An Environmental Research Abstract

Headlines Himalaya

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For the 591-592th issues of Headlines Himalaya, we reviewed journal articles from three sources and selected nine happenings from four countries. We selected four happenings from Nepal and five happenings from other Himalayan countries (India, China, and Pakistan). The overall coverage of this issue is agriculture, biodiversity, pollution, energy and environment.

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SMALL-SCALE LIVESTOCK PRODUCTION IN NEPAL IS DIRECTLY ASSOCIATED WITH CHILDREN'S INCREASED INTAKES OF EGGS AND DAIRY, BUT NOT MEAT

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Nutrients 12 (2020): 252.

Animal source foods (ASF) provide nutrients essential to child growth and development yet remain infrequently consumed in rural Nepal. Agriculture and nutrition programs aim to increase ASF intake among children through small-scale animal husbandry projects. The relationship between livestock ownership and children's consumption of ASF, however, is not well established. This study examined associations between livestock ownership and the frequency with which Nepali children consume eggs, dairy, and meat. We analyzed longitudinal 7-day food frequency data from sentinel surveillance sites of the Policy and Science of Health, Agriculture and Nutrition (PoSHAN) study. Data consisted of surveys from 485 Nepali farming households conducted twice per year for two years (a total of 1449 surveys). We used negative binomial regression analysis to examine the association between the number of cattle, poultry, and meat animals (small livestock) owned and children's weekly dairy, egg, and meat intakes, respectively, adjusting for household expenditure on each food type, mother's education level, caste/ethnicity, agroecological region, season, and child age and sex. We calculated predicted marginal values based on model estimates. Children consumed dairy 1.4 (95% CI 1.1–2.0), 2.3 (1.7–3.0) and 3.0 (2.1–4.2) more times per week in households owning 1, 2–4 and >4 cattle, respectively, compared to children in households without cattle. Children consumed eggs 2.8 (2.1–3.7) more times per week in households owning 1 or 2 chickens compared to children in households without chickens. Child intake of meat was higher only in households owning more than seven meat animals. Children's intakes of dairy, eggs, and meat rose with household expenditure on these foods. Small-scale animal production may be an effective strategy for increasing children's consumption of eggs and dairy, but not meat. Increasing household ability to access ASF via purchasing appears to be an important approach for raising children's intakes of all three food types.

For further reading: https://doi.org/10.3390/nu12010252

SPATIAL CONCENTRATIONS OF WILDLIFE ATTACKS ON HUMANS IN CHITWAN NATIONAL PARK, NEPAL

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Animals 10 (2020): 153.

The study was conducted within and adjacent to Chitwan National Park in Nepal (CNP), where several wildlife species are involved in conflicts with humans. We assessed the spatial relationships between the number of victims/km^2 (=victim density or VD) of attack by wildlife (elephant, rhino, wild boar, sloth bear, leopard or tiger) versus landscape features, including both natural habitat type and land use by humans (e.g., nursery, orchard or cultivated). We identified four levels of VD, ranging from <1 V (victim)/4 km^2 to >1 V/2 km^2 for each land use zone, then tested for correlations at one or more of those VD between each pair of wildlife species across different land use types. Our results high correlation for sloth bear and leopard ($r \approx 0.8$), for all species except elephant and wild boar at VD > 1 V/4 km^2 ($r > 0.9$) and for leopard vs. rhinoceros ($r = 0.99$) across land use types at 1 V/4 km^2) indicate some risk-reduction measures. One of them would be division of each buffer zone into three concentric rings, for instance ranging from high-risk adjacent areas to areas of high use by humans, to low-risk where human

use is low. This revision would facilitate giving local people more voice in implementing conservation measures and reducing risks.

For further reading: https://doi.org/10.3390/ani10010153

MITIGATING THE IMPACTS OF AIR POLLUTANTS IN NEPAL AND CLIMATE CO-BENEFITS: A SCENARIO-BASED APPROACH

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Air Quality, Atmosphere and Health 13 (2020): 361-370.

Short-lived climate pollutants (SLCPs) including black carbon (BC), and troposperic ozone (O_3) are major cliamte forcers after carbon dioxide (CO_2). These SLCPs also have detrimental impacts on human health and agriculture. Studies show that the Hindu Kush Himalayan (HKH) region, which includes Nepal, has been experiencing the impacts of these pollutants in addition to greenhouse gases. In this study, we derive a national-level emission inventory for SLCPs, CO_2, and air pollutants for Nepal and project their impacts under reference (REF) and mitigation policy (POL) scenarios. The impacts on human health, agriculture, and climate were then estimated by applying the following (1) adjoint coefficients from the Goddard Earth Observing System (GEOS)-chemical transport model that quantify the sensitivity of fine particulate matter ($PM_{2.5}$) and surface O_3 concentrations in Nepal, and radiative forcing in four latitudinal bands, to emissions in 2 x 2.5° grids, and (2) concentration-response functions to estimate health and crop loss impacts in Nepal. With the mitigating measures undertaken, emission reductions of about 78% each of BC and CH_4 and 87% of $PM_{2.5}$ could be achieved in 2050 compared with the REF scenario. This would lead to an estimated avoidance of 29,000 lives lost and 1.7 million tonnes of crop loss while bringing an economic benefit in present value of 2.7 times more than the total cost incurred in its implementation during the whole period 2010-2050.The results provide useful policy insights and pathways for evidence- based decision-making in the design and effective implementation of SLCP mitigation measures in Nepal.

