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International Conference 26-28 October, 2017

Abstract Book

Editors:

Vishwambhar Prasad Sati
K.C. Lalmalsawmzauva
Lalrinpuia Vangchhia

Natural Resources Management for Sustainable Development and Rural Livelihoods

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ABSTRACT BOOK

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School of Earth Sciences and Natural Resources Management
Mizoram University, Aizawl – 796004

Bishen Singh Mahendra Pal Singh
23-A, New Connaught Place
Dehra Dun - 248 001 (INDIA)
2017

Natural Resources Management for Sustainable Development and Rural Livelihoods
(Abstract Book)

ISBN- 978-81-211-0974-1

Published by Gajendra Singh Gahlot for Bishen Singh Mahendra Pal Singh, 23-A, New Connaught Place, Dehra Dun, India and Printed at Shiva Offset Press and composed by Doon Phototype Printers, 14, Old Connaught Place, Dehra Dun, India.

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Preamble

Natural resources are depleting at alarming rates because of their irrational use pattern. Although, utilization of resources is an intrinsic component of the process of development yet, overexploitation of natural resources has led to environmental degradation and change in pattern of rural economy. Rural communities, in particular, are greatly affected by the increasing use of natural resources. To many of them, development is about livelihood and survival rather than increasing productivity and accumulation of wealth. Management of natural resources seems to be the only way forward to sustain the livability of rural communities.

Management of natural resources requires collaborative works from various stakeholders as the use and un-use of natural resources depend upon a number of factors including historical, political, economic, social and cultural. Through the substantial holistic approach and concrete framework for policy research could be conceptualized, planned and implemented.

Department of Geography and Resource Management, Mizoram University, Aizawl, India, hosted an international conference on natural resources management for sustainable development and rural livelihoods which have addressed ways to boost agricultural productivity for food security and sustainable economic development, while conserving and restoring the natural resource base. Topics were covered include: assessment, management of natural resources for sustainable development, rural livelihoods and food security; integrated management of water and land resources; conserving agriculture systems; climate change mitigation and adaptation strategies including carbon sequestration in soils for different land use systems; and policy frameworks for capacity building to mitigate emerging problems in natural resource management. Developing and transition economies will be increasingly concerned with natural resources management, sustainable development and rural livelihood issues; they will have to solve a three-fold challenge: a better environment, good economic performances and poverty reduction as targeted by the Millennium Development Goals. Developing and emerging countries will also have to tackle with increasing scarcities.

Major objectives of conducting the conference was to evaluate past research efforts in integrated natural resources management for sustainable development and rural livelihoods, to streamline future scientific efforts in support of sustainable livelihood, to draw recommendations for capacity building in land, forest and water management

Invited participants were international scientists, leading farmers and experts from governmental and non-governmental organizations, researchers, representatives of

donor organizations and decision-makers who exchanged views on how to use and manage natural resources for sustainable development and rural livelihoods.

The Conference focused on various aspects of natural resources management for sustainable development and rural livelihood which were elaborated upon into the 11 thematic sessions:

Natural resources management
Climate change and sustainability issues
Biodiversity
Crop productivity
Water harvesting for improving livelihoods
Socio-economy of sustainable livelihoods
Farmers' forum on Sustainable Livelihoods and natural Resources
Agricultural and forestation issues
Soil conservation and forestry
Landscapes
Technologies for improved rural welfare

Mizoram:
Brief Introduction

Mizoram, known as the land of Blue Mountains and for its picturesque beauty, is one of the eight Sisters of Northeast India. It extends from 21°56'N – 24°31' N latitudes and 92°16'E – 93°26'E longitudes, bordered on the north by the state of Assam, on the northwest by the state of Tripura, north east by the state of Manipur, international border of Bangladesh and Myanmar on the south, southwest and east. It has a total area of 21,087 square kilometers with proportion of 0.64 per cent to the total geographical area of India.

The state earlier known as the Lushai Hills districts since 1947, which was changed into Mizo District under the administration of the Assam state until 1972 when it was carved out as a Union Territory. It conferred statehood on 20th February 1987 as the Peace Accord was signed by MNF and the Government of India on 30th June 1986 under the framework of 53rd Amendment of Indian Constitution, 1986.

Mizoram is a land of rolling hills, valleys, rivers and lakes. As many as 21 major hill ranges or peaks of different heights run through the length and breadth of the state inclined towards north south direction along with plains scattered. Important rivers that flow through this hilly state are Tlawng, Chhimtupui, Tiau, Khawthlangtuipui, Tut, Turial, Tuirini, Tuivawl and Tuichang. They are the lungs of agricultural development in the state.

The Tropic of Cancer runs through the heart of Mizoram bisects the state almost into two equal halves, and hence, it has a pleasantly temperate climate throughout the year being relatively cool in summer 20°- 29°C but progressively warmer most probably with temperatures ranging from 7°-22°C during winter season. The region is influenced by monsoons, raining heavily from May to September with little rain in the dry (cold) season.

According to 2011 census, Mizoram has a population of 1,091,014 with 552, 339 males and 538, 675 females. The sex ratio of the state is 976 females per thousand males, higher than the national ratio 940. The density of population is 52 persons per square kilometer. About 95 per cent of the population is of diverse tribal origins – colourful Mizo and other tribes with rich culture that is blend of Southeast Asia and South East Asia during the 16th century to 18th century except Chakma from Banladesh. Mizoram is the most urbanized state with 52 % of the total population lives in urban area, much higher than India's average. The literacy rate of Mizoram was 91.33 per cent which is higher than the national average 74.04 per cent, and second literate among all the states of India.

Tourist Destination place in Mizoram

Mizoram is endowed with natural scenic beauty and is considered by many as a beautiful place due to its dramatic landscape, pleasant climate, hospitality and friendly environment. Some of the interesting historical sites and monuments in Champhai district are Mizo Poets' Square also known as Mizo Hla Kungpui Mual in Mizo, Thasiama Seno Neihna is a flat on a rugged hillock measuring around 7.20 sqm which is 86 km away from a historical legendary water of 'Fiara Tui' is located about 65 km from Champhai and has its source in the Tan Tlang Mountain A cluster great megalith found near Vangchhia Village. Chawngtlai - A Mizo historical village (162 km from Aizawl, 50 km from Champhai) has many historical monuments and assets such as Sahlam - a tree of hanging enemy's head during the period of War between Mizo and Halkha Pawih, Khawpuitan tlang, Lungphun sang - Tallest monoliths of Mizoram and Lungsen - future portrayal stone. The famous cave known as Mura Puk is situated in Zote village, which is 10 km away from Champhai town. There are six caves at this site and these were the hiding place of the local villagers. The largest historical religious lake of Mizoram 'Rih dil', 27 kilometres from Champhai near Zokhawthar in Myanmar is considered to be the passage of the souls to the eternal abode.

Phawngpui (Blue Mountain) National park in the southern part and Murlen National Park is home to a rich variety of flora and fauna. Ngengpui Wildlife sanctuary and Tawi sanctuary, and Dampa Tiger Reserve is the largest wildlife sanctuary in Mizoram. A two-tiered waterfall of Vantawng Falls (called *Vantawng Khawhthla* in Mizo language) is the highest falls in Mizoram, located 5 kilometres south of Thenzawl in Serchhip district.

The Hmuifang Tlang, the mountain covered with virgin forests reserved since the Mizo Chief's time is a tourist spot near the capital city of Aizawl. Reiek village is typical village with a mountain ridge offers view of the surrounding valleys and hills which is surrounded by thick lush green temperate trees and bushes.

The state capital of Mizoram is Aizawl which is the centre of all important government offices, state assembly house and civil secretariat. Mizoram state Museum, Durlang hills, Solomonss's Temple, KV Paradise, Mizoram Science Centre and Bara Bazar are the important tourist in the city. Baktawng Village, 70 km from Aizawl is the place where Mr Ziona lives with the "world's largest existing family" with 39 wives, 94 children, 14 daughters-in-law and 33 grand children is the unique village of Mizoram.

Mizoram University

Mizoram University is a central university under the University Grants Commission, Government of India, and was established on 2nd July, 2001, by the Mizoram

University Act (2000) of the Parliament of India. Mizoram University has embarked on various programmes for academic and administrative development. It provides several academic and non-academic facilities and services to students including a library, sport facilities and/or activities, financial aids and/or scholarships, study abroad and exchange programs, as well as administrative services. At present, there are 8 schools and 38 departments functioning. There are 31 affiliated undergraduate colleges, including 2 professional institutions and 1 constituent college.

Mizoram University is a thriving academic with its large green scenic hills, located at Tanhril at the western outskirts of Aizawl city. The University life is lively and diverse with 50% of the teaching staff and 16% of the students coming from various parts of the country. On 21st 2014, the University for its First Accreditation, was awarded grade 'A'/3.12 out of 4 point scale valid up to 20th February 2019, by the National Assessment and Accreditation Council (NAAC), Bangalore.

Mizoram University was ranked 94th in the Overall Ranking of more than 3000 institutions and 51st among the Universities, for the year 2017, which was conducted by National Institutional Ranking Framework (NIRF), Ministry of Human Resource Development, Government of India, New Delhi.

The Mizoram University campus contains regenerating tropical wet evergreen and semi-evergreen forests, including a protected forested water catchment reserve in the north and a small biodiversity park. The plant life includes 384 species of vascular plants in 290 genera and 107 families. The campus also has a rich diversity of animal species. Among reptiles, there are 23 species of snakes in four families and noted as an Bird hotspot with about 50 species listed at present including species such as Eurasian Wryneck, Black-crested Bulbul and many others.

Mizoram University is about 40 minutes drive from the heart of the main city of Aizawl, capital of the state of Mizoram. the city is connected by Air Kolkatta, Gwahati and Imphal. It also connected by Silchar, Gwahati and Shillong etc,. The distance between Mizoram University and Lengpui airport is 39 kms which may takes an hour's to take a trip from Lengpui Airport to Mizoram University by a Car or Taxi.

Department of Geography and Resource management

The Department was established in 2003 under the name of Department of Geography, Tribal Culture and Resource Management, renamed as Department of Geography and Resource Management. The department has been marching under the leadership of invited renowned Professor, Prof. R.C. Sharma (Retd), pioneer of the Department from Jawahar Lal Nehru University. The charge was taken over by Prof. R.B. Singh (Retd.) from Banaras Hindu University till March 2004. After the

appointment of regular faculty in March 2004, Prof. G. Kumar became the Head of Department, succeeded by Prof. P. Rinawma (2007-2010) and Prof. Rintluanga Pachuau (2010-2013) in the next terms. Currently, Prof. Vishwambhar Prasad Sati is heading the Department.

It has seven faculty members from various parts of the country and four non-teaching staff with one Guest faculty. With the substantial resource, the Department is striving toward academic excellence as well as improving departmental facilities and teaching aids. The Department is actively engaged in developing its laboratories, GIS, Computer and Cartography. It inputs specialized courses in regional planning and is intending to provide specialized courses in Remote Sensing, GIS and Computer Cartography.

The department is running Master of Science in Geography with intake capacity of 30 students and Ph. D. course where currently 26 students are persuading Ph. D. It has organized two national seminars and one national workshop successfully and is continued working towards academic excellence.

Assam Lemon Juice Processing Plant

By Dr. Vanlalchhanhima Ralte, Owner/Partner of Koinonia Juice Plant

www.koinonian.com

Establishment

Koinonia Juice Plant, established in the year September 2011, we are the manufacture of Koinonia Lemon Juice, a Ready-To-Drink beverage. Our office is located in South Kanan, Aizawl, and our factory, the main manufacturing unit is located at Lengte, Mizoram.

Koinonia Juice Plant is a Partnership Firm with a registered serial number RF/MZ – 95 of 2011-2012, Partners between Dr. Vanlalchhanhima Ralte & Mrs. Ngurmawii Sailo, registered under the Firms and Societies, Government of Mizoram, and our business is registered under District Industries Center (DIC), Aizawl with an Entrepreneur's Memorandum Number 15/03/12/00921 (Part II) and registered with Ministry of Micro, Small & Medium Enterprises (MSME), Government of India. We are an Indian Organic certified by the certification body of Intertek (India) Private Limited. License under the Food Safety and Standard Authority of India (FSSAI). Having a Consent to Operate from the Mizoram Pollution Control Board, Government of Mizoram. And we are now a registered brand from an Indian Intellectual Property under class 32. Our image/logo that is display in each of our product and through every of our advertising channel were now all a registered brand.

History

We started our business plan from the beginning of 2011 with our private consultant from the food processing consultancy and an architect for the factory buildings. In which, the building project was estimated at Rs. 44 Lakhs, and the machineries was Rs. 40 Lakhs. With our new upgradation plan in 2017, the machineries implemented for juice processing is estimated at Rs. 60 Lakhs. Most of our machineries implemented at our factory were brought from an inter states manufacturing company i.e. New Delhi, Mumbai, etc., and an installation was completed in the year 2012, and started a trial production within the same year. And in the year 2013, Food Processing Industry, Directorate of Industry, Government of Mizoram had granted us a few

amounts of subsidy from our building and machineries project, under one of their scheme.

How We Process

Naming each of our product as "Koinonia Lemon Juice", in which we manufactured two flavor "Sweet" and "Salted". The size of our product ranges from 150ml, 250ml, 500ml, and 750ml. For processing of our product, our main raw material is Assam Lemon. Within our owned farm at Lengte, which is as large as 3.8 Ha., we grow a lemon tree of 10000 numbers, in which 8000 tree are up to satisfactory for picking during each season, which is further extracted into Lemon Juice. An extraction of 20 – 25 Assam Lemon contain 1 litre of Lemon Juice. Within a year, from our owned farm, an Assam Lemon extraction reached up to 25000 litres. As demand from the customers and consumers is increasing, apart from our farm we procured an extracted lemon juice from different local growers within the State, from various family. Before every purchased is made from the local grower, we have an analyzing meter for each lemon juice, before it is further procured, and after each and every quality testing has been passed to our standard of procurement, the procurement has been taking into place. Within a year, our annual estimated stock of lemon juice for processing of our product comes between 75000 to 100000 litres. In addition to this, water has been used for processing of the products, which is first collected from the water tank and further process into a treated water from our Reserve Osmosis (R.O.) Plant. Again, in addition to this, an ingredient has been added. Apart from our main raw material, we acquire raw material, such as packing items, preform, label, etc. from our different supplier from other States i.e. Assam, West Bengal, Odhisa, New Delhi, Mumbai.

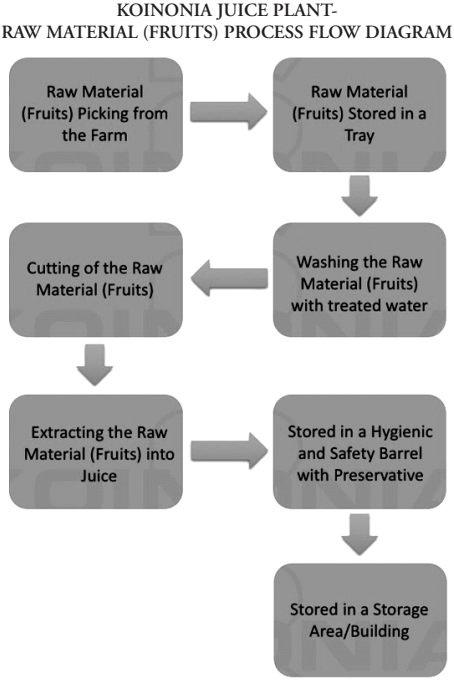
Product Description

Quantity (in ml)	Box Quantity and Weight:	Box Sizes (L/B/H)
150 ml – Koinonia Lemon Juice	150 ml x 48 = 07.2 Kgs	360 L x 260 B x 160 H
250 ml – Koinonia Lemon Juice	250 ml x 36 = 09.0 Kgs	315 L x 315 B x 185 H
500 ml – Koinonia Lemon Juice	500 ml x 24 = 12.0 Kgs	390 L x 250 B x 230 H
750 ml – Koinonia Lemon Juice	750 ml x 12 = 09.0 Kgs	300 L x 200 B x 255 H

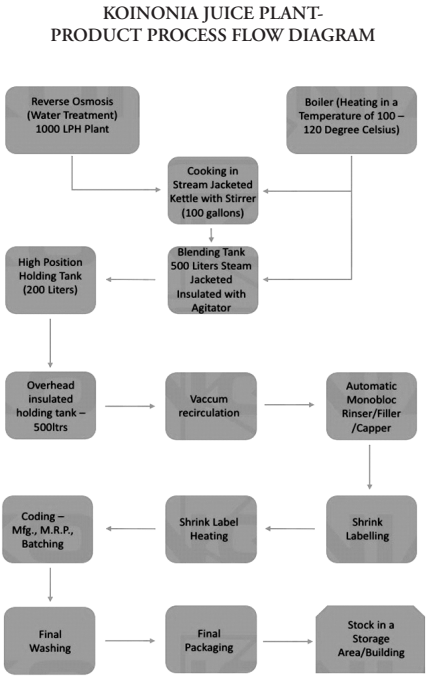
Our processed product is a Ready-To-Drink product. An organically grown product (Assam Lemon) with 100% status of an Indian Organic in the production without using any chemical fertilizer with a certification number ORG/SC/1412/002158. And 95% organic status in the processing without adding any colouring agent with a certification number ORG/SC/1412/002159.

Our juice contains vitamins and provides invigorating energy to the consumer. Lemon is good for diabetics and also well-known for its property of controlling

human blood pressure. Our fresh tangy flavor of lemon also freshens the mind and invigorates the body.



