Adaptive and collective management for more resilient water and food systems

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PANEL: Resilience perspectives on the global water challenge

Alleviating hunger of the 75% rural poor that make up the majority of the 1 billion poor requires simultaneously increasing the productivity of water and food systems and enhancing their social and ecological resilience. Drawing from two case studies in developing countries, we explore how the concept of resilience and regime shifts can inform the management of such systems and support their adaptive capacity to achieve both more resilient and more productive states. In the first case research aimed to re-green the land and restore the water quality of reservoirs and gullies in the Uganda 'cattle corridor', covering the western third of the country. Livestock overgrazing degraded pastures and soils, preventing rainwater infiltration. Termites repeatedly destroyed efforts to reestablish pastures by eating the emerging seedlings. Typically the degraded ecosystem had passed a seemingly irreversible threshold and was unable to recover its structure and functions. Learning from Ethiopian experience, animal scientists of Makerere University convinced cattle holders to corral their animals together at night in order to concentrate manure. Two weeks of corralling allowed the pasture seedlings to establish as the termites preferred eating the manure, not the seedlings. Once pasture was established, animal feed availability increased, rainfall infiltration greatly improved, soil erosion reduced and crops established. Local livestock holders now invest their own resources in the development and management of common property pasture and water resources. Outcomes showed that by exploiting positive social and ecological feedback loops of the pastoral system, adaptive and collective management contributed to reversing the non-linear and apparently unrecoverable shift of the cattle corridor.

In the second case ecosystem services research in the Andes helped improve both the quality of water for downstream users and the resilience of upstream social-ecological systems. In the area of the Fuquene lake, about 150 km north of Colombia's capital city Bogota, agriculture and cattle rearing had degraded the paramo ecosystem, the high Andean alpine-like ecological zone. Exploitation of a range of high altitude production systems, including multiple cropping and livestock, extensively deteriorated the land and water resources. Sedimentation and eutrophication resulted in the rapid reduction of the downstream lake capacity, its water volume and surface availability. Through research projects, conservation agriculture practices contributed to restore paramos, especially those functions supporting the capacity to buffer and filter water in the upstream part of the basin, as well as to increase the soil carbon stock and to reduce the net greenhouse gas emissions produced by the conventional crop-livestock system. A new local revolving fund provided incentives to upland farmers adopting conservation practices. Such financial support helped reverse the degradation of those fragile land and water ecosystems, shifting them back to a safer "operating space" where a range of ecosystem services could be delivered to local communities.

However some negative feedbacks, such as risk-aversion of farmers, limited the adoption of innovations and could not ensure the resilience of the new social-ecological state. While adaptive and collective management have triggered positive actions in the paramo system, further socio-economic interventions are needed to enhance and sustain the positive feedback loops engaged through this research.