An Environmental Research Abstract

Headlines Himalaya

For the 609th-610th issues of Headlines Himalaya, we reviewed journal articles from seven sources and selected nine researches from five countries. We selected two researches from Nepal and seven researches from other Himalayan countries (India, China, Bhutan and Pakistan).

Headlines Himalaya, a weekly research based information fact file is an attempt to keep our global readers abreast with the researches in the Himalaya. Please share it with your colleagues and friends. Also, subscription is free. Enjoy!

NEPAL   *FARMERS' RESPONSIBILIZATION IN PAYMENT FOR ENVIRONMENTAL SERVICES: LESSONS FROM COMMUNITY FORESTRY IN NEPAL*

UNLOCKING ELECTRIC COOKING ON NEPALI MICRO-HYDROPOWER MINI-GRIDS

INDIA   *COMPARATIVE LANDSLIDE SUSCEPTIBILITY ASSESSMENT USING STATISTICAL INFORMATION VALUE AND INDEX OF ENTROPY MODEL IN BHANUPALI-BERI REGION, HIMACHAL PRADESH, INDIA*

BIOPROSPECTING PLANT GROWTH PROMOTING ENDOPHYTIC BACTERIA ISOLATED FROM HIMALAYAN YEW (TAXUS WALLICHIANA ZUCC.)

CHINA   *THE COMPLETE CHLOROPLAST GENOME OF ABIES GEORGEI ORR VAR. SMITHII, A SPECIES ENDEMIC TO THE QINGHAI-TIBET PLATEAU, CHINA*

THE COMPLETE CHLOROPLAST GENOME SEQUENCE OF JUNIPERUS SALTUARIA (CUPRESSACEAE) BHUTAN

BHUTAN   *PARAMETRIC STUDY OF LOCAL SITE RESPONSE FOR BEDROCK GROUND MOTION TO EARTHQUAKE IN PHUENTSHOLING, BHUTAN*

PAKISTAN   *BIOCHAR ADDITION COUPLED WITH NITROGEN FERTILIZATION IMPACTS ON SOIL QUALITY, CROP PRODUCTIVITY, AND NITROGEN UPTAKE UNDER DOUBLE-CROPPING SYSTEM.*

IDENTIFICATION AND CHARACTERIZATION OF IMPORTANT STERILE AND MAINTAINER LINES FROM VARIOUS GENOTYPES FOR ADVANCED BREEDING PROGRAMMES OF ONION (ALLIUM CEPA)

FARMERS' RESPONSIBILIZATION IN PAYMENT FOR ENVIRONMENTAL SERVICES: LESSONS FROM COMMUNITY FORESTRY IN NEPAL

Yajnamurti Khanal and Bishnu Prasad Devkota

As attention to individual responsibility and the potential for self-realization through responsibilization grows, there is a need for better understanding of how environmental governance is also changing. In considering changes in community forestry priorities, from reversing deforestation to environmental governance, it is essential to understand how environmental responsibilities are being shifted to individuals and how people react to particular environmental conditions within such changes. In community forestry, farmers` decisions to receive and provide environmental services are guided by rational choices and market mechanisms. This study assessed how farmers value irrigation water supply services from community forests based on the economic and environmental importance of these services. The study also investigated whether responsibilization persists and reframes individual choices to pay for environmental services. Rajapani community forest user group in Rupandehi district, Nepal, was selected for the study due to its ongoing procedures to supply water for irrigation in the village. For data collection farmers were purposively selected to represent different well-being status, gender and distance of paddy field from the water source. Contingent valuation and focus group discussions were employed as research methods. The study revealed that mean willingness of the farmers to pay was USD 77.13 per ha per year for irrigation water. Distance from paddy field to water source, well-being status, education, age, gender and caste of the farmers were tested against willingness to pay (WTP). Pearson correlation tests showed distance of paddy field from water source, well-being status and gender have a substantial influence on the individual's WTP. Farmers also expressed substantial concern for the sustainability of water resources, and were exposed to responsibilizing discourses mainly because they were willing to emphasize personal action to respond to the situation and overcome potential imposed threats of climate change. The shifting forms of environmental governance have implications for responsibilizing service providers and receivers in payment for environmental services, and open a new discourse in community forestry.