Fruit (Assam Lemon) processing flow diagram at Koinonia Farm.



Product (Koinonia Lemon Juice) processing flow diagram from cooking to final packaging.

Human Resource

At our premises at Lengte, where our farm and manufacturing unit is situated, we have 25 – 30 personnel. Having an accommodation for each of our workers at our premises. Majority were accommodated, while some few personnel were working in daily. Majority of our personnel are from within the State, while a few are from other State. There main tasks were divided into different categories, from the production manager to the farmer. The production manager handling all kind of daily production record, rotation of the workers, handling all kind of communications with the main office. Operator handling all kind of machines and some technical issues.

At our registered office in South Kanan, Aizawl, personnel recruitment, sales, purchases, advertising and finance has been carried out, and all kind of Government compliances. All daily production records, dispatch records, stock records from the factory has always been recorded and maintained.

Market

Agreement: This is the first step we do before each and every sale has been supplied to our distributors. An agreement has been signed for the period of 6 months, and not more than a year. Before an expiry of an agreement with our distributor, a new agreement has been carried out within the last month of each previous agreement ending. Presently, we have three (3) distributor within the State. And we are planning to captured more market in extending our distributor in various region.

In addition to our future market expansion plan into more various large marketplace, we are planning to established a new manufacturing unit within the North-East India or within the State itself. Which would be able to captured our neighboring international market like Bangladesh, Myanmar.

Website and Social Media

Koinonia Juice Plant, having our own domain name and launched our website on 22nd May 2013 i.e. koinoniajuiceplant.com. Mainly our website is for an information, inquiry, and recruitment for and from the firm. We do even link with our social media sites like Facebook, Twitter, YouTube and Google. The main website/domain of the firm is koinonian.com, which was originally launched since 1st June 2013.

In the name of Koinonia Juice Plant, a Facebook page was created and active since 2013. In which the name of the page is Koinonia Juice Plant, and in short @ KoinoniaJP.

Financial Statement (Last Two Year)

Within the period of 2015-2016, we have spent approximately Rs. 59 Lakhs for purchasing. And the product manufactured within this period is 25000 cases, which is 1200000 finished products in a packaged bottle. So, the total market sales value (M.R.P.) of the product manufactured within this period is Rs. 1.2 Crores.

In 2016-2017, raw material purchased fund turn up to Rs. 49 Lakhs. While the product manufactured within this period is 23000 cases, which is 1100000 finished products in a packaged bottle. So, the total market sales value (M.R.P.) of the product manufactured within this period is Rs. 1.1 Crores.

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1

Section

Natural Resources Management

Identifying the Causes of Water Scarcity and Sustainable Water Conservation for Improving Livelihood in Bankura District, West Bengal: A Geographical Perspective

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Abstract

Water scarcity is one of the important concerns of present day geographers as water is the central subject of all kinds of developmental activities. Water is kinds essential for all socio-economic development and for maintaining a healthy ecosystem in the world. At present reduction of water scarcity is prime goal of many countries and Government. Bankura is one of the most backward district of West Bengal in terms of economic and human development. Water scarcity is a regular threat for the people of Bankura district which has great negative impacts on development of Bankura. Therefore Taldangra, Raipur, Ranibandh, Khatra and Onda are the five CD Blocks of Bankura district have been selected where problems of water scarcity are very much predominant and people suffer this problem throughout the year. Therefore, in this research paper, an attempt has been made to point out the root cause of water scarcity in these blocks and suggest some remedial measures especially the sustainable water conservation for further planning through which the problem may overcome and make Bankura district more water sustain and efficient.

Keywords: Goal, Water Scarcity, Threat, Sustainable Water Conservation, Remedial Measures.

Spatial Analysis of Regional Development, a Rural Area Study of Jaunpur District

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Department of Geography, Institute of Science, Banaras Hindu University Varanasi

Abstract

Regional Development is a Multi-Dimensional process. It represent an overall Development of any region like social, economic, agriculture, infrastructure and industrial development. The problem of regional disparities is not found in India only, rather it is a global problem but in India it is more common than in any another

country. The present paper aims to analyses the imbalance in the level of development with spatial emphasis on the regional dimension. Twenty four variable related social, economic, agriculture, infrastructure and industrial have been select for analyzing the spatial variation of development of 21 blocks of the Jaunpur district. For this study secondary data have been collected from Zila Sankhikiy Patrika and census of India and other related offices. Composite Index of development and Z-score have been used to calculate the agriculture development, Infrastructure development industrial development socio-economic development and finally the level of overall development. The analysis revealed that Sirkoni holds the first position while Barasati attain low level of development.

Keywords: Regional Development, Z score, Composite index of development, level of development.

Temporal Analysis of Rainfall Variability of Nagaland

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Abstract

Nagaland has mainly a rugged hilly terrain. Its topography rises abruptly from the Brahmaputra valley eastward. The torrential monsoon rains are integral features of the state's weather. Nagaland is located in the north eastern region of India; the state of Nagaland shares the international border with the country of Myanmar to the east and Arunachal Pradesh state and some parts of Assam state in the north, Assam to the west and Manipur to the southern parts. It lies between 26º6' N to 27º4' North latitudes and 95º20' E to 95º15' East longitude and has an area about 16,579 Sq.km. with the population of 19, 80, 602 (2011). The maximum average temperature recorded in summer is 32 degree Celsius while minimum is as low as 4 degree Celsius in winter. Some regions in the state are subject to frost winter. The state records an average annual rainfall of 2000mm to 2500mm. Nagaland is drained by four chief rivers of Doyang, Jhanji, Dhansiri and Dikhu. The rivers are the tributaries of the mighty Brahmaputra River with their sources in the mountain ranges of the state. The economy is dependent on agriculture which forms the chief occupation of the tribal inhabitants. Nearly one-third of the land area is cultivated by the shifting cultivation technique. The forest regions are being cleared to practice jhum cultivation which has caused the depletion of the natural vegetation of Nagaland. The surface water resource of the Nagaland is studied by analyzing rainfall data over a period of 30 years

(1986-2015) and worked out mean rainfall, rainfall intensity, rainfall variability and rainfall ratio on monthly, seasonal and annual basis. About 16 rain-gauge stations were selected within Nagaland to analyze the rainfall data. The average rainfall is 1536mm and total surface of water resources is 25,465,344,000m^3. On the basis of mean rainfall the annual average groundwater recharge worked out that is 818mm.

Keywords: Rainfall, rainfall variability, temporal analysis

Reflections of Community and Natural Resource Management in Tourism, a Case Study of Meghalaya

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Department of Tourism and Hotel Management, North-Eastern Hill University,
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Abstract

Though the development of tourism industry transforms the country's economy, creates employment opportunities but the negative impacts are threat for degradation of natural resources and biodiversity. The emerging forms of tourism like ecotourism, sustainable tourism and indigenous tourism come in action with the main concept of protection, sustainability and effective use of natural resources. Conservation and management of natural resources is increasingly valued because these resources are realised as the foundation of the tourism industry and the driver of all economic benefits associated with industry. In last two decades community plays an important role in conservation and natural resource management at the tourism destinations, as the paradigm shift from central controlled approach to bottom up approach. The abode of clouds, Meghalaya is one of the beautiful states in north eastern part of India blessed with charming natural resources attracting numbers of tourists throughout the year. The study intended to do a critical analysis on the impacts of tourism development and community's role in natural resource management at different important tourism destinations of Meghalaya. The conceptual study carried out on the basis of case studies and different secondary source data on different tourism destinations of the state. The study reflects light on the conservational aspects of the tourism industry apart from the negative impacts. The paper also focuses on different factors affecting community in natural resource management in tourism industry.

Keywords: Tourism resources, Conservation, Impact analysis, Resource Management, North-East India.

Data Management of Groundwater Resources of Afghanistan

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Abstract

Accurate and comprehensive groundwater resource data are critical to planners and decision makers at all levels of government, researchers, developers and the business community.

Now more than ever, the increasing needs to manage our groundwater resources and start collection data and monitor for many areas with continuity and non-stopping in all over the country. At this time, all water line ministries, different institution, municipalities, universities, INGOs collect and maintain extensive groundwater data whenever they needed and never want to share with each other. Improved data development, collection, management, coordination and sharing offer direct and indirect benefits to all Afghan groundwater sectors. Ministry of Energy and Water (MEW) has been responsible for mapping, monitoring and management of groundwater for a long term time with sustainable manners. For MEW, we know that we do not have too much data and information about groundwater resources in all areas in Afghanistan. We know something about our river systems and have some old data (1960-1980). But there are long periods(1980-2004) with gaps in the information from monitoring of river systems and groundwater, now our monitoring systems are in the process of being established and developed from (2006-2017) only for surface water and minor part of country covered with groundwater monitoring system from 2004-2016 (DACAAR&MEW). In the field of groundwater resources, we have very limited data. We have some old hydrogeological maps, some borehole records but no databank to consult for assessing the groundwater situation. We need to develop and manage that, only we have recent scattered groundwater data from (2004-2016) for Kabul city in Khak jabar district, Khanishen district in Helmand, Panjsher province, Sari pul area in Sheberghan province, three districts in Mazare Sharef , Khlum district in Samangan province . For example, decision makers, planners, regulators and the public can become better informed based on groundwater accurate data which may lead to improved decisions for future water planer to assist local planning efforts can be enhanced water security and safety for any users. MEW is in the process of developing a database for hydrogeological information. However, we have not yet got a system ready to handle, and receive data which also comes in all different type of formats. Very few places do we know actually how much water there is to use. It

is also necessary to monitor groundwater aquifers, water levels and capacities for sustainable exploration. We need to test pumping data for find out what capacities there. To facilitate for groundwater to serve all Afghans in a sustainable and effective manner for development and improved livelihood. We need to work to gather and updated knowledge of what groundwater resources we have in Afghanistan and how much water we can extract in a sustainable manner. To have a monitoring system that can inform us of changes and need for action to protect and sustain the vital groundwater resources. To develop instruments to manage aquifers and groundwater use, to keep extraction within sustainability thresholds of water levels also, improved data access and sharing between agencies can result in reduced duplication of efforts, thereby saving of money and time.

Keywords: Data management, groundwater resources, Afghanistan

Ethnomedicinal Practices for Livelihood Enhancement in Rural Areas of Aizawl District, Mizoram

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Abstract

Since time immemorial, in all continent of the world the ethnomedicinal plants are the major source for treatment of various diseases and ailments. Especially in rural as well as in tribal area of India it is still in practice. In Mizoram, the formulae based on traditional knowledge of ethnomedicinal plants are playing very important role for the treatment of diseases and for livelihoods. From generation to generation without proper documentation, peoples use these formulae because of easily available, low-cost and it's a good alternative to allopathic drugs. In present study, a survey was made to document the ethnomedicinal formulae which are still in practice in Aizawl District of Mizoram. It was carried out mainly on interviews conducted with the traditional healers. The names of the ethnomedicinal formulae, plant parts used methods of preparations and its combination, dosages and duration of treatment and different ailments were recorded. The finding shows that the ethnomedicinal formulae play important role for improving and maintaining the people's health. The study concludes that there is a strong need for further research and scientific validation of available knowledge regarding MAPs before they are applied industrially.

Keywords: Ethnomedicinal plants, Mizoram, rural livelihoods, tribal area, traditional healers

Impacts of Ponds and Livelihood Issues of Rural Communities with Special Reference to Dhanaipur Mouza in Harirampur Block, Dakshin Dinajpur

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Abstract

Pond is one of the important artificial or natural water bodies located all most all parts in the world which play great role for maintaining natural diversity and ecological balance. A pond is a body of standing water, either natural or artificial that is usually smaller than a lake. They may arise naturally in floodplains as part of a river system, or they may be somewhat isolated depressions (examples include vernal pools and prairie potholes). Usually they contain shallow water with marsh and aquatic plants and animals. A few animals also make their home in ponds, including both alligators and beavers. From evolution periods of human civilization, man and water body relationship are immoral and without water human civilizations do not exist. Before industrialization, 100 % population was fully depend on nature for their livelihoods like cultivation, gathering, hunting, fishing, mining etc. Due to climatic uncertainty agricultural activities was very challenging that also nowadays. So, most of human civilization was settle near water bodies, for also transportation from one place to another place. Expansion of time, human civilization was not only surrounded near natural water bodies, they also create and dug numbers of ponds for storage of water which is essential for irrigation as well as domestic and drinking purposes. Dakshin Dinajpur is important district where have very high concentrations of various sizes of pond liked, Kaldighi, Altadighi, Maliandighi, etc. The study covers both primary and secondary sources of data but more emphasis was given on primary data. Total 60 ponds are selected but 15 ponds are surveyed for this study which is cover more than 60 households located near pond bank. The study tries to find out impacts of pond water on human life, to find out socio-economic status of population and to find out the infrastructure facilities among households. Dhanipur is one of important mouza which is located nearly Harirampur block headquarter in Dakshin Dinajpur district but socio-economic status of mouza is fully depend on agricultural activities as well as primary occupation. Total areas of village are 189.84 hectares on the basis of census report 2011 and total number of households is 504. According to 2011 census, total population are 2,175, out

of them, male population 1,081 and female population 1,094. According to 21.67% households in the study area inform that pond have great role to maintain additional activities and Still 13.33% households directly and indirectly depend on pond water and 16.67% households' uses for irrigation purposes.

Keywords: Ponds, Livelihood, Significance, Ecological Balance

Mapping between Natural Hazards Stressor and Livelihood Vulnerability of Sichuan Rural Residents, an Exploratory Study Based on Structural Dynamics

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Abstract

The growing impact of natural hazards on rural livelihood has stimulated a demand for an in-depth evaluation of possible strategies to reduce their large-scale damaging effects. Livelihood vulnerability of analysis helps to shed light on potential threats and challenges rural residents facing. Based on structural dynamics, this paper combines insights from both livelihood stressors and resilience of rural households in Sichuan Province, China, for adaptation to climate change in particular natural hazards in the future, and examines change in livelihood vulnerability by combined dimensions of livelihood quality, livelihood promotion, livelihood provision, and hazards stressor during the period of 1978-2014. Results show that: (*i*) the change curve of the livelihood vulnerability of rural residents showed the characteristics of first descending, fluctuating, and then rising since 1978; (*ii*) the livelihood vulnerability of rural residents is significantly positively correlated with natural hazards stressors, but there is a strong negative correlation with the livelihood quality, livelihood promotion and livelihood provision; (*iii*) the impact of different natural hazards on the vulnerability of livelihood is different. The contribution rates of earthquake, drought and flood disaster to the vulnerability of livelihood is 2.1 percent, 6.1 percent, and 4.4 percent respectively. To this end, establishing a more reliable policy mechanism for rural residents would be a vital step in reducing livelihood vulnerability.

Keywords: livelihood vulnerability; structural dynamics; natural hazards; Sichuan; adaptation

Sustainable Livelihood of Rural People Living Nearby Wetlands, a Big Quest of the Present Time in Aie-Manas-Beki Interfluvial Region of Assam, India

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Abstract

There is a close relation between natural resource and man. It is more so in rural areas. People living in rural areas are directly associated with the available resources in their localities. Wetlands are the most concern aspects of study as the people living nearby the wetlands deteriorating their ecological quality. The present study has been undertaken to study the present status of wetlands from the ecological point of view along with the sustainability of rural people living nearby the wetlands. The study is based on both primary and secondary data collected from the field, Survey of India toposheets and satellite imageries which are analysed in GIS environment. The surrounding rural people have maintained their livelihood and occupational engagement with the resources of the wetlands. The wetlands are the primary source of water for agriculture and have now become potential areas for rice and vegetable production in winter season and fish in summer season. The conservation of wetlands for their natural ecological status has become a big challenge for the present day conscious society.

Keywords: Sustainable, livelihood, quest, interfluvial, ecological.

Tribes, Sacred Jungle and Natural Resources Management in West Bengal

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Abstract

Cultural clash and mixed culture have reduced the tribal traditions, nature oriented cultures and tribal-worshiping. And in this situation we are losing and have lost most parts of our age-old tribal traditions. Thus in this situation we have to conserve our tribal-traditions like Sacred Jungles tradition; to maintain

our environmental status and to reduce the diseases of the environment. Sacred Jungles are age-old traditional practices of our geographical territory and it has great ecological and non-ecological value to conserve our environment in fruitful way apart from and alongside the strictly theological and liturgical forms of the official religion. On the basis of different folk-Gods tribal-folks arrange their Sacred Jungles. For example, the popular Gods of Santal tribes are: Marang Buru, Moreko, Jair era, Gramadevata, Gosain era, Pargana, Manjhi. All the Gods have their allotted place in the Sacred Jungles, and are worshipped only in public place. Marang Buru alone is also worshipped privately in the family. Sacred Jungles are basically related with tribe and their life. From the whole survey total 63 tribal Sacred Jungles have been observed. In tribal society the per capita nourishment of Sacred Jungles is higher comparative to all religions because tribal society mainly practices the traditional worshipping methods and the result is like 1 tribal person are conserving 2 Sacred Jungles averagely in West Bengal. Present researcher will present the detail of tribal sacred Jungles in West Bengal and a relational Natural Resources Management in West Bengal.

Keywords: Marang Buru, Moreko, Jair era, Gosain era, Pargana.

