For the 601-602nd issues of Headlines Himalaya, we reviewed journal articles from five sources and selected 6 researches from three countries. We selected 2 researches from Nepal and 4 researches from other Himalayan countries (India and Pakistan).

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APPARENT GAINS, HIDDEN COSTS: EXAMINING ADOPTION DRIVERS, YIELD, AND PROFITABILITY OUTCOMES OF ROTAVATOR TILLAGE IN WHEAT SYSTEMS IN NEPAL

Gokul P. Paudel, Vijesh V. Krishna, and Andrew J. McDonald

Journal of Agricultural Economics 71: 199-218

The ‘high speed’ rotavator is used for shallow tillage to create a fine tilth and incorporate crop residues, often with a single tractor pass. Rotavator tillage has spread quickly in many parts of South Asia, despite short-term experimental trials suggesting deteriorating soil quality and crop yield penalties. Evidence of rotavator impacts on farmer fields across soil gradients and time is largely absent. From a farm household survey conducted among wheat farmers in Nepal, we estimate wheat yield and profitability outcomes for rotavator adopters and non-adopters using propensity score matching. We find that rotavator adoption leads to inferior outcomes, despite significant cost savings for land preparation (US$ 11–15 per hectare). With rotavator adoption, farmers
lose about 284–309 kg of wheat grain and about US$ 93–101 of profits on average per hectare per season, and these penalties increase with longer-term use of the technology. Adoption of rotavator appears to be driven by the cost and time savings for land preparation. Against this backdrop, new policy and extension efforts are required that discourage rotavator use and favour more sustainable tillage technologies.

For further reading: https://doi.org/10.1111/1477-9552.12333

MELTING HIMALAYAN GLACIERS THREATEN DOMESTIC WATER RESOURCES IN THE MOUNT EVEREST REGION, NEPAL

Leah R. Wood, Klaus Neumann, Kirsten N. Nicholson, Broxton W. Bird, Carolyn B. Dowling, and Subodh Sharma

Frontiers in Earth Science 8: 128

Retreating glaciers and snowpack loss threaten high-altitude communities that rely upon seasonal melt for domestic water resources. But the extent to which such communities are vulnerable is not yet understood, largely because melt contribution to water supplies is rarely quantified at the catchment scale. The Khumbu Valley, Nepal is a highly glaciated catchment with elevations ranging from 2,000 to 8,848 m above sea level, where more than 80% of annual precipitation falls during the summer monsoon from June to September. Samples were collected from the rivers, tributaries, springs, and taps along the major trekking route between Lukla and Everest Base Camp in the pre-monsoon seasons of 2016–2017. Sources were chosen based upon their use by the communities for drinking, cooking, bathing, and washing, so the sample suite is representative of the local domestic water supply. In addition, meltwater samples were collected directly from the base of the Khumbu Glacier, and several rain samples were collected throughout the study site. Meltwater contribution was estimated from δ18O isotopic data using a two-component mixing model with the Khumbu glacial melt and pre-monsoon rain as endmembers. Results indicate between 34 and 90% of water comes from melt during the dry, pre-monsoon season, with an average meltwater contribution of 65%. With as much as two-thirds of the dry-season domestic water supply at risk, the communities of the Khumbu Valley are extremely vulnerable to the effects of climate change as glaciers retreat and snowpack declines.

For further reading: https://doi.org/10.3389/feart.2020.00128

India-Himalaya

LINKING THE RECENT GLACIER RETREAT AND DEPLETING STREAMFLOW PATTERNS WITH LAND SYSTEM CHANGES IN KASHMIR HIMALAYA, INDIA

Irfan Rashid, Ulfat Majeed, Sheikh Aneaus, and Mauri Pelto

Water 12: 1168

This study reports the changes in glacier extent and streamflow similar to many Himalayan studies, but takes the unusual step of also linking these to downstream land use changes in Kashmir Valley. This study assessed changes in the area, snout, and equilibrium line altitude (ELA) of four parts of the Kolahoi Glacier using earth observation data from 1962 to 2018. Changes in the discharge of the two streams flowing out from Kolahoi Glacier into the Jhelum basin were also assessed between 1972 and 2018. Additionally, satellite data was used to track the downstream land system changes concerning agriculture, orchards, and built-up areas between 1980 and 2018. This analysis suggested a cumulative deglaciation of 23.6% at a rate of 0.42% per year from 1962 to 2018. The snout of two larger glaciers, G1 and G2, retreated at a rate of 18.3 m a−1 and 16.4 m a−1, respectively, from 1962 to 2018, although the rate of recession accelerated after 2000. Our analysis also suggested the upward shift of ELA by ≈120 m. The streamflows measured at five sites showed statistically significant depleting trends that have been
a factor in forcing extensive land system changes downstream. Although the area under agriculture in Lidder watershed shrunk by 39%, there was a massive expansion of 176% and 476% in orchards and built-up areas, respectively, from 1980 to 2018. The conversion of irrigation-intensive agriculture lands (rice paddy) to less water-intensive orchards is attributed to economic considerations and depleting streamflow.