For further reading: https://doi.org/10.1016/j.forpol.2020.102237

UNLOCKING ELECTRIC COOKING ON NEPALI MICRO-HYDROPOWER MINI-GRIDS

William Clements, Kimon Silwal, Surendra Pundit, Jon Leary, Biraj Gautam, Sam Williamson, Anh Tran, and Paul Harper

Electric cooking has the potential to improve quality of life for people who cook using biomass, both by improving health by eradicating harmful emissions and by removing the need to collect fuelwood, thus freeing up time for other activities. This paper reports on a study that introduced electric cooking as an alternative to biomass-based cooking in 10 households in Simli, a rural Western Nepali community, to assess its feasibility in rural off-grid contexts. Quantitative and qualitative data from a cooking diary study and electrical mini-grid data were collected, assessing the compatibility with micro-hydropower grids and Nepali cooking practices. Datasets of Nepali cooking practices and meal energy requirements were generated, revealing that generally two meals are cooked per day and that, on average, electric cooking consumes 0.25 kWh/day and 0.14 kWh/meal. Participants simplified their cooking practices and found chapati hard to cook on the induction hobs due to inexperience with the cookers. Conversely, dal and rice were found to be easy and fast to cook in pressure cookers on the hobs, leading to a switch from cooking chapati-vegetables based meals to dal-rice based meals. Fuel stacking was common, with participants reverting to their biomass stoves to cook chapati, and due to a lack of reliable electricity supply. Participants found that the transition to electric cooking provided more time for households, due to the reduction in length of time to cook a meal and less time required to collect firewood, and enjoyed cooking on the stoves due

to elimination of indoor air pollution. The electrical data analysis showed that control issues, voltage instability, and limited micro-hydropower plant capacity provide obstacles for electric cooking, especially as it becomes more widely practiced. Nepali people typically cook at the same time as peak demand for electricity, exacerbating the problem of limited capacity in villages like Simli. Only three households continued to use their electric stoves regularly due to a lack of reliable electricity supply, showing that widespread adoption of electric cooking is currently unfeasible. The running costs of electric cooking were lower than the effective labour time costs of fuelwood collection, but initial capital expenses for the electric cooking system and monthly electricity costs are a further barrier to adoption in rural Nepal.

For further reading: https://doi.org/10.1016/j.esd.2020.05.005

India-Himalaya

COMPARATIVE LANDSLIDE SUSCEPTIBILITY ASSESSMENT USING STATISTICAL INFORMATION VALUE AND INDEX OF ENTROPY MODEL IN BHANUPALI-BERI REGION, HIMACHAL PRADESH, INDIA

Prafull Singh, Ankit Sharma, Ujjwal Sur, and Praveen Kumar Rai

Landslide is a complex natural hazard that sometimes causes disaster resulting in loss of life, assets and infrastructure, especially in the Himalayas. Recent studies suggest that for effective mitigation and resilience through proper planning and policymaking, it is equally important to justify and select a suitable scientific technique that most appropriately addresses the salient causes of a landslide in any area. The principal objective of this study is to carry out a comparative assessment between two contemporary statistical techniques, i.e., the statistical information value (SIV) and index of entropy (IOE), to find out the effectiveness of the two said methods in landslide susceptibility mapping in Bhanupali-Beri region. During the analysis, the higher-resolution satellite images, i.e., World view-2 image of 2017 and Landsat-8 OLI image of 2018, have been used for delineation of various triggering parameters used for landslide susceptibility. The contemporary GIS technique integrated with the remote sensing applications was distinct in preparing the prominent landslide conditioning factor layers such as slope, slope aspect, thrust and fault proximity, geomorphology, landuse–landcover, stream power index, topographic wetness index, geology, roads proximity, lineament density and past landslide inventory. The final assessment was performed using GIS software through raster re-sampling, and the values derived for each conditioning factors were combined using defined SIV and IOE equations. The study area was categorized into five distinct landslide susceptible zones (very low, low, moderate, high and very high) using the Jenk's Natural Breaks algorithm. Index of entropy model has given better results compared to SIV. The utmost vital factors triggering landslide (estimated for entropy values) in the area are landuse–landcover with barren land and sparse vegetation followed by TWI, lineament density, geomorphology, and slope.

For Further Readings: https://link.springer.com/article/10.1007/s10668-020-00811-0

BIOPROSPECTING PLANT GROWTH PROMOTING ENDOPHYTIC BACTERIA ISOLATED FROM HIMALAYAN YEW (*TAXUS WALLICHIANA* ZUCC.)

Priyanka Adhikari and Anita Pandey

The present study aims to investigate the endophytic bacteria, isolated from the roots of *Taxus wallichiana* Zucc. and designated as GBPI_TWL and GBPI_TWr, for their plant growth promoting traits. On the basis of phenotypic and molecular characters, the bacteria are identified as species of *Burkholderia* and *Enterobacter*, respectively. Both the bacteria could grow at wide range of temperature (5-40 °C, opt=25 °C) and pH (1.5-11.0, opt = 6-7), and tolerate salt concentration up to 12 %. While both the bacterial endophytes possessed siderophore, HCN,

ammonia, and salicyclic acid producing abilities, GBPI_TWL showed IAA and ACC deaminase producing abilities, in addition. The bacteria were found to be potential phosphate solubilizers at wide temperature range (5-35 °C) by utilizing tricalcium, iron, and aluminium phosphate as substrate. Further, the bacterial isolates produced phytase and phosphatase enzymes in both acidic and alkaline conditions. Positive influence of the inoculation with the bioformulations of GBPI_TWL and GBPI_TWr was demonstrated on the test crops namely rice (*Oryza sativa*) and soybean (*Glycine max*) with respect to physico-chemical and plant growth parameters in net house experiments. The study will have implications in developing bioformulations, specifically for low temperature environments, in view of environmental sustainability.