Tank degradation and ground water nexus: an empirical analysis from West Bengal

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Abstract

Tank irrigation system is one of the oldest and most important common property resources that shows declining trend in the water scarcity arena of West Bengal. The share of tank irrigation with respect to total irrigation is evident for their degradation. Although, groundwater irrigation is the prominent source of irrigation in many parts of India, and become unsustainable due to declining water tables. Ecologically tanks are very important to the conservation of water as well as the ecosystem in a geographically well-distributed mechanism. Against this background, the main objective of this study is to find out the main causes of tank degradation and its complex relationship with ground water in the prospect of sustainable development goals. District wise secondary data are used

to estimate the dynamic panel regression model for analyzing the factor of tank degradation and its relation with ground water. The result of tank degradation shows that the performance of tanks has been a decline over the time. Rainfall has the effect on reducing the pace of tank degradation. Rice production has significant positive impact on tank degradation. This implies that technological progress is one of the important factors that hastening the process of tank degradation. The emergence of groundwater irrigation has been hastened the decline of tanks. Because farmers are, prefer to consolidate their agricultural activities near the tube wells for water security. Thus the ground water table has decreased over time, the result shows that the degradation of tank performance and its degrading factor stimulate the lowering the ground water table. There is a need to improve the mechanism of use and management of tank water supply. Therefore, more efforts are required to renovate and rehabilitate the tanks, which will go long way in enhancing the performance as well as tube wells to accomplish the sustainable development goals.

Keywords: irrigation tanks, tank deterioration, climate change, ground water, sustainable development goals

Forest Resources Traditional Medicines and Sustainable Livelihood of Tribal Population of North East India

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Abstract

About 4 billion hectares, or about 31 percent of the world's land area, is covered with forest. The sustainable management of this forest estate is critical for three reasons. First, forests are home to, and sustenance for, hundreds of millions of people, including some of the world's poorest. Second, deforestation results in severe local and global\environmental damage. Third, controlled/sustainable commercial exploitation of forest products could contribute to economic growth. However, the intrinsic characteristics of forests make sustainable management a challenge. Deforestation and degradation continue without much compensating gain for economic development or poverty reduction. While afforestation and regrowth have added eight million hectares (mostly plantations) to the global

forest estate, the loss of natural forests continues at an unsustainable rate. This loss, mainly due to the conversion of tropical forests to agricultural land, is intricately linked to commodity prices. There have been major changes in the ownership and management of forests. The scenario of forest in North East India is not much different from that of the global scenario as mentioned above. The deforestation in the North East has added a question mark to the lives of many indigenous and poor people who have been using many forest products as food, shelter and health care.

Development in Rural Areas, a Case Study of Chief Minister's Adopted Village

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Abstract

India lives in its villages. Agriculture is the main occupation of rural areas. The rural population declined from 72.19% in 2001 Census to 68.84% in 2011 Census. As per 2011 Census, the total rural population of India is 83.3 crores. But the urban population has increased from 27.81% in 2001 Census to 31.16% in 2011 Census. The increase in urban population indicates lack of employment and other facilities in rural areas. So the central and state governments recognised the importance of rural development for economic growth of the country. The Government of Telangana is implementing innovative programmes not only to eradicate the rural poverty but also to provide better employment opportunities to the rural people. The Honourable Chief Minister of Telangana State, Sri. K. Chandrashekar Rao adopted two villages of Siddipet District and he is taking special interest to develop these villages as model villages for whole country in general and Telangana State in particular. At this juncture, the present paper aims to find out various developmental programmes which are being implementing in the adopted village. The primary data has gathered by the researcher by field visits, interaction with the Village Development Committee and also the beneficiaries of the different schemes of the adopted village. The census details of the village are taken from the secondary sources. Hence the study is based on both primary and secondary sources. The study finds that all the prestigious government programmes like Mission Bhageeratha, Mission Kakatiya, Haritha Haram, Aasara Pesnions, Kalyana Lakshmi and construction of Double Bedroom houses to the poor etc. are

being implemented in the adopted village. Co-operative farming and drip irrigation system have been also practicing for sustainable development.

Keywords: Sustainable development, Adopted village, Innovative schemes, Government of Telangana

Empowering the Poor through Rural Livelihood Programme 'JEEViKA' in Bihar

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Abstract

JEEViKA is rural livelihood programme which has started in October 2007 for poverty alleviation through the collaboration of the poor, Government of Bihar and World Bank, which aims social and economics empowerment of the rural poor and improving their livelihoods by social mobilization, financial inclusion, livelihood promotion, health and skill development. According to the annual report of JEEViKA 2015-16 more than 57 lakh households joined it in 534 blocks in 38 districts in Bihar. Bihar is third most populous state in India with 8.58 per cent of the country's population, and only 2.8 per cent area of the country. According the census 2011, 88.70 per cent population resides in rural area of Bihar. The present paper attempts to analyse the socio-economic development of the poor through JEEViKA in Bihar. It discusses that how JEEViKA helps to empowering the poor and their livelihood options. This paper will help to make policies for rural development. This study is based on secondary sources of data published by World Bank, JEEViKA Reports and Bihar Statistical Handbook, GoB. Maps are prepared in ArcGIS and data computed in SPSS and MS Excel.

Keywords: Financial inclusion, JEEViKA, poverty alleviation, rural empowerment and rural livelihoods.

Rural Tourism a Sustainable Livelihood, a Case Study of Assam Linsey, East Sikkim

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Abstract

Rural area is known for the space of economically underdeveloped, socially backwardness, traditional culture, innocent etc. But undoubtedly it supplies

all the food, resource, fresh air, energy, mineral etc. to the people of the country. It has own distinct physical setting, culture, economy, polity and society. This distinctiveness and identity of the country is always challenged and encountered by urbanization, industrialization, globalization etc.. In post modern / post industrial society, there is a momentum of commodification of rural without degrading or diluting physical environment and culture of rural in the form of rural tourism though which local people can generate huge revenue with direct participation and conserve both culture and physical environment. In this paper, study on how local people get benefit from this rural tourism and how this process provide a sustainable livelihood in the study area, Assam Linsey village and protect and conserve their culture and environment. The research was carried with field survey with scheduled questionnaire and interacts with both tourist and local people. Sample size was ten household who actively participate in rural tourism. It was found that local people who participate are having better income as well as strong sense of conservation and protection of both culture and environment.

Keywords: Rural, Globalization, Rural Tourism, Post modern and Sustainable livelihood

The Apatanis: a Socio Economic Study

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Abstract

Endowed with diverse topographical condition North east India is home to different ethnic groups and tribal communities. Dwelling in the Ziro valley of Lower Subansiri district of Arunachal Pradesh the Apatani is a unique tribe with distinct socio-cultural identity making the Ziro Valley a UNESCO heritage site. Spread across five villages of the valley the Apatanis have a vibrant and fascinating culture which includes their unique body tattoo culture. The paper is therefore an attempt an attempt to have a glimpse of the Apatani Society, their agro economic practices, socio- cultural life and sustainable living practices. For the purpose of the study, two villages have been selected from the Old Ziro naming Tajang, and Hari-I Village. From these two villages 56 households have been surveyed for the primary data collection. The traditional way of living, house structures, rich organic agricultural system and most importantly knowledge of traditional practices enhancing the sustainability of environment, justified

use of natural resource and also care for preservation and protection of the natural environment etc. are interesting facets of Apatani society. The overall picture of life and livelihood depicts a very eco-friendly picture.

Keywords: Apatani Society; socio-cultural practice; agro economy; sustainability.

Reflections of Community and Natural Resource Management in Tourism, a Case Study of Meghalaya

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Abstract

Though the development of tourism industry transforms the country's economy, creates employment opportunities but the negative impacts are threat for degradation of natural resources and biodiversity. The emerging forms of tourism like ecotourism, sustainable tourism and indigenous tourism come in action with the main concept of protection, sustainability and effective use of natural resources. Conservation and management of natural resources is increasingly valued because these resources are realised as the foundation of the tourism industry and the driver of all economic benefits associated with industry. In last two decades community plays an important role in conservation and natural resource management at the tourism destinations, as the paradigm shift from central controlled approach to bottom up approach. The abode of clouds, Meghalaya is one of the beautiful states in north eastern part of India blessed with charming natural resources attracting numbers of tourists throughout the year. The study intended to do a critical analysis on the impacts of tourism development and community's role in natural resource management at different important tourism destinations of Meghalaya. The conceptual study carried out on the basis of case studies and different secondary source data on different tourism destinations of the state. The study reflects light on the conservational aspects of the tourism industry apart from the negative impacts. The paper also focuses on different factors affecting community in natural resource management in tourism industry.

Keywords: Tourism resources, Conservation, Impact analysis, Resource Management, North-East India.

Housing Conditions and Household Amenities in Census Town, a Study of North Twenty Four Parganas District in West Bengal, India

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Abstract

Increase in the number of census towns and their population share in India during 2001-2011 is directed towards the development of rural-urban continuum. However, in reality, the demographic change in census towns merely reflects the true pattern of urbanization and partially indicates the nature of rural urban continuum. A critical analysis of the change in housing conditions and availability of household amenities in census towns is essential to identify the nature of rural to urban transformation. In this context, this paper attempts to analyse the housing conditions and availability of household amenities in 58 census towns of North Twenty Four Parganas district in West Bengal following the Census of India, 2011. The district North Twenty Four Parganas has the highest urban population in West Bengal and a contiguous location with Kolkata Metropolitan Area. Using the basic indicators of housing conditions and household amenities in Census of India, 2011, a hierarchical cluster analysis (Hastie et al., 2009) has been done to analyze the nature of rural-urban transformation in census towns in the study area. It has been observed that the increase in the number of census towns does not indicate the development of rural-urban continuum in North Twenty Four Parganas district.

Keywords: Census town, cluster analysis, demographic change, household amenities, rural-urban continuum

Sensitization for Sustainable Tourism Development in East Khasi Hills District of Meghalaya

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Abstract

Sensitization for Sustainable Tourism development is very important in today's world, making people aware of the environment and how their small actions can

make a big difference. Sustainability is the ability to continue a defined behaviour indefinitely. Sustainability refers to how we might live in harmony with the natural world around us, protecting it from damage and destruction. In 2005, the World Summit on Social Development identified three core areas, such as economic development, social development, and environmental protection, contributes to the philosophy and social science of sustainable development. These "pillars" in many national standards and certification schemes form the backbone of tackling the core areas that the world now faces. Awareness through education is an essential tool for achieving sustainability. Moving towards the goal of sustainability requires fundamental changes in human attitudes and behaviour. Progress in this direction is thus critically dependent on education and public awareness. This research paper aims at sharpening the continuous growth of tourism at East Khasi Hills District of Meghalaya. The objective of the study is to: Assess the various components of environment/sustainability, where immediate attention towards sensitization for sustainability is required; Identify the potential source (organizations, group and/or individuals) whosoever can be sensitized towards sustainability for effective result; Find out the various methods (ways) of sensitization for long lasting effect on sustainability. This research work is based on various secondary sources, Government reports, Interviews of the focus groups at various organizations. Interviews were conducted on the basis of a structured questionnaire.

Keywords: Sensitization, Sustainability, Tourism, Environment, Meghalaya.

Soil Erosion, a Loss of Natural Resource

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Abstract

Soil is valuable; it is a natural resource. It is important for food production. Such soil is lost through wind and water which are called wind erosion and water erosion. There are various types of erosion. In all types of erosion top fertile soil is washed down or blown away. For formation of 1 cm of soil layer, it may take 1000 years; this information adequately shows the significance of soil erosion. North eastern hill region is comprised of the states Assam, Nagaland, Manipur, Mizoram, Meghalaya, Arunachal Pradesh, Tripura and Sikkim. Mostly the terrain is hilly and the steep slopes are very common and hence the quantum of soil eroded is relatively higher. In this paper the alarming soil loss in the North Eastern Hill Region is discussed.

Keywords: Soil erosion, wind erosion, water erosion, north eastern hill region.

Status of Potable Water in Rural Areas of Lunglei Town, Challenges and Solutions

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Abstract

Water is an essential commodity for survival and for the improvement of life quality. Although drinking water is a basic human right, many people do not have access to safe and adequate drinking water, and thus safe and reliable water supply is one of the most important things in rural areas today. The levels of natural contaminants such as fluoride and arsenic and man-made chemical pollutants such as pesticides and insecticides are high and still rising. The biological contamination of large number of drinking water sources is a serious problem, primarily due to prevalent open defecation and insanitary conditions around the drinking water sources in rural areas. To increase economic productivity and improvement in public health, there is an urgent need to immediately enhance access to safe and adequate drinking water. In this paper, we present the present day status of potable water from the rural areas of Lunglei town, Mizoram and the challenges they are facing and the solutions that lie ahead for safe potable water supply for every household in this rural hilly terrain.

Keywords: Potable water, rural areas, contaminants, water quality, Lunglei town.

Socio – Economic and Environmental Impact of Unsustainable sand Harvesting along Thoubal River, Manipur

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Abstract

An unsustainable method and indiscriminate extraction of sand from the river valley is one of the major issues in terms of the fluvial process and the river ecosystem. Rapid urbanization during last few decades has imposed a tremendous pressure on rivers where sand and gravels are occurred. Sand and gravel extraction along the Thoubal River is now becoming the main issue of environmental concern due to the growing increase demand for building construction. However this activities has its socio-economic significant for the local community. Communities living adjacent and along the river channel have earned an alternative source of income

from sand harvesting. However, environmental degradation which has experienced are deforestation, loss of top soil and acceleration of soil erosion, destruction of underground aquifer, loss of save water, affecting water quality and destroying the aesthetic value of the area. This paper focuses to determine the socio-economic impact of the sand harvesting and its effect to the surrounding environment. The study found that these activities give local employment, however the share of monetary benefit to local is minimal. Majority of the landowners have converted their land into sand mining site to obtain living. This study will be useful to explore a devise for sustainable way of sand harvesting and recommend alternative economy and land-use to reduce over reliance on sand harvesting and review of policies to protect environment.

Keywards: Thoubal River, water quality, deforestation, environmental degradation

Towards A More Sustainable Use of Ramsar Loktak Lake of Manipur, India: An Economic Approach

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Abstract

Wetlands are an important resource for the sustenance of societal livelihood. They provide diverse goods and services, which have got immense social, cultural and economic value. However, these often got ignored in the conventional policy framework mainly due to the intangible nature of the same. Loktak Lake is a one of the example for such case. Loktak Lake is considered as the lifeline of the State of Manipur due to its importance in the socio-economic and cultural life of the people. It is the largest natural freshwater lake in the north-eastern region of India. The Lake is currently threatened with severe issues of siltation, eutrophication, pollution, and excessive proliferation of Phumdis, which is the floating land mass in the Lake and hence designated as Ramsar Site.

In the present study, we employ discrete choice experiments to estimate the economic values of changes in several ecological, social and economic goods and services provided by Loktak Lake as perceived by its important stakeholders. Random parameter logit model with socioeconomic interactions is estimated to identify the stakeholders' preferences for the improvement in the selected wetland attributes. The results reveal that there exists heterogeneity in significant scale across stakeholder preferences. On average, however, they perceive positive and significant values from the improved conservation and management of Loktak Lake.

Keywords: Wetlands, Choice Experiments, Loktak Lake, Conservation, Degradation

Identifying the Causes of Water Scarcity and Sustainable Water Conservation for Improving Livelihood in Bankura District, West Bengal: A Geographical Perspective

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Abstract

Water scarcity is one of the important concerns of present day geographers as water is the central subject of all kinds of developmental activities. Water is kinds essential for all socio-economic development and for maintaining a healthy ecosystem in the world. At present reduction of water scarcity is prime goal of many countries and Government. Bankura is one of the most backward district of West Bengal in terms of economic and human development. Water scarcity is a regular threat for the people of Bankura district which has great negative impacts on development of Bankura. Therefore Taldangra, Raipur, Ranibandh, Khatra and Onda are the five CD Blocks of Bankura district have been selected where problems of water scarcity are very much predominant and people suffer this problem throughout the year. Therefore, in this research paper, an attempt has been made to point out the root cause of water scarcity in these blocks and suggest some remedial measures especially the sustainable water conservation for further planning through which the problem may overcome and make Bankura district more water sustain and efficient.

Keywords: Goal, water scarcity, threat, sustainable water conservation, remedial measures

Impacts of Tourism on Rural Development in the Mukutmanipur Village of Bankura District, West Bengal, India

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Abstract

Rural tourism is a recent offshoot of tourism sector that has grown up to be a potential business in its own space. Rural tourism is a form of nature based tourism that uncovers the rural life, culture, art and heritage at rural locations, thereby favouring the local communities socially and economically. Such form of

tourism has created tremendous impact on the local economy and socio-cultural scenario of the concern area on one hand and carries a potential scope for the rural residents on the other hand. Rural tourism is an opportunity for rural development. The Mukutmanipur village of Bankura district has great diversity of culture, tradition and natural resources which makes it every attractive tourist destination. It is a store house of a unique Buddhist culture that has form the basis of attractions for outsiders. Here, rural tourism promotes the local economy, socio-cultural changes and life style of the people residing in and around the village. This present paper aims at exploring of rural tourism at Mukutmanipur village, which act as an incentive to promote local, socio-economic and cultural changes and lifestyle of the people residing in and around this tourist location and also to find out various constraints and possibilities of tourism development in the study area.

Keywords: Rural tourism, rural development, socio-economic, constraints, tourism development.