For further reading: https://doi.org/10.3390/w12041168

WOOD ANATOMY OF INDIAN OAKS, WITH REFERENCE TO SYSTEMATIC, ECOLOGICAL AND EVOLUTIONARY PERSPECTIVES

Prachi Gupta and Sangeeta Gupta

Nordic Journal of Botany 38: e02570

The present study provides a comprehensive analysis of the wood microstructure of 16 species of the genus Quercus (Fagaceae) inhabiting the Himalayan region of India. Indian oaks can be categorized into two groups: ring porous oaks and diffuse porous oaks. Most of the diffuse porous oaks were quite homogenous in their microstructure and showed only slight variations in ray cellular composition and axial parenchyma distribution. The results revealed that the current classification of Quercus is not in concordance with the wood microstructure. Instead, cluster analysis suggested that the quantitative wood microstructure of Indian oaks reflects the environmental/climatic differentiation of the eastern and western Himalayas. All the species of oaks showed a combination of both primitive and advanced wood anatomical characters.

For further reading: https://doi.org/10.1111/njb.02570

EARLY EVIDENCE OF SHIFTS IN ALPINE SUMMIT VEGETATION: A CASE STUDY FROM KASHMIR HIMALAYA

Maroof Hamid, Anzar Ahmad Khuroo, Akhtar Hussain Malik, Rameez Ahmad, Chandra Prakash Singh, Jiri Dolezal, and ShiekhMarifatuHaq

Frontiers in Plant Science 11: 421

Under the contemporary climate change, the Himalaya is reported to be warming at a much higher rate than the global average. However, little is known about the alpine vegetation responses to recent climate change in the rapidly warming Himalaya. Here we studied vegetation dynamics on alpine summits in Kashmir Himalaya in relation to in situ measured microclimate. The summits, representing an elevation gradient from treeline to nival zone (3530–3740 m), were first surveyed in 2014 and then re-surveyed in 2018. The initial survey showed that the species richness, vegetation cover and soil temperature decreased with increasing elevation. Species richness and soil temperature differed significantly among slopes, with east and south slopes showing higher values than north and west slopes. The re-survey showed that species richness increased on the lower three summits but decreased on the highest summit (nival zone) and also revealed a substantial increase in the cover of dominant shrubs, graminoids, and forbs. The nestedness-resultant dissimilarity, rather than species turnover, contributed more to the magnitude of β-diversity among the summits. High temporal species turnover was found on south and east aspects, while high nestedness was recorded along north and west aspects. Thermophilization was more pronounced on the lower two summits and along the northern aspects. Our study provides crucial scientific data on climate change impacts on the alpine vegetation of Kashmir Himalaya. This information will fill global knowledge gaps from the developing world.

For further reading: https://doi.org/10.3389/fpls.2020.00421
PHENOTYPIC TRAIT VARIATION IN INVASIVE AND NON-INVASIVE ALIEN SPECIES OF POTAMOGETON IN KASHMIR HIMALAYAN LAKES OF VARYING TROPHIC STATUS

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ActaPhysiologiaePlantarum 42: 73

Why some alien species become invasive and some of their phylogenetically related congeners do not, is still an intriguing question in invasion biology. Hence, we compared 15 quantitative traits between 4 species of genus Potamogeton, of which 3 (P. crispus, P. nodosus and P. natans) are invasive and one (P. perfoliatus) is non-invasive. Regression analyses of the selected quantitative traits, excluding the leaf number, petiole and peduncle length, showed a significant variation amongst the haplotypes of invasive and non-invasive Potamogeton. The invasive species consistently showed a higher degree of performance-related traits than those of non-invasive species. Phenotypic differentiation among populations was moderate to high ($P_{ST} = 0.10$ to 1.00). Bray–Curtis cluster analysis obtained from 11 populations of the 4 species revealed the maximum trait similarity between P. perfoliatus of Nalnag lake with that of Manasbal lake (similarity indices 0.0796), as against the distantly related invasive P. crispus and non-invasive P. perfoliatus of Manasbal lake (similarity indices 0.7689). We also studied occurrence of target species in three lakes (Dal lake, Manasballake and Nilnag lake) of Kashmir Himalaya along a gradient of trophic status. In general, the highest trait values for all the studied species were recorded in eutrophic Dal lake systems, while the smallest values were found in the oligotrophic Nilnaglake. Conclusively, 12 out of 15 quantitative traits showed significant variation between invasive and non-invasive alien species of Potamogeton, thereby providing useful clues for invasiveness of the 3 species (P. crispus, P. nodosus and P. natans) in a typical eutrophic Dal lake. However, other two lakes are likely to be invaded in view of being in trophic evolution from mesotrophic to eutrophic.

For further reading: doi.org/10.1007/s11738-020-03062-8