For further reading: https://doi.org/10.1007/s11869-020-00799-6

GROWTH-RING ANALYSIS OF *DIPLOKNEMA BUTYRACEA* IS A POTENTIAL TOOL FOR REVEALING INDIGENOUS LAND USE HISTORY IN THE LOWER HIMALAYAN FOOTHILLS OF NEPAL

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Forests 11 (2020)*:* 242.

Slash-and-burn is a farming practice of the indigenous communities in the Himalayan foothills of Nepal. The traditional land-tenure system is based on a customary oral tradition. However, the government's persistent denial of land rights has fueled the indigenous conflicts in the last few decades. Deliverance of scientific evidence-based arguments may underpin the ongoing conflict-resolution dialogues between the authorities and the indigenous communities. Dating growth rings of trees in a slash-and-burn system might help the indigenous people to find evidence of their historic land uses in the mountainous landscape. In this pilot study, we examined the potential of *Diploknema butyracea* (Roxb.) H. J. Lam growth rings for documenting land use history of Nepalese indigenous farming practices, as this species is being preserved during the slash-and-burn practices. The species is an economically important and ecologically interesting (as it flushes leaves when everything is dry, and sheds leaves while everything is green) deciduous tree species belonging to *Sapotaceae* family and widely distributed in Sub-Himalayan tracts. Five stem discs were studied which were originated from the Kandrang valley of the Chitwan district, Nepal. For the first time, we revealed distinct growth rings in this species which are marked by fibers with thicker cell walls. Growth-ring anomalies, i.e., wedging and partially missing rings, were also found. Four out of five samples could be crossdated at a marginal level ($GLK \geq 60$ and $t \geq 2.0$) which is a confirmation of the annual nature

of growth rings. One of the samples showed black spots of oxidized wood which are traces of fire, suggesting evidence of slash-and-burn practices in the study area since 1933. This study suggests a strong potential of *D. butyracea* for growth-ring analysis to reconstruct indigenous land use history in Nepal.

For further reading: https://doi.org/10.3390/f11020242

India-Himalaya

FACTORS AFFECTING WOOL CHARACTERISTICS OF SHEEP REARED IN KASHMIR

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Tropical Animal Health and Production (2020): 1-5.

This study was conducted on 82,908 records of purebred and upgraded Kashmir Merino sheep to evaluate the performance of breed over the years. The data pertaining to fiber diameter (FD), staple length (SL), clean wool yield percent (CWY %), number of crimps/cm (NCPC), and medullation percent (MP) spread over a period of 15 years (2013–2017) was collected from Fleece Testing Laboratory Nowshera, Srinagar. The highest CV (%) was observed for MP, whereas the lowest CV (%) was observed for FD (2.07%). The least-squares means were 20.96 ± 0.002 µm, 4.05 ± 0.01 cm, 66.68 ± 0.01%, 4.38 ± 0.02 No/cm and 0.79 ± 0.05% for FD, SL, CWY (%), NCPC and MP, respectively. The year of shearing had highly significant ($p < 0.01$) effect on all the traits under the study. The study concludes that crossbreeding with exotic fine wool breeds has resulted improved genetic potential of native germplasm with respect to wool quality traits with Merino sheep performing better in the agro-climatic conditions of the State. Environment was also found to play a significant role in expression of wool quality traits during the period of the study.

For further reading: https://doi.org/10.1007/s11250-020-02238-1

China Himalaya

RURAL HOUSEHOLD ENERGY CONSUMPTION OF FARMERS AND HERDERS IN THE QINGHAI-TIBET PLATEAU

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Energy 192 (2020): 116649.

Rural energy consumption not only significantly affects the national economy but also informs us about the living conditions of rural residents. A comprehensive survey of households in the agropastoral area of Qinghai Province was conducted from 2017 to 2018 to identify its energy consumption characteristics. In this paper, a typical household energy flow model was established. The results show that 1) the proportion of noncommercial energy in the agropastoral area of Qinghai Province is 52.89%, and it is affected by the 'returning farmland to forest' (RFF) policy and the 'returning grazing land to grassland project' (RGLGP). Furthermore, the household energy consumption structure has shifted from traditional biomass to coal and a combination of other energy sources. 2) Households of different cultural backgrounds have different energy consumption patterns. 3) High-income households consume more energy and have more frequent energy flows compared with low-income households. The results of this survey will help policymakers and scholars to formulate strategies for energy conservation and more effectively assess energy policies.