Natural Resource Management by Asurs of Jalpaiguri, West Bengal

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Abstract

A survey was carried out in December 2016 on the Asurs tribe, a section of who are residing near the Carren tea garden in Nagrakata in the district of Jalpaiguri, West Bengal very close to the Indo-Bhutan border. The Asurs *migrated* from the Chotanagpur plateau area and settled down here permanently synchronizing their economic productivity with the resources available locally. Besides working as tea garden laborers they are also engaged in agricultural activity to supplement their income .To solve the food insecurity situation they sometimes cross the border as the wage rate there is higher. The people harvest the rain water to meet their various needs and are quite aware of the governmental programmes launched in favour of them. The interventions are slowly changing their material culture, food habits and livelihood strategies .Mixed research methods were applied both qualitative and quantitative to empirically represent the findings on the management of locally available natural resources .(157 words)

Keywords: Asurs, tea garden, food insecurity, sustainable livelihood strategies

Data Management of Groundwater Resources of Afghanistan

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Abstract

Accurate and comprehensive groundwater resource data are critical to planners and decision makers at all levels of government, researchers, developers and the business community.

Now more than ever, the increasing needs to manage our groundwater resources and start collection data and monitor for many areas with continuity and non-stopping in all over the country. At this time, all water line ministries, different institution, municipalities, universities, INGOs collect and maintain extensive groundwater data whenever they needed and never want to share with each other. Improved data development, collection, management, coordination and sharing offer direct and indirect benefits to all Afghan groundwater sectors. Ministry of Energy and Water (MEW) has been responsible for mapping, monitoring and management of groundwater for a long term time with sustainable manners. For MEW, we know that we do not have too much data and information about groundwater resources in all areas in Afghanistan. We know something about our river systems and have some old data (1960-1980). But there are long periods(1980-2004) with gaps in the information from monitoring of river systems and groundwater, now our monitoring systems are in the process of being established and developed from (2006-2017) only for surface water and minor part of country covered with groundwater monitoring system from 2004-2016(DACAAR&MEW). In the field of groundwater resources, we have very limited data. We have some old hydrogeological maps, some borehole records but no databank to consult for assessing the groundwater situation. We need to develop and manage that, only we have recent scattered groundwater data from (2004-2016) for Kabul city in Khak jabar district, Khanishen district in Helmand, Panjsher province, Sari pul area in Sheberghan province, three districts in Mazare Sharef , Khlum district in Samangan province . For example, decision makers, planners, regulators and the public can become better informed based on groundwater accurate data which may lead to improved decisions for future water planer to assist local planning efforts can be enhanced water security and safety for any users. MEW is in the process of developing a database for hydrogeological information. However, we have not yet got a system ready to handle, and receive data which also comes in all different type of formats. Very few places do we know actually how much water there is to use. It is also necessary to monitor groundwater aquifers, water levels and capacities for sustainable exploration. We need to test pumping data for find out what capacities there.To facilitate for groundwater to

serve all Afghans in a sustainable and effective manner for development and improved livelihood. We need to work to gather and updated knowledge of what groundwater resources we have in Afghanistan and how much water we can extract in a sustainable manner. To have a monitoring system that can inform us of changes and need for action to protect and sustain the vital groundwater resources. To develop instruments to manage aquifers and groundwater use, to keep extraction within sustainability thresholds of water levels Also, improved data access and sharing between agencies can result in reduced duplication of efforts, thereby saving of money and time.

Keywords: Data management, groundwater resources, Afghanistan

Pattern of Utilization and Management of Wetland Resources, a Case Study of Haringhata Block,Nadia District, West-Bengal

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Abstract

Wetlands are of immense values as a safeguard to our environment and for the maintenance of ecological balance. Hence this calls for a comprehensive study on the degradation, conservation and management ofthese fragile ecosystem. The present paperis concerned with a systematic study on the pattern of utilization and management of wetland resources for the future economic development.ofHaringhata Block of Nadia District**,** West Bengal, which is situated within the lower Ganga delta *plains* of India**.**. These wetlands play an important role in the ecological and economic security of the region. The rapidly developing agricultural economy in this area along with the pressure of population has led to conversion and encroachment of wetland leading to its degradation which in turn has affected the socioeconomic conditions of its stakeholders. The primary objectives of the study is, to review the management pattern of these wetlands including their developmental potentiality ,to analyze the causes of degradation of the wetlands and to suggest conservation measures towards sustainable development of those resources with due weightage on the attitude of the users, Governmental and Non-Governmental organizations. The research work is based on modern methodologyincluding G.I.S and Digital image processing techniques as well as intensive field work, sample survey and collection of primary data. The main findings of the research work are that the district is under fluvial processes where certain intrinsic attributes of wetlands are of immense local, regional and global value. Nadia district which is the part of matured Ganga Delta is the land of several rivers like the river Bhagirathi, the Jalangi, the Churni, the Mathabhanga, the Icchamati

and the Bhairab. The shifting nature of these rivers mainly by avulsions along with the meandering courses has created innumerable fresh water wetlands like ox-bow lakes, cut-off meanders, and abandoned river channels locally known as bils andkhals**.** The welandsof Haringhatablock are mainly oxbow lakes and abandoned river channel, but the irony lies in the fact that these wetlands are degraded and are most vulnerable resources of the district due to biotic pressure and human interference. These wetlands are the most resourceful ecosystemsof the study areawith multiple utilities in terms of ecology, economy and sociology. They play certain vital functions in maintaining economic and environmental sustainability of the region. Soproper and planned harnessing of its resources and full implication of wetland values and losses should be undertaken in perspective of attempt for its sustainable utilization.

Keywords: Wetlands,bils, khals, fragile ecosystem, sustainable utilization

Impact of Flood on the Rural Livelihoods of People Residing at the Floodplain of Burhi Dihing Basin, a Study on the Khowang Block of Dibrugarh District

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Abstract

Flood is the natural phenomena caused due to excessive input of water in a drainage system within a short span of time. Flood is a common natural phenomenon of humid regions such as Assam, where excessive rainfall in the lower reaches of Brahmaputra valley and snow melt in the upper reaches accelerates the process of heavy and rapid water discharge. The Burhi Dihing River is an important tributary on the southern Bank of the Brahmaputra River. The total length of Burhi Dihing is about 360 km with a catchment area of 8730 sq km (Bhagawati, at el., 2007).The river has an annual average discharge of 1,41,539 m3 per sec Flood in the Burhi Dihing Basin leads to the inundation of low lying areas and causes mass destruction of human lives and property mostly in a densely populated area. Therefore an initiated has been taken to study how flood has influenced the pattern of rural livelihood of the villagers residing in the flood plain of Burhi Dihing basin of Dibrugarh District. The study is based on the analysis and interpretation of both primary and secondary data. The entire study is based on the collection of empirical facts and figures which are obtained through field survey.

Natural Resource Management and Rural Livelihood Development in Churchu Block of Hazaribagh District, Jharkhand

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Abstract

The maintenance of 'natural resource' through scientific and sustainable techniques is called 'Natural Resource management' (NRM). The aims of this paper are to focus on the techniques which have been employed for community based Natural Resource Management and to explore its impact on Sustainable livelihood development in the rural areas of Churchu block of Hazaribagh district. This study is basically analytical and empirical in nature. Primary data have been collected on the basis of questionnaire survey, observation and Focus Group Discussion (FGD). Secondary data have been collected from the annual report of different NGOs, Government web site and offices. So many programmes have been taken by the Government and Non Government Organization (NGO) for Natural Resource Management to encourage the rural livelihood. For improved income generation the degraded uplands of this block have been converted to WADI for horticulture and vegetable cultivation. Now, in this area, Kitchen Garden and Non Timber Forest Product (NTFP) have been widely promoted for the suitable use of homestead land and forest conservation respectively. The chronic level of poverty in this block has been reduced due to the improvement of agriculture by water harvesting and land development.

Keywords: Water Harvesting, Land Development, Horticulture, Agriculture, Non Timber Forest Product

Risk Perception of Flood and its Management by the Stakeholders along Mayurakshi Basin, a New Arena in Flood Research Management

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Abstract

Integrated Natural Resource Management (INRM) is a process which involves sustainability of resources and at the same time focuses to incorporate all possible stakeholders from the planning level itself, reducing possible future conflicts. Water

has always been an essential resource for survival. There is a great spatial and temporal inequality in the distribution of precipitation in India which is generated by the south-west monsoon. India experiences flooding every year and disastrous floods threaten regions and the people living there and the basis of their existence. Flood Risk Management (FRM) is the latest approach which has shifted its paradigms from technical oriented flood protection measures of focus on defending against floods towards flood risk management, a focus on managing flood risks. Human perceptions of flood risk of the stakeholders provide the necessary information and integration of these perceptions in decision-making process may help in developing a holistic flood management policy. The present study aims to analyse the perception of flood damage and its causes by the inhabitants of Mayurakshi River basin in Jharkhand and West Bengal. The river Mayurakshi, one of the major right bank tributaries of the river Bhagirathi flows down through a large part of eastern India and has structural measures like Massanjore dam and Tilpara barrage. The river has become infamous for its widespread flooding and long duration water logging in the lower reaches of its basin, the worst of which happened in the year 2000. A questionnaire survey was carried out in 21 villages covering a wide range of flood- related issues was prepared to examine the perception of the bank-dwellers. People's perception suggests that apart from natural causes like very high rainfall, improper management of the reservoirs and dams, as well as lack of adequate coordination in releasing water from dams and barrages, are the root causes of recent flood in the basin.

Keywords: Integrated natural resource management (INRM), stakeholders, Flood Risk Management (FRM), perceptions of flood risk, holistic flood management policy.

How Far Sustainable Livelihood is Successful in Ensuring Rural Development, an Analytical Study on Bankura District, West Bengal

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Abstract

A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base. The significance at sustainable livelihood in the desire to empower the capacity of people to earn incomes that meets their current and future economic and social needs

and minimizes their vulnerability to external hazards. As per United Nations Millennium Development Goals (UNMDG) sustainable livelihood is for eradicating poverty and hunger which stands out prominently among the third world countries like India who is still suffering to meet the HDI parameters. A Significant disparity over the east and north-east region, deprivation, lower level of poverty in rural areas are the basic reflectance of such conditions .So as a study area Bankura district has been selected to analyze the regional disparity within its blocks in terms of poverty elevation as well as ensuring rural development maintaining the basic standard of living. Basically the study is empirical in nature based on observational survey and secondary data source which proves that still it's a district predominantly having agrarian structure of the economy but introduction of various livelihood strategies has reduced the level of poverty, raised the socio economic condition of rural dwellers specially the status of women. However the centrally sponsored schemes are playing vital role for changing status-quo of the rural people and to some extent it is able to eradicate the socio economic backwardness of the people of the districts.

Keywords: Rural Development, Poverty, Women Work Participation, Bankura, Sustainable Livelihoods

Magnitude of Poverty in Md Bazar C.D. Block of Birbhum District, W.B. : A Study on the light of Sustainable Development Goal 2030

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Abstract

Poverty is a burning threat in the present World. 836 million people are still live in extreme poverty in the World (UNO, 2015). India is one of the worst affected countries and Birbhum District in West Bengal is highly poverty prone area. The empirical study has been conducted through door to door survey to reveal the distributional pattern of poverty with respect to the income of the people and its causality by considering the given indicators of United Nation Organization's Sustainable Development Goal 2030. The study has revealed that 68.85% people of the study area are still live in extreme poverty. The study has also revealed that there is a remarkable variation in the pattern of the difficulty in level of household's income. High unemployment rate is one of the root causes of the misery. Though extreme poverty rate has been reduced by more than half since 1990 in the World, but

unexpected reality is that the study area still remained in very nastiest situation. In view to end the poverty, decent and productive work for all including women is needed.

Keywords: Poverty, Burning Threat, Sustainable Development Goal 2030, Income, and Unemployment

Non-Timber Forest Products (Ntfps) Used By Garo Tribe of Rongram Block in West Garo Hills, Meghalaya

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Abstract

The forests of Garo Hills, Meghalaya has a rich diversity of Non-Timber Forest Products which contribute in different ways for the livelihood of the villagers. The objective of the study is to construct socio-economic profile and to document the available NTFPs in the study area. Present study was carried out in 12 villages of Rongram block in West Garo Hills district viz. Baljek agal, Dorenggre, Bolbokgre, Masumatagre, Waribok, Asanang, Tebronggre, Rombagre, Chibragre, Wakringtonggre, Chandigre and Sakalgre. Data were collected from randomly selected 300 households using pre-tested semi-structured questionnaire. All the households from the 12 villages reported collection of NTFPs. A total of 67 plant species belonging to 42 families and 63 genera were recorded. Maximum number of species were recorded for fuelwood (28), followed by wild fruits with 17 species, wild vegetables with 15 species, 14 species for medicinal plants and fodder with 8 species. Other NTFPs like broom, mushroom and honey were also collected by the villagers for their livelihood.

Keywords: Non-timber forest products, document, livelihood, Garo tribe, Meghalaya.

Contamination of Potable Water Sources of Lawngtlai Town, Mizoram

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Abstract

The area under study belongs to southern part of the state of Mizoram constituting north-east India. The region as a whole is in lime light because of

its higher arsenic contamination in ground water sources including neighbouring states of Assam, Manipur, Tripura and also Bangladesh. The present study focused to establish the current status of physico-chemical characteristics along with toxic metals in order to determine its suitability for drinking and other domestic purposes in accordance to the Standards. Therefore, Tuikhurs and Hand pumps samples at different location were collected in the area and analyzed as per standard methods. The concentrations of heavy metals were determined by using Microwave Plasma-Atomic Emission Spectroscopy. Total E-coli was tested on Multiple-Tube Method. For anion and cation, piper and ternary diagrams are plotted in order to classify the facies and water belongs to Ca-Na-HCO_3 type. The results revealed that most of the water samples are within the recommended values of water quality standards prescribed by World Health Organisation and Bureau of Indian Standards. However, Most Probable Number, Iron and Lead contents at some locations are found more than the permissible limits of 10/100 ml, 0.3 mg /me and 0.05 mg /me respectively.

Keywords: Physico-chemical Parameters· Coliform· Toxic Metals· Tri-linear and Ternary Diagrams· Standard Levels.

Participation of Women on Water Resource Management in Rural Areas of Mizoram: An Empirical Analysis

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Abstract

The way natural resources have been used by man and woman is an essential dynamics in understanding change in the society in particular and the environment which engulfs us in general. Women use of natural resources is an integral part to assess the credibility of any sustainable efforts and fostering an efficient human resource management. Accessibility to water is one of the most important indicators that rules out where the society stands in terms of providing the basic necessities of life. Women play a very important role in the provision as to ensure water is provided for their livelihood. This paper tries to examine the gender aspects of water particularly the accessibility of water to women. Gendered appraisal combined with geographic critique will help in the better understanding of socio-economic and human resource management initiatives at the grass-root level.

Keywords: Accessibility, water, gender, livelihood, human resource.

Impact of Industrial Model Township on Natural Resources: A Case of Manesar Town and its Envions

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Abstract

Earlier, human beings were merely dependent on natural resources for their survival and had been controlled and used collectively by village communities. In 1990, when the liberalization, privatization and globlization (LPG) model and new industrial policy 1991 came up, an abrupt transformation was discerned in the economy from agriculture to industrial activities. Accordingly, Indian cities have started turning into a melting pot of urbanization but the concern for natural resources remained neglected because of the poor land management practices, inadequate institutional arrangement etc made situation critical. Although the growing concern of environmentalist still persist in independent India but they have failed to stop the exploitation of natural resources on the name of development which has imbalanced the ecosystem. Manesar town and its surrounding resources are facing the acute problem of depleting ground water due to the presence of large scale industries. Thus quantitative and qualitative approach and other statistical methods have been employed for analysis and identified various issues such as loss of forest cover and biodiversity, drying waterbodies, depleting water table, loss of agricultural land etc.

Keywords: Industrialization, Urbanization, Land Management, Resources, Ecosystem

Commercial Plantation in Forest Lands of North-East India and Its Impact on Livelihood Sustainability of the Local People

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Abstract

Forest areas cover more than 70 per cent lands of the seven North-eastern states except Assam and constitute one fourth of the country's total. In order to meet the growing needs arising from population growth, increase social conflict, economic activities and climate change, commercial plantation has started gradually within these forest reserves after clear felling of the diverse and healthy trees. Deforestation

brings change in the forest ecosystem which cannot be restored by creating human made monoculture plantation. In addition to environmental benefits, forest provides rural livelihood security through income generating products (timber and non-timber goods). Plantation forestry, taken up by the states or private operators, has been the only objective to provide raw materials for industry and this has largely ignored the right of the forest dwellers. This paper examines the trend of plantation forestry in north-eastern states using secondary data and discusses how sustainable forestry systems and policies can be developed to provide industrial supplies, promote environmental objectives and support the livelihood of the local people. The study has revealed that greater part of the land brought for large scale commercial plantation of oil-palm, rubber and coffee were earlier used by the tribal people for jhum cultivation. They not only grew rice, maize, vegetables and fruits on jhum lands but also harvested bamboo shoots and firewood on the same patch of land in the non-growing period. Now, the farmers receive cash as one time support against giving up jhum but loose diverse livelihood opportunities. By pressing for plantation farming, forest agencies of the respective states tend to abolish the traditional community forestry management system and in many instances now the farmers, contractors and businessmen from distant towns purchase the community land. It is suggested that the activity of converting forest land into plantation land should be regulated under Forest (conservation) Act, 1980. Instead of forests, degraded forest lands and wastelands could be effectively used for the productive purpose and policy must focus on equitable benefit sharing between the government and the local community. This paper also concludes how sustainable livelihood options including farm forestry and agro forestry have become helpful for reducing rural poverty and promoting community conserved areas.

Keywords: deforestation, monoculture plantation, livelihood security, community forestry management, sustainable livelihood options.

