

# Headlines Himalaya

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No. 691 – 692 Editorial Team: Aarati Khatri and Shreyashi Bista

For the 691<sup>th</sup> - 692<sup>th</sup> issues of Headlines Himalaya, we reviewed researches from two sources and selected nine researches from three countries. We selected two researches from Nepal and seven researches from other Himalayan countries (India and China).

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## Nepal-Himalaya

### DEPREDTION LOSS DRIVES HUMAN-WILDLIFE CONFLICT PERCEPTION IN THE TRANS - HIMALAYAS

Tika Ram Poudel, Prakash Chandra Aryal, Resham Thapa-Parajuli, Arjun Thapa, Shailendra Kumar Yadav, and Manab Prakash

Communities in and around protected areas are exposed to a higher level of human-wildlife interactions. The conservation practice with persistently adverse local livelihood outcomes can potentially aggravate such interactions leading to conflict. In our study, we examined how perceptions of HWC have formed in a protected area of the Trans-Himalayas whose conservation program collides with a centuries-long tradition of transhumance pastoralism. To examine determinants of depredation and how conflict perception has developed there, along with the socioeconomic and ecological interactions underlying those trends, we collected data using household surveys, key informant interviews, and focus group discussions. We employed Poisson-logit maximum-likelihood hurdle, binary logit, and multinomial ordered logit regressions in order to explore the determinants of annual livestock depredation, predator attacks on the shed, and household-level perceptions of HWC, respectively. Depredation and encounters with wildlife were the principal causes of perceived HWC, and depredation caused an average household-level loss of US \$422.5, up to 23.28% of annual income in some households. Predators' attacks on high-quality sheds were relatively infrequent but more common in areas with perceived habitat degradation. Social customs, pastoral practices, and the present compensation mechanism were identified as being antithetical to conflict reduction and sustainable pastureland management. Further analysis revealed that a diversity of livelihoods, however, lowered conflict perception formation. The identified socio-ecological factors will continue to increase depredation, exacerbate perceived HWC, and degrade pastureland unless local conservation authorities take appropriate remedial measures.

For Further Reading: <https://doi.org/10.1016/j.jenvman.2022.114763>

#### **REUTILIZING ABANDONED CROPLAND IN HILL AGROECOLOGICAL REGION OF NEPAL: OPTIONS AND FARMER'S PREFERENCES**

Yuba Raj Subedi, Paul Kristiansen, and Oscar Cacho

*Land use Policy* 117: 106082

Despite the looming scarcity of agricultural land and rapidly growing demand for food and biofuel globally, more agricultural lands are being abandoned from farming than are being converted to agriculture. Therefore, there is increasing interest in reutilising abandoned croplands to mitigate the undesirable impacts of abandonment and address global challenges such as food insecurity, arable land scarcity and agrobiodiversity loss. Although a number of studies have examined the extent, drivers and impacts of abandonment at various temporal and spatial scales, few studies have investigated the dynamics and potential pathways for reutilising abandoned cropland. This study addressed this knowledge gap by analysing potential reutilisation options of abandoned croplands, considering the influence of socio-economic factors on farmer preferences for reutilisation options, and assessing the conditions that would create an enabling environment for productive reutilisation. Using a mixed methods approach, quantitative data was collected through a survey of 374 households and qualitative data from six focus group discussions in three districts of the Hill agro ecological region of Nepal. The majority of farmers, regardless of abandoned cropland holdings, considered that abandoned croplands should be reutilised. The farmers identified seven options (Cash cropping, Fruit crop farming, Spice and medicinal crop farming, Fodder tree plantation, Cereal cropping, Woodlot plantation and Mixed subsistence farming) for reutilising of abandoned croplands. Farmers' preference was comparatively higher for high value and cash-generating options for the reutilisation. Despite the dominance of traditional mixed subsistence farming in the area, the majority of farmers did not consider this system as a viable option for reutilisation. Structural and institutional factors, as well as labour constraints, were found important to create an enabling environment that motivates farmers for the reutilisation. Farmers' greater preference for cash-generating options implies that the promotion of market-oriented farming on abandoned croplands could help to minimise abandonment and revitalise the Nepalese agricultural sector. The findings are relevant to other regions of the globe that have experienced cropland abandonment.