For Further Readings: https://doi.org/10.1016/j.micres.2020.126536

China Himalaya

THE COMPLETE CHLOROPLAST GENOME OF ABIES GEORGEI ORR VAR. SMITHII, A SPECIES ENDEMIC TO THE QINGHAI-TIBET PLATEAU, CHINA

Jiang-Rong Li, Jia-Rui Chen, Jian-Ke Wang, and Wei-Lie Zheng

Mitochondrial DNA Part B 5: 2553-2554

Abies georgei Orr var. *smithii* is an evergreen coniferous species of Pinaceae, and is endemic to the Qinghai-Tibet Plateau of China. Considering its vital ecological functions in this unique area, the complete chloroplast (cp) genome was constructed in this study to provide genetic information for its further study of conservation and evolution. The complete cp genome is 121,213 bp in length with GC content of 38.3%, and contains a tetrad structure, including a large single copy region of 76,278 bp, a small single copy of 42,575 bp, and two very short repeats of 1,180 bp for each. Besides, it contains 113 genes in total, including 74 CDSs, 35 tRNAs, and four rRNAs. This genome has been deposited in Genbank under accession number of MT527722.

For Further Readings: https://doi.org/10.1080/23802359.2020.1780981

THE COMPLETE CHLOROPLAST GENOME SEQUENCE OF *JUNIPERUS SALTUARIA* (CUPRESSACEAE)

Xinjun Zhang, Xingle Qu, Jiangrong Li, Jian Huang, Yuhuan Jia, and Shujun Chen

Mitochondrial DNA Part B 5: 2565-2567

In order to supply genetic information of *Juniperus saltuaria*, we reported the complete chloroplast genome sequence based on high-throughput sequencing data. The whole chloroplast genome was 128,099 bp long with an asymmetric base composition (32.9% A, 16.9% C, 18.1% G and 32.1% T). The genome annotation predicted a total of 116 genes, including 82 protein-coding genes, 30 tRNA genes, and 4 rRNA genes. The neighbor-joining phylogenetic analysis based on 45 complete chloroplast genome sequences showed that *J. saltuaria* was more closely related to the congeneric *J. recurva*. The assembled chloroplast genome of *J. saltuaria* will provide useful genomic data both for the phylogenetic research of *Juniperus* and the conservation of this species.

For Further Readings: https://doi.org/10.1080/23802359.2020.1781559

Bhutan-Himalaya

PARAMETRIC STUDY OF LOCAL SITE RESPONSE FOR BEDROCK GROUND MOTION TO EARTHQUAKE IN PHUENTSHOLING, BHUTAN

Karma Tempa, Raju Sarkar, Abhirup Dikshit, Biswajeet Pradhan, Armando Lucio Simonelli, Saroj Acharya, and Abdullah M. Alamri

Earthquakes, when it comes to natural calamities, are characteristically devastating and pose serious threats to buildings in urban areas. Out of multiple seismic regions in the Himalayas, Bhutan Himalaya is one that reigns prominent. Bhutan has seen several moderate-sized earthquakes in the past century and various recent works show that a major earthquake like the 2015 Nepal earthquake is impending. The southwestern city of Bhutan, Phuentsholing is one of the most populated regions in the country and the present study aims to explore the area using geophysical methods (Multispectral Analysis of Surface Waves (MASW)) for understanding possibilities pertaining to infrastructural development. The work involved a geophysical study on eight different sites in the study region which fall under the local area plan of Phuentsholing City. The geophysical study helps to discern shear wave velocity which indicates the soil profile of a region along with possible seismic hazard during an earthquake event, essential for understanding the withstanding power of the infrastructure foundation. The acquired shear wave velocity by MASW indicates visco-elastic soil profile down to a depth of 22.2 m, and it ranged from 350 to 600 m/s. A site response analysis to understand the correlation of bedrock rigidness to the corresponding depth was conducted using EERA (Equivalent-linear Earthquake Site Response Analysis) software. The amplification factors are presented for each site and maximum amplification factors are highlighted. These results have led to a clear indication of how the bedrock characteristics influence the surface ground motion parameters for the corresponding structure period. The results infer that the future constructional activity in the city should not be limited to two- to five-story buildings as per present practice. Apart from it, a parametric study was initiated to uncover whatever effects rigid bedrock has upon hazard parameters for various depths of soil profile up to 30 m, 40 m, 60 m, 80 m, 100 m, 120 m, 140 m, 160 m, 180 m and 200 m from the ground surface. The overriding purpose of doing said parametric study is centered upon helping the stack holders who can use the data for future development. Such a study is the first of its kind for the Bhutan region, which suffers from the unavailability of national seismic code, and this is a preliminary step towards achieving it.