Natural Resources in Rural Landscape: A Case Study of Nonoi Watershed, Assam

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Abstract

Natural resources are still the major source of wealth and power in a country as these act as key to rural development. These resources are dynamic in response to increased knowledge, expanding science, and changing individual wants and social

objectives. In Assam about 87% of the total population live in rural areas and most of them are economically backward and their livelihoods are reliant on available natural resource base. Though the infrastructures of rural areas have been enhanced in the domain of developmental perspectives but traditional use of natural resources are the bases for livelihood among the rural people. In fact, the resource base of rural areas and the geo-environmental determinants affect the pattern and processes of rural development. The study area, Nonoi watershed of Nagaon and Karbi Anglong district is dominantly endowed with natural resources, viz. land, water and forests covering an area of 556.80 sq km. The physiographic make-up of the watershed influences the resource distribution and on the basis of this, the rural landscape is categorized as farm land, forest and natural vegetation, water bodies especially wetlands (*beel*) and homestead area. This study aims at investigating the relationship between natural resources endowment and pattern of rural livelihood is based on the sample villages in the watershed using qualitative and quantitative methods with supporting secondary and primary database and use of geo-informatics as effective tool for data interpretation. In this context, this study will focus upon issues of rural development and use of natural resources that affect the livelihood of the rural poor.

Keywords: Natural Resource, Rural Landscape, Rural Development, Watershed, Physiographic make-up, Livelihood, Geo-informatics

Submissive Role of Power in Resource Access: An Application of "Theory of Access" in Wetland Resource

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Abstract

Power relations within social, economic, legal, political and institutional spheres are fundamental to governance in wetland resource management. Typically, power is derived from the various institutional mechanisms, social identities and traditional beliefs and practices; and leads to access in resources. The key objective of this study was to explore various power relation mechanisms and their impact on wetland resource access in less development country. Based on the Ribot & Peluso's 'Theory of Access', this paper has reviewed a number of literatures. The study also applied content analysis for analyzing power relationships. The findings revealed that institutional and

social structures are empowering some people's symbolic supremacy and allows them to practice authoritative control over the community members. Financial ability, cast and religion, gender and others cultural factors establish small number of people as leaders; enables them to set organizational norms, accumulation and control over wetland resources; whereas other people, particularly poor and women are excluded from the access and control of this resources. Thus, power dynamism should be deemed significantly for introducing any wetland related policies.

Keywords: Power structure, Social Relationship, Resource Access, Resources management, Wetland

Physico-Chemical Analysis of Potable Water in The Vicinity of Aizawl, Mizoram

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Abstract

The quality of water sources are highly polluted with different harmful contaminants due to increase human population, use of fertilizers, pesticides, manures, anthropogenic activities etc. For mankind, knowledge of quality of potable water is vital and is directly linked with human warfare. The present study focused on the Physico-chemical characterization of sub-surface water during rainy season in 2017. Water samples from Tuikhurs at various locations in the area were collected and analyzed. Total Iron content was measured by using the Water Testing Kit and for pH, Turbidity, Total Dissolved Solids and Electrical Conductivity values, digital instruments were used. Nitrate concentration was done by uv-spectrophotometric method. Total Hardness, Calcium, Magnesium, Total Chloride, Total Alkalinity and Sulphate were analyzed by titrimetric method. Bicarbonate (HCO_3^-) determination was carried out using acid titration. For anion and cation, piper and ternary diagrams are plotted in order to classify the facies and water belongs to Ca-Na-HCO_3 type. The results revealed that all of these water samples were well within the permissible limits established by World Health Organization and Bureau of Indian Standards and hence suitable for drinking purposes. However, magnesium contents at few sites are found exceeding the permissible value of 30 mg/l.

Keywords: hardness; physico-chemical parameters; piper tri-linear diagram; ternary diagram; Standard levels

A Study of Selected Socio-Economic Chararcteristics and Sustainable Livelihoods of Rural Landscpae of Darjeeling, West Bengal

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Abstract

The study has been made by the selected socio-economic characteristics of the small farm tea cultivators and their preferences for different varieties in Darjeeling of West Bengal. Darjeeling landscape was selected for the study on the basis of maximum area under small farm tea holders.The Darjeeling landscape that covers the catchment of Rangit river basin. This means Tiger Hill and Senchal Reserve forest on the south till the Rangit on the North and on the west is Darjeeling town and on the east is Tagdah forest. The region of Darjeeling has 87 tea estates (Tea gardens) which almost 17500 Ha area of tea cultivation and engaging about 50 percent the people of Darjeeling district. But, in recent times the trend of small tea farm activities are increasing day by day in Darjeeling region. The random sampling method was used to collection of sample from different community villages of the landscape. Another important data have been collected from different tea estates of the landscape. The result shows that the majority of the respondents were middle age group and they have secondary education; most of the respondents had medium size of family, small size of landholding, medium annual income, medium cropping intensity and medium farming experiences. Majority of the farmers identified their major problems with the lack of credit, lack of credit facilities, Lack of working capital (assets like land) and lack of skills (education). Recommendation for this study is that farmers should be encouraged to invest more and increase their input in agriculture as to improve their output/revenue. Also, the government should give concessions to the rural farmers in various aspects which include provision of credit facilities, provision of infrastructures and inputs for rural farmers for their sustainable livelihood strategies.

Keywords: Socio-economic, Small Farmers, Tea cultivation, Sustainable livelihood, Darjeeling.

Eri Silk (Samia Cynthia Ricini) and its Importance in Rural Livelihood, a Case in Brahmaputra Valley of Assam

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Abstract

'Eri' is derived from the Assamese word 'era', which means 'castor', as the silkworm feeds on castor plants. Eri silk is also known as 'endi or errandi' in India. The woolly white silk is often referred to as the fabric of peace when it is processed without killing the silkworm. Eri silk are found in places of diverse geo-ecological backgrounds in northeast India. They grow in high altitude areas that are 300-1,500 meter above sea level and in natural forests. In India it is found naturally in Assam region and in other parts it is grown by artificial techniques. The botanical name of Eri silk is *Samia cynthia ricini* and is also locally known as Eri pat. Eri like Muga (*Antheraea assama*), has a history dating back to thousands of years and enjoys a value-based position. Though there are slight differences in their usage, in the current market, Eri is less costly than Muga silk. For the purpose of the study, the cost discussed is based on 2,000 hectare plantation in the study area which involves individual planters. Costs involved in this analysis were adopted from entrepreneur and villagers involved in Eri rearing. The costs discussed here are based on per year rotation. In this paper an attempt has been made to emphasize the possibilities of Eri silk and its importance for sustaining rural livelihood in the Brahmaputra valley of Assam.

Keywords: Eri, geo-environmental condition, traditional silk, rural livelihood and economic upliftment

Land Use Change and Its Impact on Rural Livelihood in Naharani Area of Golaghat District, Assam

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Abstract

Generally, a large number of factors are found to the type and degree of land use in an area and their change in course of time. The change in land use again may have significant impact on the livelihood of the people living in the area. The present study is an attempt to analyse the pattern of land use change and its impact on the livelihood of

the inhabitants of the Naharani area in Golaghat District of Assam. The study is based on intensive survey carried out in three villages- Batiporia Lukumai Gaon,Batiporia Garia Gaon and Dhodang Garia Gaon of the area during 2016-17. The agricultural landscape of the area was till recently dominated by sugarcane cultivation. But now it has been increasingly put to Agarwood and tea plantations which has significantly influenced the livelihood pattern of the people living in the area. The ecological and socio-economic changes caused by recent land use change have been matters of serious concern in the context of the study area. This kind of rapid change in land use and livelihood in a rural scenario is doubted to have negative impact on the sustainability of the otherwise eco-friendly and socio-economically viable rural system of the area.

Keywords: Land use change, Rural Livelihood, Socio-Economic, Sustainability

Co-Management and Sustainable Livelihood Diversification, a Study on a Wetland Area in Bangladesh

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Abstract

Due to the natural calamities and anthropogenic reason *Haor* (wetland) ecological balance is being threatened gradually. Consequently, government has implemented community lead 'MACH' (Management of Aquatic Ecosystems through Community Husbandry) project where two different groups like Resource Management Organizations (RMO) and Resource User Groups (RUG) are involved with co-management process. The study has tried to measure the patterns, determinants and constrain of livelihood diversification among the co-management practitioner. Both descriptive and analytical designs have followed for data collection. Collected data has analyzed through Simpson Livelihood Diversification Index, Problem Confrontation Index and Multiple Regression model. The index value of livelihood diversification indicates that, RMO has more livelihood diversification than the RUG. It is also found that, access to the institutional support, lineage, religion, social and kinship network, rank in the organization, access to aquatics resources, education, training are the key determents of livelihood diversification. The study identifies some major problems for instance lack of training, awareness and monitoring, corruption of executive committee, lack of infrastructure, lack of asset,

lineage and religious value, local power dynamism are creating different constraint for livelihood diversification.

Keywords: Community based organization; Co-management; Livelihood diversification; Sustainable development; Wetland.

Water Management in Minnesota, the Watershed Approach

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Abstract

In Minnesota, the land of 14,000+ lakes, wetlands and 6554 natural streams and rivers, water is central to our way of life. The State of Minnesota has been involved in water management for decades. At the State level of government there several agencies that must communicate and define their area of concern; be agriculture, natural resources, pollution control or human health. In 2008, the citizens of Minnesota agreed to change the constitution and add a small tax that now provides millions of dollars to manage water resources. The voter referendum outcome, known as the Clean Water Land and Legacy Amendment is driving actions across the State. Recently, Governor Dayton declared that all impaired waters should meet a 25% pollutant reduction by 2025. This presentation illustrates some of the "how" and "why" behind the move toward watershed management in Minnesota and the creation of the Land and Water Legacy.

Impacts of Tourism on Rural Development in the Mukutmanipur Village of Bankura District, West Bengal, India

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Abstract

Rural tourism is a recent offshoot of tourism sector that has grown up to be a potential business in its own space. Rural tourism is a form of nature based tourism that uncovers the rural life, culture, art and heritage at rural locations,

thereby favouring the local communities socially and economically. Such form of tourism has created tremendous impact on the local economy and socio-cultural scenario of the concern area on one hand and carries a potential scope for the rural residents on the other hand. Rural tourism is an opportunity for rural development. The Mukutmanipur village of Bankura district has great diversity of culture, tradition and natural resources which makes it every attractive tourist destination. It is a store house of a unique Buddhist culture that has form the basis of attractions for outsiders. Here, rural tourism promotes the local economy, socio-cultural changes and life style of the people residing in and around the village. This present paper aims at exploring of rural tourism at Mukutmanipur village, which act as an incentive to promote local, socio-economic and cultural changes and lifestyle of the people residing in and around this tourist location and also to find out various constraints and possibilities of tourism development in the study area.

Keywords: Rural tourism, rural development, socio-economic, constraints, tourism development.

Issues of Sustainable Livelihood in the Chars of Teesta in Jalpaiguri, West Bengal

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Abstract

The river Teesta, originating in the Sikkim Himalayas, drains a considerable stretch over West Bengal before meeting the Jamuna in Bangladesh. Teesta's Bengal journey starts with a break of slope followed by sedimentation and 'char' formation. These fertile riverine lands have easily attracted a special section of the human society for their basic survival needs. Further, time allowed streams of migrants from near and far to find another home in these *chars*. The present study attempts an understanding of the balance between the survival needs and natural resource utilization in the Teesta *Chars* of Jalpaiguri district, with its principal focus on the sustainability of livelihood options of the char dwellers. The present work is based on both primary and secondary information for analyzing and developing the document. It tries to throw light on the overall physical and socio-economic environment of the *char*, suggesting possible means of sustaining the man- nature union in this unique land.

Keywords: *Chars, livelihood, resource utilization, sustenance and Sustainability*

An Approach for Holistic Development of the Marginalized Brick Kiln Workers in North 24 Parganas, West Bengal

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Abstract

Social exclusion in terms of gender, ethnicity, caste and poverty, is still a prominent phenomenon in rural Bengal. Workers in brick kilns also fall in this purview of being socio-economically disadvantaged. Large number of brick industries on both the banks of Ichhamati River from Baduria to Hasnabad block of North 24 Parganas, West Bengal is a means of livelihood of thousands of rural population here. Enough sediment supply, availability of water, source of cheap labour, availability of other raw materials and good market for the products, make the industry quite profitable. Besides men and women, a large section of child population is also engaged in the industry's labour force. Thus the objective of the present study is a step towards empowering those marginalized workers by improving their educational status and eradicating socio-economic hindrances. So, both primary and secondary source of data sets are analyzed to accomplish a lift through alternative livelihood options and realize inclusive economic development for a sustainable rural society.

Keywords: *Social exclusion, marginalized workers, alternate livelihood, holistic development and sustainability*

Sustainable Resource Management in Northeast India, a Socio-Economic and Political Perspective

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Abstract

Sustainable Development requires building a coherent nexus among environmental resource management, development and social equity. However, roadblocks are present in building and implementing this. In this context the study concentrates on Northeast India as a case in point. The objectives include, what are the recurring

barriers that are prohibiting this region from the attainment of sustainability goals; the possible options that balance conservation of resources, development and community involvement in the process. The study employs case study and descriptive analytical methods. The study found that Population growth and unscrupulous development activities have created inroads in the natural environments; the region lacks funds, inclusive growth and social equity; Efforts to improve the management of natural resource base for the protection and restoration of the environment to exploit the hydro-potential for power generation and to overcome the infrastructural bottlenecks, have been made time to time to induce sustainable and equitable growth and development of the region; If the traditional knowledge base is properly utilized and community involvement and participation of local people and their indigenous institutions in resource management are recognized, the problems can be mitigated.

Keywords: Natural Resource management, Northeast India, Sustainability, Development, Traditional knowledge

National Rural Livelihoods Mission – Progress towards Rural Development in India

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Abstract

India is one of the fastest growing countries in the world with annual growth rate over 8 percent in the recent past. In spite of this rapid growth rate 41.8% of the rural population continue to live below poverty line according to the Tendulkar Committee. The success of achieving the goal of sustainable development of our country lies in empowering rural India where 68 per cent of its population resides. Realizing the significance of rural development, India has adopted various innovative strategies and approaches for ensuring the basic rights of the rural population. Rural development in India has witnessed tremendous changes over the years. The Government of India has formulated various programmes and schemes focusing towards the rural development. The strategy of rural development has aimed at alleviating poverty, promoting educational access in rural India, ensuring better livelihood, opportunities for rural poor, making provision for basic amenities and providing suitable infrastructure facilities through innovative wage and self employment programmes. The National Rural Livelihoods Mission (NRLM) is the largest poverty reduction programme for women, in the world aiming to reach nearly

70 million rural households. Mainly secondary source of data are used and data are computed in SPSS and Excel.

Keywords: rural livelihood, innovative, rural poverty, sustainable development.

Natural Resource Management and Its Preservation for Best Livelihood

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Abstract

Natural resource management refers to the management of natural resources such as land, water, soil, plants and animals, with a particular focus on how management affects the quality of life for both present and future generations .Some of the natural resources that are common resources are air, water and soil, biological resources - plants and animals, raw materials (like minerals) and solar energy. Natural resource management deals with managing the way in which people and natural landscapes interact. It brings together land use planning, water management, biodiversity conservation and the future sustainability of industries like agriculture, mining, tourism, fisheries and forestry. It recognizes that people and their livelihoods rely on the health and productivity of our landscapes, and their actions as stewards of the land play a critical role in maintaining this health and productivity. Natural resource management is an interdisciplinary field of study that considers the physical, biological, economic and social aspects of handling natural resources. It involves putting resources to their best use for human purposes in addition to preserving natural systems. Natural resource managers' duties include overseeing workers, analyzing data, developing environmental plans and policies in accordance with state and federal laws and negotiating land and resource use contracts with landowners and governments. Within this field, there are various areas of concentration, Earth or physical sciences involve the chemical and physical properties of ecosystems. This may include the study of soils and the disciplines of geoscience and GIS (Geographic Information Systems). Science of biotic resources focuses on ecosystem management and biological principles. This would include the study of vegetation, wildlife and landscapes. It can include working with farmers in an effort to manage rangelands and protect wildlife, along with working with other agencies to oversee recreational land use. Social sciences look at how humans affect the environment or various ecosystems. This area of natural resources management may look to the disciplines of sociology, anthropology or emergency management. Pollution control examines how

air, water and land pollution can be reduced and how quality of these resources can be restored. Environmental communication involves the use of mass media, public relations and journalism to highlight environmental and natural resources issues and concerns. Economics of natural resources encompasses policy making, regulation, administration and management of natural resources. It involves the combination of policy and economics to protect ecosystems, with the ultimate goal of sustainability. The best way to conserve natural resources is to find ways to reduce dependency of natural resources in everyday life. Resources are products of the natural environment that humans use in some way or another. Oil, natural gas, water and coal are all natural resources that are used in energy and food production. Another way to conserve natural resources is reuse. We should continue the practice of using something over and over again before recycling, composting, or throwing it away.

Rural Housing Condition of East District of Sikkim State: A Case Study on Burtuk Village

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Abstract

Housing conceived as a set of services, is an important environment that has profound impact on the socio-economic and physio-psychological development of human beings. Housing is the basic reality of both rural and urban design.Sikkim is a small but beautiful State. Sikkim is located between 27° 00' 46″ N to 28° 07' 48″ N latitude and 88° 00'58″ E to 88° 55'25″ E longitude. According to 2011 census 25.20% of Sikkim's population resides in urban and 74.80% of population residing at rural area depends on agriculture for their livelihood. East District of Sikkim State has been selected as the study area. In rural area the type of houses are recognized as follows: Detached houses, Semi-detached houses, Group housing.The study mainly provide information regarding the morphological aspect of housing, To find out the quality of life of the residents with respect to housing patterns and basic amenities they enjoy, To study the associated problems related to housing condition. Primary information are collected by using schedule questionnaire and all secondary information has been collected from the different government & private offices. East District of Sikkim also suffers from housing problemslike Overcrowding, Lack of modern amenities for comfortable lifestyle, Lack of Transport system and bad condition of roads, Problem of water supply, Sewage problem, Lack of land, soil erosion etc.