For Further Reading: <https://doi.org/10.1016/j.landusepol.2022.106082>

## DECARBONIZING THE POWER AND INDUSTRY SECTORS IN INDIA BY CARBON CAPTURE AND STORAGE

Kai Zhang, Hon Chung Lau, Harsha Kumar Bokka, and Nanji J. Hadia

*Energy* 249: 123751

In this paper, we evaluate opportunities to mitigate CO<sub>2</sub> emission from the power and industry sectors of India by carbon capture and storage. Results show that the total CO<sub>2</sub> emission from 630 power and industrial plants is 1.7 Gtpa. Of this, 0.9 Gtpa comes from power plants and 0.8 Gtpa from industry plants. There is 416.2 Gt of CO<sub>2</sub> storage capacity (mid case scenario) in India, enough to store 237 years of emission. Of this, 412.7 Gt (99%) comes from saline aquifers in 22 sedimentary basins, 1.9 Gt (0.44%) from six major gas fields, and 1.7 Gt (0.41%) from 37 major oil fields. The total mid CO<sub>2</sub>-enhanced oil recovery potential in India is  $500 \times 10^6 \text{ m}^3$  with the biggest potential found in the following oil fields: Mumbai High ( $231 \times 10^6 \text{ m}^3$ ), Gandhar ( $13 \times 10^6 \text{ m}^3$ ), Mangala ( $17 \times 10^6 \text{ m}^3$ ) and Nahorkatiya ( $24 \times 10^6 \text{ m}^3$ ) in the states of Gujarat, Maharashtra, Rajasthan and Assam, respectively. Results of a CO<sub>2</sub> source-sink mapping exercise show that in most cases, CO<sub>2</sub> source-sink distance is less than 500 km, and many cases less than 100 km.

For Further Reading: <https://doi.org/10.1016/j.energy.2022.123751>

## ETHNOMEDICINAL STUDY OF WILD PLANTS USED BY FRINGE COMMUNITIES IN TEMPERATE FORESTS OF HIMALAYAN KASHMIR, INDIA.

Shaista Khan, T.H. Masoodi, M.A. Islam, A.A. Wani, and A.A. Gatto

*Phytomedicine Plus* 2: 100251

This paper represents the ethnomedicinal information regarding the traditional use of wild medicinal plants in the Sindh Forest Division and its utilization to cure different ailments by fringe people which has not been fully documented. The objective of the study was to explore and document the traditional knowledge of wild plant species used by forest fringe communities of the Sindh Forest Division of Union Territory Jammu and Kashmir, India. The ethnomedicinal data was collected from 111 household respondents including traditional *Hakims* selected by multi-stage random sampling method from the study area. With the help of a well-structured pre-tested interview schedule, data on the local (Kashmiri) names of the wild medicinal plants, their therapeutic uses, plant parts used, method of preparation and mode of administration to patients were obtained. A total of 82 medicinal plant species belonging to 76 genera and 52 families were used by fringe communities to treat various ailments. Among all the medicinal plants, *Artemisia absinthium* shows the highest Relative Frequency of Citation value (0.89) whereas *Dioscorea deltoidea* possess the lowest Relative Frequency of Citation value of 0.03. The forest fringe communities possess abundant information on the wild medicinal plants and their specific properties for curing different diseases. This ethnomedicinal survey on the diversity and traditional knowledge of medicinal plants can provide new insights towards the discovery and development of new drugs.

For further reading: <https://doi.org/10.1016/j.phyplu.2022.100251>

## SPATIAL DISTRIBUTION OF MO AND $\delta^{98}\text{Mo}$ IN WATERS OF THE NORTHERN INDIAN OCEAN: ROLE OF SUBOXIA AND PARTICLE - WATER INTERACTIONS ON LIGHTER MO IN THE BAY OF BENGAL

