress the damage to their livelihoods and incomes. With higher capacity to invest in strategies to protect and sustain existing livelihoods and economic activities, they may be able to minimize or reduce losses in the face of shocks.

FIGURE 7.3 Dependence on different levels of adaptation strategies by land size categories (quartiles) of households



Source: Data from TAFSSA agrifood systems assessment.

FIGURE 7.4 Five types of capital relevant for building adaptive capacities in South Asia

Source: Indicators compiled from a review of Datta and Behera (2022); Sardar et al. (2019); Brown et al. (2019); Maharjan et al. (2021); Khanal and Wilson (2019); Sam et al. (2018); Venus et al. (2021); Aryal et al. (2021); and Devkota et al. (2021).

To assess differences in the types of adjustments and adaptations adopted by households with different resource endowments, we categorized household adaptation strategies reported in the survey using this framework (Figure 7.3). Smallholder and landless households tended to resort more to accepting losses through reduction of consumption and expenditures on household requirements, including food, distress selling of assets, and use of credit and urgent remittances. These strategies tend to leave households worse off in the aftermath of a shock. Medium and large landholders, however, are more likely to reduce losses by investing in resource management and climate-smart agronomic practices and technologies, which enables them to sustain or even improve their livelihoods and income in the aftermath of a shock. These differences in adaptation strategies accessed by different classes of households increase the gap between richer and poorer households, deepening existing socioeconomic inequalities (IPCC 2023; Parsons et al. 2024). Policies that facilitate households' access to different adaptation strategies can thus support different classes of households. For instance, integration of social safety net programs for improved livelihoods, access to health services,

and access to food and nutrition even in times of shock can support adaptation strategies of households that are otherwise compelled to accept losses and reduce basic consumption.

Capacity to adapt reflects a multisectoral enabling environment

A household's adaptive capacity is supported by its access to different types of resources and capital – natural, physical, financial, human, and social (Mortreux and Barnett 2017). An enabling environment of policy, institutions, and markets can strengthen households' capacity to adapt by facilitating and deepening their access to these resources. Our review of the literature on adaptive capacities in South Asia found that a variety of capital types are relevant in the region (Figure 7.4). These span access to land, water, roads, markets, and credit and insurance; information and training; and livelihoods, education, and health services. Boosting these different capitals would require policy interventions in multiple social and economic sectors, including the wider system of governance, markets, and food environments. Building capacity to adapt in the face of sudden shocks would therefore require a systems perspective to adaptation.

LESSONS FOR CLIMATE ADAPTATION POLICIES

The TAFSSA household-level assessments revealed that adaptation responses often extend beyond the farm, encompassing livelihood shifts, reduced consumption, reliance on social networks, and informal credit. However, such multisectoral adaptation practices are not reflected in national policy design, and poor or smallholder households remain particularly constrained in accessing resilience strategies. Evidence from South Asia underscores the value and need for taking an agrifood systems approach to adaptation to sustain food security in the face of climatic shocks.

National Adaptation Plans (NAPs), mandated under the Paris Agreement for all signatory countries, are comprehensive strategic policy documents identifying medium- and long-term priorities for adapting to climate change. Bangladesh and Nepal have already developed their NAPs (Bangladesh, Ministry of Environment, Forest and Climate Change 2022; Nepal, Ministry of Forest and Environment 2021). India developed a National Action Plan on Climate Change (NAPCC) in 2008 as a key policy for climate action and is currently in the process of preparing its NAP. The NAPs of Bangladesh and Nepal, as well as India's NAPCC, integrate an agrifood systems perspective into climate adaptation planning to varying degrees.