Keywords: Rural, Housing Condition, East Sikkim, Housing Problem

Impact of Mahatma Gandhi National Rural Employment Guarantee Act (Mnrega) on Rural Livelihood in Sonbhadra District, Uttar Pradesh

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Abstract

MGNREGA is mainly formulated for improving the living standard of rural peoples for the low income group. It involves upliftment of socio-economic status of rural people's and optimum utilization of local resources both natural and human. It is the biggest employment provides programme started in a country for the development of rural areas. MGNREGA provides employment to those who demand and it is a paradigm shift from earlier programmes. It aims at enhancing livelihood security by providing at least 100 days of guaranteed wage employment in a financial year to every rural household whose adult members volunteer to do unskilled manual work. Under the scheme, 216.34 crores person days have been generated for workers during 2011-12. Out of these, 40 per cent accounted for SCs/ STs and 48 per cent for women during 2011-12 and during 2012-13, women share is 53 per cent of the total employment generated. Sonbhadra is the 2nd largest district of Uttar Pradesh in terms of area. The study region covers the total area 6788 km² and rural population 83.12% as per 2011 census.it is predominately rural populated district. Sonbhadra 250 most backward districts (out of 640 districts) in India, This paper is an attempt to highlight enhancement of livelihood security, reduced rural urban migration and encouragement of social equality. Present study is based on primary and secondary data. Primary data are collected from personal observation and generated from the available topographical maps drawn on the RF 1:50,000. Secondary data have been collected through secondary sources like District Census Handbook, Sankhyaki Patria etc. Data collected and generated from these sources have been depicted with the help of suitable cartographic diagrams.

Keywords: MGNEREGA, livelihood, Socio-economic development, unskilled Manual work, backward districts

Natural Resource Management: Some Experience

Asok Kumar Ray

Abstract

The natural resources are limited and exhaustible and non-regenerative resources. These resources need management to strike a balance between human extraction

of resources and ecological sustainability. One of the major tasks in natural resource management is to set a limit of resource allocation, not too high-not too low, to keep the optimum level of extraction and use so that there is no wastage and overuse of the natural resources.In the past, India had well-organized a system of management of natural resources for collective survival of the people based on inter-dependency, common vigilance and common monitoring. There was also a definite boundary of NRM institutions within which the community members could exercise their rights. A unique example of it was the water and irrigation management in ancient India.The colonial rulers ruthlessly extracted the natural resources in the colonies without any balancing mechanism for the development in the metropolis. Northeast region of India was one of the major resource reserves. The colonials made this region a supply zone of natural resources for manufacturing industries in the metropolis. In the era of liberalization, natural resource management faces the dilemma between the 'Rational Choice' and Social Optima. In this era, the North East Region has relaxed the conservation norms of natural resources for attracting FDI and has made institutional changes accordingly. Uranium, coal, water and forest resources are being ruthlessly exploited by the corporate agencies. This has let loose conflicts of interest.The task of natural resource management in North East India is to manage conflict between different stakeholders through greater participation of the community, to manage distribution of benefits to the stakeholders, manage the bio-diversity, proper use and regeneration of natural resources. Community based monitoring and evaluation of natural resources is a part of the Community-based natural resource management. The government of India very specifically introduced the community management of resources from the 9th Five Year Plan onward. In Assam the community has been involved through the JFM order of the government of Assam that has instituted Forest Protection and Regeneration Committee. The Community Forestry Alliance for North East India evinced community-based forest management in North East India. In Nagaland Village Education Committee, Village Health committee, Village Electricity Management Board and Urban electricity Management Board were instituted under the Nagaland Communitization of Public Institutions and Services Act 2002. Mizoram has introduced Village Forest Fire Prevention Committee under the Mizoram (Prevention and control of Fire in the Village Ram 1983. The North East Regional Community Resource Management Programme implemented in Assam, Manipur and Meghalaya aimed at utilizing the customary community structures for conservation of the region's rich bio-diversity. Community based management of natural resources has made a paradigm shift from professional management and ensured management efficiency.This paper will discuss at some length some of the

community based management initiatives in North East and in some other parts of the country to get an overall picture of the same.

Socio-Economic Profile of Rural Dimapur, Nagaland

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Abstract

The measurement of socio-economic well-being in resource dependent communities has generally relied on indicators that are readily available and quantifiable such as income, unemployment, poverty, cost of living, housing affordability, population turnover, welfare dependence. Multi-criteria analysis has been used to show the development of different blocks through using different socio-economic indicators. The study is based on secondary data sources. A total of 31 indicators have been used to analyse different socio-economic indicators such as social indicators (including educational and health related indicators), economic indicators (including infrastructure facilities such as roads, electricity, water etc.) agriculture development indicators and demographic indicators such as population, sex ratio etc. The indicators were given weights and ranks according to their importance and then scores were obtained. The results show that Dhansaripar block has performed lowest among all the four blocks whereas Medziphema has scored highest amongst all the blocks. Niuland and Kuhuboto have made their place in the medium category.

Keywords: Socio-economic indicators, Multi-criteria index, Dimapur, Nagaland.

Socio-Economic Survey; to know the Forest Dependency among People

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Abstract

The sole aim of the Socio Economic planning of our country is to transform the socio – economic condition of the people living in the rural areas. Dependency over the forest based resources is most common in this region. Sustainable livelihood initiatives are sets of activities that rural dwellers engage especially women in

economic activities that have the propensity to adverting individual subsistence farming approach to a collaborative cooperative sector approach in order to increase productivity. Some trees are multiple uses and they play important role in rural people's economy. To increase the availability and widen the distribution of basic life-sustaining articles such as food, cloths, shelter, health care and security. ; Plants are basic source of livelihood in Garhwal Himalaya region. We works on socio-economic survey in four villages of district Pauri Garhwal of uttarakhand and found that their various mode of livelihood dependence on the forest and other occupation criteria. The focus group discussions were also conducted for the occupational groups like agriculture, daily wage worker, animal husbandry. Survey in rural areas has shown some eyebrow raising outcomes that shows the current status of India's rural section.

Keyword: Socio-economic survey, Forest, Sustainable livelihood.

Assessment of Sustainable Livelihood through SHGs' Activities under NRLM Scheme: A Block Level Case Study in Hooghly District of West Bengal

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Abstract

Sustainable livelihood is a livelihood which can cope with economic vulnerability and gives opportunities to access both the social and material resources which are the means of living . This paper is meant to assess the socio economic condition of the members of the Self Help Groups which are formed under National Rural Livelihood Mission. The scheme, which was launched by Ministry of Rural Development, brings a radical change in the livelihood of the rural poor mainly the women. This study is conducted in Serampore- Uttarpara block, which is one of the most important blocks of Hooghly district of West Bengal, containing 559 Self Help Groups where 82.3% are female members. This paper is mainly concerned with the working process of SHGs formed under NRLM and how this scheme brings the opportunities for sustainable livelihood in the lives of poor rural women. It is found that not only their economic condition has been changed into a positive direction but they come forward in social and political fields too. Therefore there is no doubt that NRLM is a strong weapon to eradicate poverty and bring women empowerment through Self Help Groups. But

there are some limitations too which obstruct the expected growth. The paper suggests some strategies to overcome these limitations so that many more women come out from vulnerable conditions and can be a part of productive, independent population of the country.

Keywords: NRLM, Sustainable livelihood, SHGs, Women empowerment, Growth.

Traditional Livelihood on the Verge of Extension, a Study of Occupational Change among Rural Brass Metal Artisan of Assam

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Abstract

A livelihood is sustainable when it can maintain or enhance the different elements which determine living of an individual or group of people. In addition to it the livelihood must be also capable to cope and recover from stress and shocks for sustainability. Assets, capabilities, activities and the access to these things are the basic elements affecting livelihood. Sustainable livelihood thus encompasses the multiple elements which influences the living. Traditional Livelihood practices may sometimes identities of some specific indigenous peoples. The Brass artisan of Brahmaputra Valley of Assam is also no difference in this regard. The trusted Canon and Gun maker during the Ahom rulers and now the traditional brass item manufacturer of Assam, the Morias are now economically very backward. Now a day, most of the new generations have been switching over to other tertiary activities. But, a less number of Morias are still trying to revive their traditional work. An attempt has been made in this paper to discuss the present pattern of livelihood, trend of change in occupational pattern of the Morias and the causes behind this occupational shift and also to discuss the Skill India Initiatives that has taken by PM Modi. Whether, the Skill India Initiative includes such traditional practices of livelihood for the development of traditional practices of knowledge and how far reaching this might be for the people involved in.

Keywords: Moria Community, Indigenous People, Brass Artisan, Economic Backward, Traditional Livelihood, Occupational Shift, Skill India Initiative.

Design and Implementation of Water Resources Monitoring Program for the State of Mizoram-Pilot Project

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Abstract

Watershed management is critical for sustainable food and water throughout the world. However, hydrological data is needed to perform analysis and provide information to decision makers. University of Minnesota in St. Paul, Minnesota, United States and Mizoram University, Aizawl, India have been working together under a memorandum of agreements for the last five years. Mississippi Watershed Management Organization (MWMO) in Minneapolis, Minnesota, USA has been collaborating with University of Minnesota and Mizoram University scientists and faculty members for the past three years. MWMO has hosted two faculty members from Mizoram University and provided on-site field training on water resources monitoring. This paper describes the design and implementation of water resources monitoring program for the state of Mizoram as a pilot project. Goals and objectives, as well as methods and data collection procedures of the water resources monitoring will be described. A field manual to implement the water resources monitoring program will be prepared as part of this pilot project paper.

Keywords: Sustainable Food and Water, hydrological data, Water Resources Monitoring,

The Role of Women in Natural Resources Conservation: A Study in Community Based Wetland Resources Management Groups in *Hail* Wetland

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Abstract

Climate-Resilient Ecosystems and Livelihoods (CREL) is a community based project which introduced co-management approach for promoting

community mobility and wetland resources conservation. The study has tried to explore role of different women's groups on wetland resources conservation. To meet the objectives of the study Case study and In-depth interview methods have been used. Study reveals that, women have a significant involvement in wetland resources conservation. CREL project provided different training including poultry and livestock rearing, fishing handicraft, and small scale women's micro-credit for livelihood diversification. Again, through the various knowledge mobilization activity like weekly 'Mothers Caucus', women become conscious about the importance of wetland. They restrain their male person for catching undersize or mother fish; and actively engage them on their income generating activities. Consequently, male family member of these women's groups is spending less amount of time for catching fish or collecting other aquatics resources from wetland. Finally, since their family income is increased, women have sent their children in school who were associated for catching fish with their father in earlier. However, sometimes women are confronting different problems because of institutional hindrance. So, government or NGO should take proper initiatives for women advancement to conserving wetland resources.

Keywords: Co-management, Empowerment, Livelihood diversification, Resource conservation, Women.

An appraisal on the status of spring water resource management for the rural livelihood: a case study from western Himalayan District of Kullu, Himachal Pradesh, India

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Abstract

Springs are not only the lifeline for the rural populace in mountainous region but also reflect condition of groundwater in relation to both quality and quantity. This paper aims at ascertaining the present status of spring resources in terms of their impact on the rural livelihood in the upper Beas basin of Kullu District in Himachal Pradesh. In the present paper qualitative approach on spring water issues has been taken up which includes physicochemical as well as chemical analysis of various ions present in the water. Access to safe drinking water is a major challenge in developing countries and United Nations (2002) has declared that access to water is a human

right recognizing the importance of water to human life and health. Results indicate that various chemical parameters such as TDS, K^+, $Mg^{2+,}$ NO_3^-, F^- are above the desirable limit of BIS (2012). Spring water quality issues can be related to increasing urban activity, proliferating population, and tourism industry growth towards urban to rural, change in landuse pattern, climate change and lack of spring management system at village level. Future sustainability of these meagre and important resources is the present requirement for the rural livelihood in high altitude areas of Kullu.

Keywords: Springs, management, sustainability, rural livelihood, Kullu

Water Resource Appraisal and its Management in Nana Kosi Micro Watershed of Almora District, Uttarakhand

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Abstract

Water is available through the hydrological cycle over space and time as a limited renewable resource through a complex physical-socio-economic-ecological system and availability of water and management is the key factor in the socio-economic well being of the people of the area. It is not only a commodity which is directly used by man but it is often the mainspring for extensive economic development, commonly an essential element in the man's aesthetic experience and always a major formative factor of the physical and biological environment providing the stage for his activities. It is not only a resource of economic value but also a basic component of man's environment. The present paper tries to evaluate the present condition of water resource, associated problem of water resource and its proper management in Nana Kosi Micro watershed, Almora.

2

Section

Agriculture and Rural Livelihoods

Assessment of Technological Interventions in the Field of Agriculture and Allied Sectors for the welfare of Rural Communities in India

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Abstract

India is a country where 833087662 i.e. almost 69% (census of India, 2011) of the people residing in rural areas. Out of the total population around 57% of them are engaged in agriculture and allied sectors, which contributes 16-17% to the total GDP of India. As, a large number of people engaged in these sectors, rural welfare cannot be done without advancement in the field of agriculture and allied sectors. This article overviews the role and function of technological interventions for the welfare of rural communities. Science and Technological advancement, more precisely the farm mechanization, innovation in the field of veterinary sciences, biotechnology have been discussed briefly and efforts being made to showcase some to the appropriate technologies developed by several research institutes (RuTAG), and organizations suitable for application in rural areas. The data highlighted in this article are of secondary type and collected from various government organization and institutes.

Keywords: allied, intervention, veterinary, biotechnology, RuTAG

Soil Characteristics of Ginger-Based Agroforestry System of Mizoram

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Abstract

Agroforestry systems are the land management practices viable both ecologically and economically than any other land management unit.Degradation in soil fertility has been caused through various monoculture practices. Intercropping and mixed cropping sustains soil fertility and productivity.In order to assess the soil physicochemical properties of ginger (*Zingiber officinale* Rosc.) and rubber (*Hevea brasiliensis)* intercropping, astudy was conducted at Kawnpui, Kolasib District.

The study aims to compare the changes under different stages of cropping i.e., Pre-cultivation (PC), Flowering stage (FS) and Post Harvest (PHV) within each treatment i.e., Rubber + Ginger (RG), Sole Ginger (SG) and Control (CTRL). The results showed that soil pH was acidic in all the soils. Higher soil moisture content was noted at FS soil whereas soil from PC and PHV showed lower soil moisture content. RG and SG plots harbored higher amount of Available Phosphorus during Pre-cultivation and Flowering Stage. Higher amount of NO_3^--N and NH_4^+-N were exhibited at PHV and FS. No significant changes were found in soil physical properties. It was also observed that soil physico-chemical properties were influenced by sloppy terrain.

Keywords: Agroforestry, Intercropping, Soil fertility *Zingiber officinale, Hevea brasiliensis.*

Cropping Pattern and Agricultural Production System in Shella Area, a Case Study of Sohlap and Pyrkan Villages

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Abstract

Cropping pattern means the proportion of area at any point of time. This paper focuses on the agricultural scenario of Shella with specific reference to the cropping pattern and the production system of the crops cultivated in the area. From the field observation as well as through interview with the respondents in the two villages it has been revealed that the area is dominated largely by betel nut and orange which indicates that much of the cultivated area is devoted to cash crops as these two crops earn a handsome return from the market. Other crops like carambola, mango, rice, pineapple, bay leaf, betel leaf, banana and vegetables are also found scattered but only in small proportion of area according to the consumption pattern of the people. Moreover it has been found out that a 2 crop combination of betelnut-orange is found in every single household as these crops are less labour consuming rather than paddy crop. Although paddy has a good domestic demand for food but the farmers of the area do not prefer to give much attention to it because of unfavourable soil conditions. Consequently in terms of production also, betel nut accounted for the largest share followed by rice and carambola etc. But in spite of this the overall cropping pattern in the area is inferior and poor. The basic inferiority owes primarily to the limitations

of cultivable land area due to widespread limestone mining and also because of certain socio-economic variables like status of farmers, irrigation, fertilizers, implements used etc. which consequently made the cropping pattern of the area purely traditional.

Keywords: cropping pattern, production system, crop combination, consumption pattern, Shella.

Plant diversity in home gardens of Cachar district, Assam: a case study

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Abstract

Home gardens are mixed cropping systems that involves management of multipurpose trees, shrubs, herbs, ornamental and medicinal plants in association with livestock as a source of food and income. The study aimed at enumerating plant species, knowing their uses and understanding the home gardens of Nutan Ram Nagar Village, Cachar district, Assam. A questionnaire survey was adopted for collecting information of 20 different households having home gardens. The size of the home gardens varied from 0.08 ha to 0.64 ha with an average of 0.28 ha. Home gardens forms the land use pattern of the locality and are maintained as a part of tradition. Home gardens are a source of both subsistence and commerce for the farming community. The number of species recorded ranged from 14 to 32 within the studied home gardens. On the whole 62 species were encountered in the home gardens of the studied village with fruit trees as the dominant category. Other than fruits, there were timbers, medicinal plants, ornamental plants and vegetables in the study area. The species diversity of home gardens largely depends on the landholder choices in growing a particular plant species. Based on the growth forms the home gardens are predominated by trees followed by shrubs and herbs. The home gardens of the study area are indigenously managed land use systems that harbour a variety of plant species fulfilling the needs of the rural people as well as a means of conservation. Thus these traditional management systems will not only act as conservation sites but also supports sustainable uses of bio resources.