Vineet Goswami, Sunil K. Singh, Ravi Bhusan, and Vinai K. Rai

*Geochimica et Cosmochimica Acta* 324: 174-193

The dissolved Mo concentrations and Mo isotopic composition ( $\delta^{98}\text{Mo}$ ) have been determined in the water column of the northern Indian Ocean to assess the impact of water column anoxia/suboxia, seasonal hypoxia, and enormous riverine particulate fluxes from the Ganga-Brahmaputra river system on Mo isotope composition of seawater. All the samples collected from the Arabian Sea and the central and southern Bay of Bengal display conservative and uniform Mo concentrations and  $\delta^{98}\text{Mo}$ ,  $112 \pm 2$  nmol/kg, and  $2.25 \pm 0.13\text{‰}$ , respectively, similar to the other global oceanic basins. Overall, this study suggests no modification in both Mo concentrations and Mo isotopic composition in the water columns of the Arabian Sea and the open ocean locations of the Bay of Bengal under the influence of suboxic/denitrifying conditions and high primary productivity. However, we report, for the first time, lighter Mo isotope composition in the water column of the northern coastal Bay of Bengal. These waters from the northern Bay of Bengal continental margin show significantly depleted/lighter  $\delta^{98}\text{Mo}$  (average =  $1.64 \pm 0.42\text{‰}$ ;  $1\sigma$ ) than the global open ocean average value, with conservative Mo concentrations. In addition,  $\delta^{98}\text{Mo}$  of bulk sediments and leachable Fe-Mn oxyhydroxide phases from this region show a lower  $\delta^{98}\text{Mo}$  than the overlying water column, with the bulk sediments containing  $\sim 5\text{--}11\%$  of leachable Mo fraction adsorbed on Fe-Mn oxyhydroxide fraction. Intermediate water anoxia/suboxia in this region extends up to the sediment-water interface. The depletion in  $\delta^{98}\text{Mo}$  in the northern coastal Bay of Bengal waters could result from the in situ release of relatively lighter Mo from the reductive dissolution of Fe-Mn oxyhydroxide phases adsorbed on suspended particulate matter. Repeated cycles of deposition and reductive dissolution of sedimentary Fe-Mn oxyhydroxide phases in the shelf/slope regions could supply lighter Mo to the porewaters. Furthermore, the subsequent diffusion/advection of these porewaters to the water column and/or dissolution of Fe-Mn oxyhydroxide phases in the suboxic water column could supply lighter Mo to the waters of the northern coastal Bay of Bengal.

For further reading: <https://doi.org/10.1016/j.gca.2022.03.010>

## China Himalaya

### ENHANCING THE ECOLOGICAL SERVICES OF THE QINGHAI - TIBETAN PLATEAU'S GRASSLANDS THROUGH SUSTAINABLE RESTORATION AND MANAGEMENT IN ERA OF GLOBAL CHANGE

Shikui Dong, Zhanhuan Shang, Jixi Gao, and Randall Boone

*Agriculture, Ecosystem and Environment* 326: 107756

Massive grasslands on the Qinghai-Tibetan Plateau (QTP) provide vital ecosystems services, which have been decreased by land degradation associated with global change. Effective efforts and actions of restoration and management are required to promote the sustainable development of these grassland ecosystems with global importance. This special issue collected numerous papers to address share the innovative theoretical foundations and practical approaches for restoring and protecting QTP's grassland ecosystems in the era of global change. The findings from the collected papers of this special issue stated that the ecosystems services of the QTP's grasslands are declining due to weakened interfaces among soil, plant and grazing animals in the QTP's grassland ecosystems by climate and land use changes. Applicable actions such as climate change mitigation and adaptation, close-to-nature restoration, rotational grazing regime with moderate grazing intensity should be taken to enhance the ecosystem services through rebuilding rational soil-plant-animal interfaces.

For further reading: <https://doi.org/10.1016/j.agee.2021.107756>

### WILD PLANTS USED BY TIBETANS IN BURANG TOWN, CHARACTERIZED BY ALPINE DESERT MEADOW, IN SOUTHWESTERN TIBET, CHINA

Xiaoyong Ding, Changan Guo, Xiong Zhang, Jing Li, Yixue Jiao, Haowen Feng, and Yuhua Wang

*Agronomy* 12: 704

This study documented the wild plants used by Tibetans and the related traditional knowledge in Burang Town (Karnali

River Valley). Ethnobotanical surveys, including semi-structured interviews and participatory observations, were conducted in five Tibetan communities in July 2020 and August 2021. The informant consensus factor (*ICF*) and cultural importance index (*CI*) were used for data analyses. In total, 76 wild species belonging to 58 genera and 30 families were determined to be used. These included 26 edible, 29 medicinal, 34 fodder, 21 fuel, 17 incense, three economic, three dye, two ritual, two handicraft, and one species for tobacco plants species; many of these have multiple uses. The top five important plants are *Carum carvi* (*CI* = 1.88), *Hippophae tibetana* (*CI* = 1.45), *Rheum moorcroftianum* (*CI* = 0.87), *Urtica dioica* (*CI* = 1.45) and *Chenopodium album* (*CI* = 0.75). Of the wild plant species used, 53 were recorded in croplands and 25 were found in alpine pastures. This pattern of use is influenced by local livelihood patterns and culture. Plants in highland cropland have diverse ethnobotanical values that are often overlooked. These findings will inform strategies and plans for local communities and governments to sustainably use and protect plants at high altitudes