Bangladesh's NAP shows a strong sectoral focus on agriculture, livestock, and fisheries, emphasizing climate-resilient crops, irrigation, and soil health, but it treats these components in isolation, without addressing postharvest value chains, food environments, or nutrition outcomes. Nepal's NAP offers a more systemic framing – linking agrobiodiversity, food security, water resources, and livelihoods – indicating an effort to use an agrifood systems lens. However, it too underrepresents trade, food loss and waste, and the role of private actors, as well as safety nets and social protection. India's earlier NAPCC emphasizes mitigation and technological adaptation through its National Mission on Sustainable Agriculture, but it

lacks an integrated view of agrifood systems and does not consider nutrition, market dynamics, or localized vulnerabilities.

In all three countries, social safety net policies that offer strong complementary support to other adaptation efforts already exist at scale. These include national food security programs, agricultural marketing reforms, social protection schemes, livelihood supports, and nutrition missions. These policies support access to alternate livelihoods, emergency food rations, or allowances/pensions in periods of extreme crisis, thus facilitating coping and reducing impact. Schemes also exist in these countries for food security (for example, India's Public Distribution System and Mid-Day Meal Scheme and Bangladesh's Vulnerable Group Development Program and Food-Friendly Program) and for livelihood support (for example, India's Mahatma Gandhi National Rural Employment Guarantee Act and Pradhan Mantri Kisan Samman Nidhi, Bangladesh's Employment Generation Program for the Poorest, and Nepal's Prime Minister Employment Program). However, they are not strategically aligned with national adaptation planning. Food security is often reduced to production resilience and technology-centric solutions in adaptation plans. Additionally, institutional coordination remains weak, with limited formal mechanisms for joint planning across sectors such as agriculture, nutrition, health, and social welfare. To strengthen adaptation planning through an agrifood systems lens, national adaptation policies must move beyond a production focus and integrate across the agrifood system, align with social protection mechanisms, and address differences in household capacities.

Policies must also empower local governments to design and deliver context-specific, cross-sectoral strategies, while developing monitoring systems that track resilience outcomes across the food system. An agrifood systems-based approach would ensure that adaptation policies not only safeguard production but also enhance household well-being, reduce inequalities, and build resilience across interconnected agrifood system components to deliver food and nutritional security for households.