For further reading: https://doi.org/10.1016/j.energy.2019.116649

DIVERSITY AND DISTRIBUTION OF METHANOGENIC COMMUNITY BETWEEN TWO TYPICAL ALPINE ECOSYSTEMS ON THE QINGHAI–TIBETAN PLATEAU

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Current Microbiology 77(2020): 1061-1069

Alpine permafrost regions are important sources of biogenic CH_4 and methanogens play an important role in the methane-producing process. The alpine permafrost on the Qinghai–Tibetan plateau comprises about one-sixth of China's land area, and there are various types of alpine ecosystems. However, the methanogenic communities in the typical alpine ecosystems are poorly understood. In this study, the active layers and permafrost layers of the natural ecosystem of alpine grassland (DZ2-1) and alpine swamp meadow (DZ2-5) were selected to investigate the diversity and abundance of methanogenic communities. *Methanobacterium* (63.65%) are overwhelmingly dominant in the active layer of the alpine grassland (DZ2-1A). ZC-I cluster (26.13%), RC-I cluster (19.56%), and *Methanobacterium* (15.02%) are the dominant groups in the permafrost layer of the alpine grassland (DZ2-1P). *Methanosaeta* (32.92%), Fen cluster (29.59%), *Methanosarcina* (16.33%), and *Methanobacterium* (13.95%) are the dominant groups in the active layer of the alpine swamp meadow (DZ2-5A), whereas the Fen cluster (50.85%), ZC-I cluster (27.63%), and RC-I cluster (14.15%) are relatively abundant in the permafrost layer of the alpine swamp meadow (DZ2-5P). qPCR data showed that the abundance of methanogens was higher in the natural ecosystem of alpine swamp meadow than in alpine grassland. We found that the community characteristics of methanogens were related to environmental factors. Pearson correlation analyses indicated that the relative abundance of *Methanobacterium* had a significantly positive correlation with hydrogen concentration ($P < 0.01$), while the relative abundances of *Methanosaeta* and *Methanosarcina* were positively correlated with acetate concentration ($P < 0.05$). This study will help us to understand the methanogenic communities and their surrounding environments in alpine ecosystems.

For further reading: https://doi.org/10.1007/s00284-020-01891-x

Pakistan- Himalaya

FLOOD VULNERABILITY ASSESSMENT USING MOVE FRAMEWORK: A CASE STUDY OF THE NORTHERN PART OF DISTRICT PESHAWAR, PAKISTAN

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Natural Hazards 101(2020): 385-408

Climate variability and changes in contemporary society such as increasing population, poor urbanization and expansion of residential areas are increasing the vulnerability and frequency of flooding hazards in Pakistan, especially in Khyber Pakhtunkhwa (KP) Province. Minimizing flood vulnerability needs an understanding of the factors that drive vulnerability to flooding hazard. The present study was conducted in the flood-prone areas of Peshawar, a district of KP, to evaluate flood vulnerability of the population using the Method for the Improvement of Vulnerability Assessment in Europe. Following this framework, an extensive literature review was conducted to develop relevant proxy indicators. Structured questionnaires were used for household surveys to collect data from 210 households in seven selected sites through simple random sampling method. The vulnerability factors, i.e., exposure, susceptibility and resilience, as well as the overall vulnerability were calculated and compared using ArcGIS tools. Results show that the overall vulnerability and the factor vulnerability of the studied sites were very high. Susceptibility and exposure factors were found to greatly influence vulnerability, and communities had low resilience in the face of flooding hazard. Addressing these indicators properly in developing strategies can reduce

vulnerability and increase capacity of the communities to cope with floods in the future. Additionally, the government and disaster management agencies can play a significant role in minimizing the vulnerability to floods by strengthening physical and socioeconomic capacities through education, training and awareness about precautionary and mitigation measures.

For further reading: https://doi.org/10.1007/s11069-020-03878-0

HAPPENING OF THE MONTH

NEPAL GOVERNMENT REMOVES PENALTIES FOR KILLING WILD BOAR, RAISING CONCERN AMONG CONSERVATIONISTS

The recent change to the existing National Park and Wildlife Conservation Rules (1974) allows communities to capture and even kill wild boar if the animals enter their agricultural farms and damage crops. Wildlife conservationists have concerned that the new provisions could lead to the rampant killings of wild boars, which are prized for their meat. According to the Ministry of Forests and Environment, wild boar has been included on the list of pest animals—which is a category of animals that cause agricultural damage and other losses to local communities—after following complaints that the animal enters into farm land and damage crops at an unprecedented level. However, law provisions that farmers cannot intentionally hunt the wild boars; they first need to chase away or capture the animals alive and release them. If in case they are killed in the process of capturing or chasing away the boars, farmers will not be penalised; but need to provide the details of the incident validating with five persons, including representatives from the ward office. Additionally, meat of the animal can then be consumed by locals if they so desire by paying a certain amount to the authorities as per the weight of the dead boar. But, the question is if it controls the crop damage from wild boar or increase the illegal hunting of wild boar.