For further reading: <https://doi.org/10.3390/agronomy12030704>

### **EFFECTS OF ORGANIC AMENDMENTS AND RIDGE – FURROW MULCHING SYSTEM ON SOIL PROPERTIES AND ECONOMIC BENEFITS OF WOLFBERRY ORCHARDS ON THE TIBETAN PLATEAU**

Chenxiao Duan, Jifei Chen, Jiabei Li, Hao Feng, Shufang Wu, Qingtao Meng, and Kadambot H.M. Siddique

*Science of The Total Environment* 827: 154317

Water scarcity and low soil fertility severely constrain crop growth and sustainable agricultural productivity on the Tibetan Plateau. Organic amendments and ridge–furrow mulching system (RFMS) are widely used to improve soil moisture, soil structure, and crop production in arid and semi-arid areas. However, their combined effects on soil physicochemical properties and economic benefits of wolfberry (*Lycium barbarum* L.) on the Tibetan Plateau remain unclear. A two-year field experiment was undertaken to evaluate the combined effects of organic amendments and RFMS on soil water, soil structure, soil saturated hydraulic conductivity, soil organic carbon (SOC), total nitrogen (TN), and economic benefits on wolfberry. Four cultivation practices were established: traditional flat plot with mulching (FP), traditional flat plot with mulching and organic amendment (FPOA), ridge–furrow planting with mulching (RF), and ridge–furrow planting with mulching and organic amendment (RFOA). The organic amendment and RFMS treatments had higher soil water storage (SWS) and soil desiccation index (SDI) than the FP treatment in both growing seasons, especially at 20–60 cm soil depth. In addition, organic amendment significantly decreased soil bulk density by 6.4% and increased soil saturated hydraulic conductivity by 16.8% in the 0–60 cm soil layer, respectively, and improved the proportion of larger soil aggregates (0.02–2 mm) by 10.8% in the 0–40 cm soil layer. Furthermore, the RFOA treatment significantly improved SOC and TN contents at 0–60 cm soil depth by 47.7% and 19.4%, respectively, relative to FP. The measured soil properties were highly correlated with wolfberry yield and water use efficiency over 2 years. In particular, the RFOA treatment had higher crop yield and economic benefit than the other treatments due to the more favorable soil environment. Therefore, the RFOA treatment could be a sustainable and efficient cultivation practice for alleviating drought stress, improving soil properties, and increasing economic benefit on the Tibetan Plateau.

For further reading: <https://doi.org/10.1016/j.scitotenv.2022.154317>

### **VARIATION AND MUTUAL RELATIONS OF VEGETATION – SOIL – MICROBES OF ALPINE MEADOW IN THE QINGHAI – TIBET PLATEAU UNDER DEGRADATION AND CULTIVATION**

Yueju Zhang, Mingjun Ding, Hua Zhang, Nengyu Wang, Fan Xiao, Ziping Yu, Peng Huang, and Fu Zou

*Land* 11: 396

Artificial cultivation had been applied to recover the meadow suffering from serious degradation in the Qinghai–Tibet Plateau. Studies focusing only on the changes in vegetation, soil and microbes along the meadow degradation were insufficient, and artificial cultivation as an important part of succession was always neglected. Here, the variables of

vegetation, soil, and soil bacteria are surveyed in four types of alpine meadow in the protected lands of the Qinghai–Tibet Plateau: intact alpine meadow (IAM), moderate degradation alpine meadow (MDAM), extreme degradation alpine meadow (black soil beach (BSB)), and artificial alpine grassland (AAG). The results indicated that degradation and cultivation significantly changed the characteristics of the vegetation community, physicochemical features of the soil, and soil bacterial community diversity. Soil bacteria took a considerably longer time to adapt to degradation and cultivation than vegetation and soil. Compared to IAM and BSB, ADAM and AAG had more specific bacteria identified by ANOVA and LEfSe analysis, implying an unstable state. Combined with vegetation and soil variables, it was speculated that the unstable AAG was not significantly improved from the degraded meadow, and also lagged significantly compared to IAM. Correlation analysis revealed that aboveground biomass, species richness, vegetation coverage, SOC, C/N, BD, WC, and pH were significantly associated with bacterial diversity under community level. Aboveground biomass was an effective indicator for soil bacterial gene copies. Redundancy analysis demonstrated that the soil bacterial community is mainly regulated by the vegetation coverage, Gleason index, Simpson index, TN, TP, and pH under phylum and genus level. Partial mantel test analysis indicated that the physicochemical features of the soil were the most important factor correlating with the soil bacterial community along the degradation and cultivation, compared to other environmental factors.

For further reading: <https://doi.org/10.3390/land11030396>