For further reading: https://doi.org/10.3390/su12135273

Pakistan- Himalaya

BIOCHAR ADDITION COUPLED WITH NITROGEN FERTILIZATION IMPACTS ON SOIL QUALITY, CROP PRODUCTIVITY, AND NITROGEN UPTAKE UNDER DOUBLE-CROPPING SYSTEM

Izhar Ali, Liang He, Saif Ullah, Zhao Quan, Shangqing Wei, Anas Iqbal, Fazal Munsif, Tariq Shah, Ying Xuan, Yuqiong Luo, Li Tianyuan, and Jiang Ligeng

Biochar and inorganic fertilizer when co-applied have been reported to increase crop yield and enhance soil fertility. However, studies on this complementary effect on soil properties and noodle rice performance in China are still scanty. To investigate the effects of biochar application coupled with inorganic fertilizers on soil sustainability and yield and yield attributes of noodle rice, outdoor pot experiments were conducted in the early and late growing seasons in 2018. The treatment combinations were T_1 (B0 t/ha + N270 kg/ha), T_2 (B20 t/ha + N270 kg/ha), T_3 (B40 t/ha + N270 kg/ha), T_4 (B60 t/ha + N270 kg/ha), T_5 (B0 t/ha + N360 kg/ha), T_6 (B20 t/ha + N360 kg/ha), T_7 (B40 t/ha + N360 kg/ha), and T_8 (B60 t/ha + N360 kg/ha). The results compiled across the seasons showed an increase in Pn (net photosynthetic rate), grain yield, N uptake, gel consistency, amylose content (AC), and protein content in biochar-treated pots as compared to T_1. Average increases of 63.24, 63.66, 14.85, 58.0, 59.0, 22.39, and 2.9% were observed in soil porosity, moisture content, pH, organic carbon, total nitrogen, available phosphorus, and available potassium in T_4 over T_1 across the seasons, respectively. Root morphological characteristics such as total root length, surface area, volume, and average root diameter were significantly improved in T_3, T_4, T_7, and T_8. Starch-related enzymes such as starch branching enzyme (SBE), starch debranching enzyme (DBE), and soluble starch synthase (SSS) were not affected significantly; however, granule-bound starch synthase (GBSS), ADP-glucose pyrophosphorylase (ADPG), and starch synthesis (SS) enzyme showed higher activity

in 40 and 60 t B/ha across N rates. Conclusively, biochar application of 60 t/ha along with 270 kg N/ha is a promising option for improving soil quality and increasing photosynthesis, yield, and yield attributes of noodle rice.

For Further Readings: https://doi.org/10.1002/fes3.208

IDENTIFICATION AND CHARACTERIZATION OF IMPORTANT STERILE AND MAINTAINER LINES FROM VARIOUS GENOTYPES FOR ADVANCED BREEDING PROGRAMMES OF ONION (*ALLIUM CEPA*)

Rafiq Ahmad, Mahmood-ul- Hassan, Ghanan B. Akhtar, Sadia Saeed, Sabaz A. Khan, Muhammad Kausar Nawaz Shah and Nadeem Khan

Onion is one of the major vegetable crops in terms of production as well as consumption. In the current research, available onion genetic stock was evaluated to identify male-sterile lines and produce high-yielding F_1 hybrids for future breeding programmes. A mitochondrial DNA-based marker was mapped and correlated with phenotypic traits to isolate male-sterile plants. Based on the floral and pollen structure, nine putative male-sterile lines were identified. On the other hand, for nuclear marker identification at *Ms* locus, two sets of primers were used, one for *Ms* dominant allele and another for sterile and maintainer plants. Results revealed that 70% of open pollinated varieties (OPVs) possess plants with sterile cytoplasm coupled with genetic sterility at *Ms* locus, called sterile "A" line. Approximately 20% of plants in some genotypes were identified with normal (N) cytoplasm having recessive fertility gene at *Ms* locus, called maintainer "B" line. Based on the present findings, "A", "B" and "R" (restorer line), future F_1 hybrid seed production systems in onion is discussed.

For Further Readings: https://doi.org/10.1111/pbr.12844