Keywords: Assam, home garden, land use, species, traditional

Systematic of Rice Intensification (SRI) is a best practice of Paddy cultivation for Sustainable Agriculture: a Case Study of Karnataka

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Abstract

Rice is life for millions of people in the world, particularly in developing countries. Rice is the most widely grown crop in India. It is cultivated in 45.50 million hectares and has production of 96.43 million tonnes of grain. In Karnataka it is grown in an area of 14.42 lakh hectares with a production of 34.50 lakh tonnes of grain. India occupies the world's largest area under rice, grown under a wide range of agro-ecological conditions.In Karnataka most farmers are adopting Systematic of Rice Intensification (SRI) methods for rice cultivation because of its advantages such as very less seeds, less water and no chemical fertiliser, pesticides and alsorice seedlings are transplanted early 8 to 12 days old compared to 21 days in the conventional method in this using methodssustainable agriculture for future days. In this paper we address (i) the methods that are implemented for promotion of SRI method of Paddy cultivation (ii) the difference between the yield of cultivation in conventional and SRI methods (iii) the advantages or rezones for adopting SRI method in cultivation. The study is reported by using case study method. The data was collected through in-depth interviews conducted to farmers involved in SRI farming.

Key words: Agriculture, Sustainable, Conventional, Transplant

Sustainable Rural Development through Lac Cultivation in Purulia, District of West Bengal: a case study

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Abstract

Lac is an eco-friendly, non-toxic natural resin, secreted from number of species of insects, cultivated in some perennial host trees. In Purulia, highest lac producing

district of West Bengal, prominent lac host trees are Palas (*Betea monosperma*) and Kusum (*Schleichera oleasa*), and common species of insects is "Keria Lacca". Nearly, one lakh cultivators, mostly tribals are associated with lac cultivation. It is simple, free from high technology and requires low labour cost, hence small investment. It ensures sustainability through income generation on a lasting basis as perennial host trees alive for prolonged years and sustains environmental equilibrium. Keeping in view the above relevance, the objective of the present study is how far sustainable development takes place in tribal life through lac cultivation in terms of income generation, food security, education etc. and find out the associated impediment of development. This study is based on mainly primary data, collected from 78 lac growers, 5% of the total lac growers of Bagmundi block of Purulia district. Stratified random sampling is adopted to select respondents. This study reveals that approximately 67 % cultivators are able to increase their income from 40 to 55 %. Traditional method of cultivation, interference of middleman and miserable literacy rate are the prominent impediment.

Key words: Eco-friendly, Host tree, Sustainability, Perennial, Equilibrium.

Analysis of the Relationship between the Availability of Agricultural Water Resources and Livelihoods in the Koshi River

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Abstract

The availability of water resource is the basis of ensuring the safety of agriculture and stabilizing the livelihood of farmers. Nepal is a typical mountain country; more than 80% of Nepal's population depends on agriculture for their survival and development. As the largest rivers in Nepal, the Koshi River is not only China, Nepal and India's cross-border river, is also part of representative rivers in the middle of the Himalayan region and is an important tributary of the Ganges. Koshi river main stream and tributaries across eastern Nepal, which basin has a population of 6 million and over 40% of the population is poor. It is a typical rain fed agricultural area on the whole, but irrigated farmland is limited. It is a typical agricultural region dominated by rain water, irrigated farmland is limited. Also, agriculture is the river water conservation, almost takes up 90% of the total water. Under the influence of

global climate change, precipitation and runoff are obviously changed, which has a profound impact on the livelihoods of farmers in the basin, especially the impact on pure-agriculture households' livelihood. Their livelihoods depend entirely on the planting that make their livelihoods of adaptive challenge more. In recent years, with rapid population growth in Nepal, the human production and living water demand is also rapidly increasing, this social phenomenon has brought a lot of pressure for the government's water resources utilization and development. As the result farmers' livelihoods adaptability is also facing new challenges. Comprehensive analysis of water resources availability in the Koshi River basin is very important to ensure the safety of agriculture. Through the analysis of the system characteristics, interpretation of the agricultural water resources availability and evaluate potential risk of water crisis for farmers living of the Koshi river, we can more easily provide the basis for its proposed adaptive strategy.

Keywords: Water resources availability; Agriculture; Livelihood; Adaptation; Koshi River

Heavy Metal Analysis on Tobacco Plants Found in Mizoram

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Abstract

Tobacco is a value added agricultural product processed from the fresh leaves of plants of the genus *Nicotiana* of the Solanaceae (nightshade) family. Certain heavy metal ions are known to accumulate in tobacco plant [Rodgman *et al*., (2009)]. '*Zozial*' is a hand-rolled, filter-less cigarette for which 'organic' tobacco is grown exclusively in Mizoram. The main objective of this study is to analyze the presence of heavy metals and their concentration levels in tobacco. Tobacco leaves grown within different Districts of Mizoram were collected. The tobacco samples were digested using analytic grade concentrated nitric acid and analyzed using Induction Coupled Plasma (ICP)-Atomic Emission Spectroscopy (AES) methods which revealed the presence of some heavy metal ions in relatively high concentrations. Since tobacco plants are known to transport metal ions from the soil through the roots and sequester them predominantly in the leaves [Lougon-Moulin *et al*., (2004)], the present study revealed the heavy metal composition of tobacco grown in Mizoram.

Keywords: Tobacco, Zozial, heavy metal ions, ICP-AES

Sustainable Used Value Index of Wild Edible Plants amongst the Tai Khampti Tribe of Arunachal Pradesh

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Abstract

This paper tries to document the traditional wealth of wild edible plants used by the Tai Khampti tribes who are settled in Namsai district of Arunachal Pradesh. They are mainly known for being in harmony with the nature and are also having tremendous knowledge on traditional application of the wild natural floras surrounding their environment. The study aims to investigate the distribution, its utility and loss of natural floras due to various exploitative activities from various agencies. Though the collection of the wild plants could be an important source of employment and income generation for the local inhabitants however a good networking of marketing needs to be developed to benefit the actual collectors rather than the middle men who usually exploit the rightful resource owners. The Used Value Index (UVI) shows the over exploited plants in the following four categories of wild edible plants, viz., vegetables, medicines, fruits & spices. It also proves that the highly used wild edible plants needs to be checked and care must be taken from being over exploited. Appropriate strategy for conservation and sustainable utilization and judicious management of these natural and endemic resources is very essential.

Keywords: Tai-Khampti, Used Value Index (UVI), Floras, Sustainable, Middle men

Economic and Ecological Importance of Lichens with Reference to Mizoram

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Abstract

Lichens are thallophytic plantlike organisms comprise a unique group of plant that consists of two unrelated organism, a fungus and an alga, growing together in a close symbiotic association. Lichens have been used for many different purposes by human cultures on every continent; the study of the relationship between lichens

and people is known as Ethnolichenology.Lichensare used by humans for making dyes, medicines, food, decoration, etc. As the role in biodiversity; Lichens are very important to reflect environmental problems. It shows the changes in forest structure, air quality and climate. Moreover, the Epiphytic lichens provide a clear indication of potential air quality and used to monitor the ecosystem naturally. Considering these above all in respect to Mizoram, it has considered as the seventh hotspot floral diversity of the world. Hence, a very diverse range of Lichens species are available in the Mizoram. Based on that, an attempt has been made to provide necessary information for sustainable management of Lichens in the state to generate the economy as well as to assess the ecological imbalances.

Keywords: Economy, Ecological imbalances, Ethnolichenology, Lichens, Mizoram

Ethno-medicinal Practices for Livelihood Enhancement in Rural Areas of Aizawl District, Mizoram

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Abstract

Since time immemorial, in all continent of the world the ethnomedicinal plants are the major source for treatment of various diseases and ailments. Especially in rural as well as in tribal area of India it is still in practice. In Mizoram, the formulae based on traditional knowledge of ethnomedicinal plants are playing very important role for the treatmentof diseases and for livelihoods. From generation to generation without proper documentation, peoples use these formulae because of easily available, low-cost and it's a good alternativeto allopathic drugs. In present study,a survey was made to document the ethnomedicinal formulae which arestill in practice in Aizawl District of Mizoram. It was carried out mainly on interviews conducted with the traditional healers.The names of the ethnomedicinal formulae, plant parts used methods of preparations and its combination, dosages and duration of treatment and different ailments were recorded. The finding shows that the ethnomedicinal formulae play important role for improving and maintaining the people's health. The study concludes that there is a strong need for further research and scientific validation of available knowledge regarding MAPs before they are applied industrially.

Keywords: Ethnomedicinal plants, Mizoram, Rural livelihoods, Tribal area, Traditional healers

Impact of Soil Amendments on Crop Productivity and Soil Fertility in different Fallow Lands under Shifting Agriculture Systems of Mizoram

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Abstract

Shifting cultivation in northeast India was ecologically sound and economically feasible in the past because prolonged fallow periods (20-30 years) allowed for sufficient ecosystem recovery between cropping cycles. In recent years, soil fertility and land productivity have considerably decreased due to drastic reductions in fallow periods (<4 years), leading to serious concerns for livelihoods of poor farmers. This study used a chronosequence of shifting cultivation sites that had been fallow for 3, 5 and 10 years to test the potential for practical and locally feasible soil amendment treatments to mitigate the impacts of short fallow periods. Rice and soil fertility were measured over two consecutive years in replicate treatment plots that had been inoculated with rhizosphere microbes (T_{micro+}) prior to burning, amended with top soil (T_{soil+}) and litter ($T_{litter+}$) from adjacent forest. Soil bulk density significantly decreased (P<0.05) and soil pH, total carbon (TC), nitrogen (TN) and phosphorus concentrations increased during fallow cycle. $T_{litter+}$ and T_{micro+} have significantly (P<0.05) enhanced soil nutrients and rice grain yield whereas T_{soil+} has marginal effects in two years of cropping. In conclusion, our result strongly suggest that locally derived low cost amendments such as addition of rhizosphere microbes and forest litter can substantially enhance soil fertility and crop productivity in short fallow period shifting cultivation lands.

Scope and Potential of Medicinal and Aromatic Plants and their Associated Challenges in Mizoram

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Abstract

Mizoram is a totally hilly terrain state having tremendous potential for the development of small and medium level entrepreneur in Medicinal and

Aromatic Plants (MAPs) sector. It has good geographical condition to cultivate commercially demanding medicinal and aromatic plants. Currently, in global market the demand of essential oils and raw materials are highly valuable. In this case the state can initiate to establish good cultivation practices for the Lemon grass, Patchouli, Vetiver, Cinnamon, *Mentha*, *Homalomenna*, *Eucalyptus*, Ginger, Curcuma, Alpinia, *Aloe vera*, *Andrographis*, *Cleodendrum*, *Costus*, Rose etc. Other wildly available medicinal plants can be protected by the Government to utilize sustainably for future use. The Problem arises due to wrong cultivation practices and unscientifically collection of wild medicinal plants from forest. If the state Government can able to protect the forest flora, that can be a good asset for the state for developing the entrepreneur for livelihood of peoples. In case of endangered and endemic species the conservation protocols must be start immediately; because due to over utilization of these plants they becoming vulnerable. Ultimately, it will be a big loss for the state in coming era, where worldwide the peoples have hope from plants only.

Keywords: Cultivation practices,Endangered, Entrepreneur, MAPs, Mizoram

Role of Insect Pollinators for Enhancing Sweet Orange, *Citrus sinensis* (L.) Osbeck Production

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Abstract

The role of insect pollinators on Sweet Orange, *Citrus sinensis* (L.) Osbeck production was studied on three cultivars i.e. Early Gold, Rhod-e-Red and Trovita in factorial randomized block design. Seven insect belonging to Hymenopterans (6) and Dipteran (1) were identified and collected from nectar and pollen of flower. Observations on number of flowers visited, time spent, initiation time, peak activity, cessation time, fruit set, fruit yield, fruit weight and number of seed were recorded. Additionally, TSS, dry matter and moisture content were also analyzed. The maximum abundance of different insects on different cultivars was observed at 10.01-12.00 noon while it was minimum at 02.01-04.00 PM. The highest number of flowers visited per minute was recorded in *Xylocopa tenuiscopa* (0.710) followed by *Apis cerana* (0.470) and *Apis florea* (04.10) while it

was minimum in *Nomia* spp (01.30). The time spent (second per flower) was found highest in *Nomia* spp. (37.20) followed by stingless bee and *Apis cerana* (10.60) and lowest in *Xylocopa tenuiscop* (04.30). Initiation, peak activity and cessation time of different insects was recorded during 6.00-7.00 AM, 10.00-11.00 AM and 4.00-5.00 PM respectively. Significantly higher fruit set, fruit yield/kg, fruit weight (g/fruit), number of seeds, TSS and dry matter content was observed in open pollination than pollinator exclusion. Maximum moisture was observed in pollinator exclusion. Highest fruit set, fruit weight, number of seeds/fruit, fruit yield/kg and dry matter percent were observed in early gold. The highest TSS and moisture content were recorded in Rhod-e-Red and Trovita respectively. No significant difference was observed in the interaction between modes of pollination and different cultivars.

Keywords: Sweet orange, insect, pollinators, *Citrus sinensis*, production.

Assam Lemon Juice Processing Plant

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Abstract

As we all know, North East India is rich in natural resources, particularly Mizoram. Among many agriculture and horticulture crops, Assam Lemon is the most nutritious, hygienic fruit extensively grown in Mizoram and in other North Eastern States. In view of such rich potential of Assam Lemon fruits, Koinonia Juice Plant started in 2011, having its clear vision, began to manufacture the raw juice into a Ready-To-Drink beverage and marketed within the state of Mizoram. In addition, the said Juice Plant procured an extracted raw juice from various local growers, which is, in fact, benefitted by the growers of more than 500 families. Koinonia Juice Plant being the only privately owned and juice manufactured unit in Mizoram, its products are processed through highly modern sophisticated technological machineries. In facts, the finished products have been going through quality control as per food safety norms and regulations. Since, the inception of the Juice Plant, there has been a great scope for further expansion of the production unit. Further, there is a wide and suitable scope for the growers, which will ultimately bring sustainable marketing avenues not only within the local market, but even outside the local market.

Influences of Rainfall on Crop Production, a case study of Assam

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Abstract

In Assam, rainfall anomalies have led to several incidences of flood and drought in recent years. This study has been carried out with the aim of understanding the impact of excess or scarce rainfall on crop production of Assam. This study analysed annual and seasonal rainfall variability and their relationships with crop production. Monthly rainfall data for a period of 36 years (1975-2010) recorded in 08 rainfall gauging stations of Assam has been analysed. Coefficient of variation (C.V.) and Precipitation concentration index (PCI) has been computed to assess rainfall variability. Agricultural data of all the districts of Assam has been collected for the period 1975-2010 and processed. Carl Pearson correlation method is employed to study the relationship and effect of rainfall characteristics on crop production. The statistical significance of correlation coefficients has been tested at 5% and 1% level of significance. Findings showed that there exist a relationship between rainfall variability and crop production.

Keywords: Rainfall variability, crop production, trend analysis, coefficient of variation, precipitation concentration index

Landuse/Landcover Changes of Jiadhal River Basin, Assam

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Abstract

Landuse/landcover change was quantified for the year, 1990, 2000, 2010 and 2016 using Landsat imagery ETM+, TM. Rapid and timely monitoring and predicting of LULC changes are important and significant. Currently Geographic information System (GIS) is one of the important tools for detecting LULC change. The study was carried out in the Jiadhal River Basin, Assam. The river originates from West Siang district of Arunachal Pradesh and flows to plain of Assam in braided

pattern carrying huge sediment load and high flood weaves in the monsoon season which is the major problem in the study area. Human intervention in the upstream is adversely impacting the downstream of the river which are responsible for the geo-environmental changes of the study area. Downstream is highly populated and source of living in and around the river basin is mainly agriculture which is resulting to extensive landcover changes. It is found out that maximum land has converted to river sand, built-up area and agricultural land in the last 30 years.

Keywords: Landuse/landcover, Change Matrix, Environment, Jiadhal River Basin.

Assessment of Land Capability and Suitability Classification for Agriculture using Geospatial Techniques in Rudraprayag District (Garhwal Himalaya)

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Abstract

Rudraprayag district falls in lesser and greater Himalayan ranges and implies Mandakini river basin and some area of middle Alaknanda basin. It covers area about 1982.92sq. km. ranging from Latitude $30^0$19'00" North to Latitude $30^0$49' North and longitude $78^0$49' East to 79^0 21' 13" East lies in Garhwal. Uttarakhand is covered with 64.76% of its area under Himalayan forest providing the exquisite biodiversity and climatic differences with variety of flora and fauna, whereas about 50.04% area of this district covered with forests. In this district the very limited area about 20.80% remains for agricultural activities. Basic aim of this study is to analyze various soil characteristics and to find capable and suitable sites for agriculture. For this, various morphological characteristics and physic-chemical properties of soils such as effective depth, texture, structure, soil reaction and plant nutrient status associated with other land features like Physiographic position, slope, erosion hazards, stoniness, rockiness, etc are analysed using geospatial tools and techniques. For such interpretation according to USDA parameters and criteria were followed on the bases of data received from SLUSI, (IARI, Pusa, and New Delhi). After carrying out the results and interpretation, there are five Land Capability Class according to USDA (II, III-IV, IV, VI-VII, VIII) found in this district. Out of them, the soils in class II to

IV are suitable for agriculture with progressive increasing limitations that affect their use under agriculture, where as classes VI - VII to VIII lands are not suitable for cultivation but are suitable for pasture, afforestation , wild life preservation, aesthetic ecotourism.