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REFERENCES

- Aryal, J.P., T.B. Sapkota, D.B. Rahut, P. Marenja, and C.M. Stirling. 2021. "Climate Risks and Adaptation Strategies of Farmers in East Africa and South Asia." *Scientific Reports* 11 (1):10489. <https://doi.org/10.1038/s41598-021-89391-1>.
- Bangladesh, Ministry of Environment, Forest and Climate Change. 2022. *National Adaptation Plan of Bangladesh (2023-2050)*. Ministry of Environment, Forest and Climate Change. <https://www.undp.org/bangladesh/publications/national-adaptation-plan-bangladesh-2023-2050>.
- Brown, P.R., S. Afroz, L. Chialue *et al.* 2019. "Constraints to the Capacity of Smallholder Farming Households to Adapt to Climate Change in South and Southeast Asia." *Climate and Development* 11 (5):383-400. <https://doi.org/10.1080/17565529.2018.1442798>.
- Burton, I., R.W. Kates, and G.F. White. 1993. *The Environment as Hazard*. 2nd ed. The Guilford Press.
- Datta, P., and B. Behera. 2022. "Assessment of Adaptive Capacity and Adaptation to Climate Change in the Farming Households of Eastern Himalayan Foothills of West Bengal, India." *Environmental Challenges* 7:100462. <https://doi.org/10.1016/j.envc.2022.100462>.
- Devkota, N., R. Kumar Phuyal, and D.L. Shreshta. 2021. "Asymmetric of Income, Uneven Adaptive Capacities, and Determinants of Climate Change Adaptation Options among Poor and Non-Poor Rural Rice Farmers of Nepal." *Southeast Asian Journal of Economics* 9 (3):129-58. <https://so05.tci-thaijo.org/index.php/saje/article/view/255873>
- FAO (Food and Agricultural Organization of the United Nations). 2021. *The State of Food and Agriculture 2021: Making Agrifood Systems More Resilient to Shocks and Stresses*. FAO. <https://openknowledge.fao.org/handle/20.500.14283/cb4476en>.
- HLPE-FSN (High Level Panel of Experts on Food Security and Nutrition). 2020. *Food Security and Nutrition: Building a Global Narrative Towards 2030*. FAO. <https://openknowledge.fao.org/server/api/core/bitstreams/8357b6eb-8010-4254-814a-1493faaf4a93/content>.
- IPCC (Intergovernmental Panel on Climate Change). 2023. "Asia." In *Climate Change 2022: Impacts, Adaptation and Vulnerability*, Chapter 10, 1457-1580. Cambridge University Press. <https://doi.org/10.1017/9781009325844.012>.
- Khanal, U., and C. Wilson. 2019. "Derivation of a Climate Change Adaptation Index and Assessing Determinants and Barriers to Adaptation among Farming Households in Nepal." *Environmental Science & Policy* 101:156-65. <https://doi.org/10.1016/j.envsci.2019.08.006>.
- Maharjan, A., S. Tuladhar, A. Hussain *et al.* 2021. "Can Labour Migration Help Households Adapt to Climate Change? Evidence from Four River Basins in South Asia." *Climate and Development* 13 (10):879-94. <https://doi.org/10.1080/17565529.2020.1867044>.
- Mishra, V., U. Bhatia, and A.D. Tiwari. 2020. "Bias-Corrected Climate Projections for South Asia from Coupled Model Intercomparison Project-6." *Scientific Data* 7 (1):338. <https://doi.org/10.1038/s41597-020-00681-1>.
- Mortreux, Colette, and Jon Barnett. 2017. "Adaptive Capacity: Exploring the Research Frontier." *Wiley Interdisciplinary Reviews: Climate Change* 8 (4):e467. <https://doi.org/10.1002/wcc.467>.
- Nepal, Ministry of Forest and Environment. 2021. *National Adaptation Plan of Nepal, 2021-2025*. Ministry of Forest and Environment. <https://www.unep.org/gan/resources/policy-and-strategy/nepals-national-adaptation-plan-2021-2050>.
- Parsons, E.S., A. Jowell, E. Veidis, M. Barry, and S. Thadaney Israni. 2024. "Climate Change and Inequality." *Pediatric Research* 98:1238-45. <https://doi.org/10.1038/s41390-024-03153-z>.
- Sam, A.S., A. Abbas, S.S. Padmaja, H. Kaechele, R. Kumar, and K. Müller. 2018. "Linking Food Security with Household's Adaptive Capacity and Drought Risk: Implications for Sustainable Rural Development." *Social Indicators Research* 142 (1):363-85. <https://doi.org/10.1007/s11205-018-1925-0>.
- Sardar, A., A.K. Kiani, and Y. Kuslu. 2019. "An Assessment of Willingness for Adoption of Climate-Smart Agriculture (CSA) Practices through the Farmers' Adaptive Capacity Determinants." *Yuzuncu Yil University Journal of Agricultural Sciences* 29 (4):781-91. <https://doi.org/10.29133/yyutbd.631375>.
- TAFSSA (CGIAR Initiative on Transforming Agrifood Systems in South Asia). 2024. "Open-Access Agrifood System Data from 4,000 Households across Bangladesh, India, and Nepal." CGIAR News (blog). March 20. <https://www.cgiar.org/news-events/news/open-access-agrifood-system-data-from-4000-households-across-bangladesh-india-and-nepal/>.
- Venus, T.E., S. Bilgram, J. Sauer, and A. Khatri-Chettri. 2021. "Livelihood Vulnerability and Climate Change: A Comparative Analysis of Smallholders in the Indo-Gangetic Plains." *Environment, Development and Sustainability* 24 (2):1981-2009. <https://doi.org/10.1007/s10668-021-01516-8>.