Keywords: Land Capability and Suitability classification, RS & GIS techniques

Soil Characteristics of Ginger-Based Agroforestry System of Mizoram

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Abstract

Consciousness about the depleting fossil fuels and the environmental hazards leading to global climate change escort the researchers to think over identification and proper understanding of various renewable resources and its importance for the healthy existence of the environment. At the same time, over exploitation of natural resources has also led to environmental degradation and change in livelihood. Therefore, rational utilization of natural resources is the need of the hour for sustainable development. In this paper, the exploitation of the seed oil of *Mesua ferrea* L. plant (available in North East India) has been reported in the development of a series of high performance polymers including polyurethane nanocomposite and nanocoatings. Besides, the natural waste cum buckles of the seeds of the plant has been utilized for the first time for the production of nanocellulose (CNC). Nanocellulose was isolated from the uniformly sliced fibers of the buckles by alkali treatment technique at 85±5^{0}C followed by bleaching and finally sulfuric acid hydrolysis. Acid hydrolysis was performed at 45^{0}C by using 60 wt % sulfuric acid solution under mechanical stirring conditions followed by centrifugation, dialysis and ultrasonication. The isolated CNC's were characterized by SEM, XRD, FTIR and TG analysis. The study further reports that the derived CNC's with renewable potential have tremendous scopes to be utilized as prospective nano-reinforcing agents for production of sustainable nanocomposite materials. Thus it can be concluded that management of natural resources like *Mesua ferrea* L. plant in the development of polymers to nanomaterials in a cost effective and environment friendly manner may play a key role to the sustainable development and rural livelihoods.

Keywords: Polyurethane, Nanocellulose, Sustainable, Acid Hydrolysis, Nanocomposite

Total Factor Productivity of Flowers: A Study of Selected Villages in Nadia District in West Bengal, India

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Abstract

Agro-ecological environment in Nadia district in West Bengal is conducive for floriculture. Due to substantial economic return, farmers are attracted more towards flower cultivation in this district. Consequently, area under flower cultivation in this district has increased from 1595 hectares in 2000-01 to 6763 hectares in 2013-14. Nadia district accounted for 27.22 per cent of the total area under flower cultivation in West Bengal and contributed 29.27 per cent of the total loose flower and 27.84 per cent of the total cut flower production in West Bengal (2013-14). Considering the immense potential of floriculture for the sustenance of rural livelihoods in this district, an in-depth analysis of flower productivity is required. In this context, six villages have been selected in Nadia district to assess the total factor productivity during the period of 2000-01 to 2013-14. Based on area under flowers and technological inputs, Malmquist Data Envelopment Analysis (DEA) developed by Fare et al. (1994) has been used to measure technical efficiency change, technological change, pure technological change, scale efficiency change and total factor productivity change of flowers in these villages. This study has revealed a noticeable progress in flower productivity and conspicuous variations across villages have been observed.

Keywords: Data Envelopment Analysis, Rural livelihoods, Technological change Technological inputs, Total factor productivity

Geographical Study of Reclaimed Kayals in Kuttanad Wetland of Alappuzha District, Kerala

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Abstract

Kuttanad wetland is a paddy wetland in Kerala, unique for its below mean sea level location and gives the status of lowest point in India. Most of the wetland

area is found below mean sea level and this is the only area in India where paddy is cultivated below mean sea level. ***Polders*** are the lowlying paddy fields and locally known as *Padashekaram.* These polders are found below (0.2 to 2.6 metres) mean sea level, therefore the method used by the natives for cultivation of paddy in this wetland is significant. ***Polders*** of this wetland are reclaimed from the shallow part of the backwater and the rivers with a method locally known as *Kayal Kuthu*(Backwater Reclamation).The present study is limited to the Kuttanad area of Alappuzha District. The objectives of the present study is to map and compare the different stages of Kayal reclamation and to analyze the evolution, methods and techniques used by the natives for the reclamation of Kuttanad wetland. Maps for the study area has been prepared with the help of GIS techniques. The map of different stages of reclamation has been prepared with the help of toposheet from Army Map Services of US corps of Engineers and SOI toposheet. Major findings of the study reveal that, backwater (*Kayal*) reclamation has increased the cultivable land and managed to give space to the increasing population in Kuttanad paddy wetland. Recent reclaimed lands are still found as sparsely populated due to lack of accessibility and infrastructure. Socially backward people like *Pulayas*, *Parayas* and *Ezhavas* are settled in this inaccessible area.

Keywords: Kuttanad, Vembanad Backwaters, *Kayal* Reclamation, Polder, *Pulaya, Paraya, Ezhava*

Changes in Sources of Irrigation and its Impacts on Major Crops Production: A Geographical Analysis of District Varanasi, UP, India

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Abstract

Rainfall is the main factor that affects the production or production of cost of the crops. Agriculture development of any region mainly depends upon the availability of water resources. It is true that irrigation is the prominent input which plays a permanent role of insurance against the vagaries of rainfall but rainfall is also the fundamental source of irrigation and also all types of water supply on the earth surface. The present research work is an attempt to analytical description of close relationship between sources of irrigation and major crops production of middle Ganga plain in District Varanasi. There are two objective of this research work, first is

to study the changes in sources of irrigation and second is to recognize the impacts of changes in sources of irrigation on major crops production in District Varanasi. For completing this research work data personally collected and computed from District Statistical Handbook and the Office of Executive Engineer, Irrigation Department, Varanasi District. The climatic data were collected from Geophysics Department, BHU and *Zila Sankhyiki Patrika*. The MS Word, MS Excel 2010 and Arc GIS 10.1 are used in this research for all type of computational works. Tube wells is the main source of irrigation and are important because they serve comparatively a very large area and utilize to a maximum possible extent the available ground water. Due to their varying capacity and size for lifting ground water, tube wells are easy to manage even by small formers supplemented by governmental initiative, especially in form of loans. Thus, there has been a tremendous popularity of tube well installation in recent year. Their rigated area by private tube wells (53359 hectare) is more than to public tube wells (20453 hectare in 2015). The canals irrigated area decreases year after year and it has been recorded that the canals irrigated area in study area are only 8376 hectares in 2015. The Paddy, Wheat, etc. is main production crops in study area.

Keywords: Irrigation, Crops, Tube Well, Rice and Wheat, rainfall

Evaluation of Crop Productivity in Serchhip District, Mizoram, North East India

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Abstract

Agriculture remains the fundamental economic activity in Mizoram. The present study analyzes the crop productivity of Serchhip district in relations with Mat River. The district is blessing by Mat River, Tuikum River and Tuichang River in agricultural productions. Among these three major rivers, Mat River valley situated on the outskirts of Serchhip Town, it facilitates multiple agricultural patches such as Chamdur, Zawlpui and Zuangleng patches. Zawlpui agricultural patch serve as the rice bowl of District Serchhip. Apart from these patches, several tributaries of Mat River form agricultural patches in their respective valleys. Serchhip district is the main producer of cabbage and mustards in Mizoram. Primary data have been collected through household survey covering 40 percent of the total agricultural household by purposive sampling techniques. The factors influencing crop production have been analyzed, Mat Watershed plays vital role in the amount of agricultural production,

farm distance from Mat River valley largely impact the amount and diversification of crops. The socio economic conditions of farmers has been determined keenly to draw the exact picture of rural livelihood, parameters like educational attainment, family income, newspaper subscription, assets, etc. were also studied, these factors largely determine the general crop production. The performance of marginal farmers in crop production and their socio economic status has been interlinked. Suggestions have been made to improve their socio economic conditions by increasing crop production in sustainable ways.

Keywords: Crop productivity, socio - economic, diversification of crops, marginal farmers, rural livelihood.

Eri Silk (*Samia cynthia ricini*) and its Importance in Rural Livelihood, a Case in Brahmaputra Valley of Assam

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Abstract

'Eri' is derived from the Assamese word 'era', which means 'castor', as the silkworm feeds on castor plants. Eri silk is also known as 'endi or errandi' in India. The woolly white silk is often referred to as the fabric of peace when it is processed without killing the silkworm. Eri silk are found in places of diverse geo-ecological backgrounds in northeast India. They grow in high altitude areas that are 300-1,500 meter above sea level and in natural forests. In India it is found naturally in Assam region and in other parts it is grown by artificial techniques. The botanical name of Eri silk is *Samia cynthia ricini* and is also locally known as Eri pat. Eri like Muga (*Antheraea assama*), has a history dating back to thousands of years and enjoys a value-based position. Though there are slight differences in their usage, in the current market, Eri is less costly than Muga silk. For the purpose of the study, the cost discussed is based on 2,000 hectare plantation in the study area which involves individual planters. Costs involved in this analysis were adopted from entrepreneur and villagers involved in Eri rearing. The costs discussed here are based on per year rotation. In this paper an attempt has been made to emphasize the possibilities of Eri silk and its importance for sustaining rural livelihood in the Brahmaputra valley of Assam.

Keywords: Eri, geo-environmental condition, traditional silk, rural livelihood and economic upliftment

Growth and Yield of Different Intercrops under Mandarin Orange (*Citrus reticulate* Blanco) based Agro-forestry System in Mizoram

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Abstract

The present investigation has been done in two consecutive seasons in Mandarin Orange orchard, South Hlimen located at 5 kms South of Aizawl, the capital of Mizoram. The aim of this study was to identify suitable combination of crops, legumes or non-legumes to be cultivated with Mandarin orange in order to improve farm productivity. Two (2) legumes and two (2) non-legumes were grown randomly in between the interspaces of the Mandarin tree. Tree and crop growth yield and some soil properties were measured. The results showed that Mandarin orange with French bean combination recorded highest gross return and the lowest was in sole Mandarin orange. The highest benefit; cost ratio was obtained in Mandarin orange + French bean intercropped and the lowest was in sole Mandarin orange. From the present investigation, it was found that Mandarin orange + French bean combination gave the best results with respect to equivalent yield and Gross-income.

Rural Livelihood under Shifting Cultivation System in Mizoram

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Abstract

Shifting cultivation is continuously practice in rural areas of Mizoram as the main sources of income. Though, production quantity is low, still it acts as their main sources of income. Shifting cultivation is a traditional system of cultivation where piece of sloppy land is prepared and managed for mixed cropping for a specific period, after which the land is left fallow. When a piece of land is selected for cultivation, trees or bushes growing on it are cut down to a certain extent, or sometimes down to the ground level, allowed to dry, and then set on fire. In the land which is thus cleared, seeds are sown in little holes dug in the ground or are broadcast. No plough is used and no animal is employed. All work is done by human labour(Nandi,1991).

Apart from such activities, rural households also engage in different livelihood activities to sustain and supplement income. The present paper is a preliminary report of the study on shifting cultivation and livelihood activities in Mizoram. This paper makes use of the information gathered in three districts of Mizoram viz Saiha, champhai and Aizawl. The operational steps involved in shifting cultivation are 1) Allotment of jhum sites, 2) Demarcation of boundaries, 3) Clearing the forest, 4) Drying, 5) Burning the forest, 6) Re-firing and cross bar setting, 7) Sowing, 8)Weeding, 9)Harvesting. During off-season and interval periods of jhumming, non-timber produces from forest and livestock farming are performed for their family consumption and to supplement their livelihood.

Wild Edible Fruits of Southern Assam (Barak Valley) and Their Traditional Process of Utilization

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Abstract

Southern Assam popularly called Barak Valley consisting of southern most three districts of Assam viz. Cachar, Karimganj and Hailakandi is very rich in plant resources and as such, a good number of tribal and economically backward communities are living in forest areas, adjoining areas of wetlands, river side and remote villages. So, they utilize wild plant resources as food, medicine, etc. since time immemorial. In the present paper, an attempt has been made to present an account of 40 wild edible fruit plants and the traditional process of utilization of their fruits as food by local communities. Some of the wild plants with edible fruit of southern Assam are *Artocarpus chama* Buch.-Ham, *Artocarpus gomezianus* Wall. ex. Trecul., *Baccaurea ramiflora* Lour, *Calamus floribundus* Griff., *Coccinia grandis* (Linn.), *Dillenia indica* Linn., *Ehretia acuminata* R. Br., *Euryale ferox* Salisb., *Ficus racemosa* Linn., *Flacourtia jangomas* (Lour.) Raeusch., *Garcinia cowa* Roxb. ex DC., *Garcinia pedunculata* G. Don., *Garcinia xanthochymus* Hook. *f.* ex Anderson, *Grewa nervosa* (Lour.) Panigr., *Randia spinosa* (Thunb.) Pair., *Solanum stramonifolium* Jacq., *Spondias pinnata* (Linn. *f.*) Kurz, and *Ziziphus oenoplia* (Linn.) Mill. The data presented here, has been collected after regular visits and surveys in different forest areas, villages, markets and interactions with different communities for last several years in the southern of Assam districts. Correct botanical nomenclature, together with family, local names in respective languages of the community concerned, mode(s) of consumption, voucher specimen number, distribution in the valley, as

well as in India and some notes on nutritive value) have been provided against each species.

Keywords: Barak Valley, wild edible fruits, tribal, backward communities, nutritive value

Wild Leafy Ornamental Angiosperms of Barak Valley of Assam with Notes on Their Taxonomy, Habitat Ecology and Prospects of Commercial Utilization

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Abstract

An account of 25 species of wild leafy ornamental Angiosperms considers as potential leafy ornamentals of Barak Valley of Assam is presented. Correct taxonomic nomenclatures of the species with habitat ecology along with some other aspects have also given. Suggestions have been offered for the cultivation of these on commercial scale within the country. Some of the wild ornamental leafy angiosperms are *Aglaonema hookerianum* Schott, *Homalomena aromatic* Schott, *Jatropa gossypifolia* L., *Pinanga gracilis* (Roxb.) Bl., *Rhaphidophora hookeri* Schott, *Stemona tuberose* Lour etc.

Traditional and Sustainable Natural Resource Management System of the Apatani tribe of ziro valley in Arunachal Pradesh

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Abstract

The Apatani cultural landscape identified by the wet rice cultivation system which combine rice,millet and fish cultivation system in the form of sedentary agriculture in the valley illustrate the utility value of the traditional knowledge system with economical and ecological efficiencies. ”Paddy cum Fish Culture” is considered as the economicalally viable and hence sustainable farming too.The entire farming process takes place without the use of any animals and machines. Domestic waste

such such as rice bran, animal excreta, decomposed straw and remains of burnt straw after the harvest are used to enhance soil fertility and also serve as feed to the fishes. It is not paddy and fish but every inch of land is used. Millet are grown on bunds constructed in between paddy field. The most unique feature of the irrigation system is that only one small river irrigates the entire paddy fields of the valley through a network of irrigation channel. Resource conservation is not limited to land only but also forest. There is a traditional practice of protection of forest by these indigenous communities which is a reflection of their socio-ecological system where they are strongly aware of meeting their basic need on sustainable basis, without destroying the nature. The "sacred Groves" of Apatani serve as a very good example of community based traditional practice where a patch of virgin forest near the village is declared as "sacred" and protected on ground of socio cultural belief. The paper reveals the indigenous land use knowledge system of the Apatanis which has not been affected by ever-growing science and technology

Keywords: Apatani , Indigenous ,Sustainable, Rice cum fish culture, sacred groves

Jhum Cultivation and Changing Livelihood Strategy of Tripura Tribe of Longtharai Valley, Tripura

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Abstract

The Tripura community has been practicing jhum or huk as a livelihood through centuries. The social life of Tripura tribe is directly associated and controlled by the sifting cultivation. The huk has played vital role in constructing society, their life cycle were totally dependent on cultivation. This paper attempts to study the occupational change and living conditions and livelihoods amongst the Tripura Tribe in Longtharai Valley, Dhalai District of Tripura North-East India. The impact of modernisation, globalisation and climate change have resulted into change of occupation along with the change upon living conditions, infrastructure and the social organization and culture of Tripura tribe. This paper is based on a field study of 391 households taken from seven village committees of Longtharai valley conducted in 2014. Presently, the area under huk cultivation is decreasing due to increasing soil erosion. Due to reduction in huk cycle, there is less time to generate nutrient in a particular place, thus the land capacity has reduced. That also brought insecurity in livelihoods among Tripura tribe and other tribal communities in Tripura state.

Some constrains have been put by governments by planting *teak* wood in old huk area which made land infertile. The results demonstrate that out of total 391 sample household surveyed in 2014, only 167 households are engaged in jhum or h*uk (42.71%)* while 224 households (57.29%) had left or abandoned the age old occupation and have chosen other means of livelihood. Thus, impact of globalization and modernization is seen in the livelihoods in Tripura tribe.

Keywords: Huk or Jhum; Longtharai valley, globalisation and changing Livelihood.

Understanding Global Warming in Local Contexts: Mizoram's Jhum Cultivation and Hybridised "Chapchar Kut"

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Abstract

The biggest obstacle to countering the effects of global warming today is the lack of conviction among the inhabitants of this very world, some of whom are powerful elites with the authority to shape the fates of the majority. The paper proposes an obvious (yet meticulous) solution, that rather than try and continue raising awareness at a wide scale global level, the problem should be handled at local levels using tropes that the indigenous relate to. In the case of Mizoram, said tropes would be that of jhum cultivation and the local festival of "Chapchar Kut". The paper will review the current academic discord on not only the effects of jhum cultivation (including global warming), but also the reports on whether jhum cultivation is being culled by policies; and in the process, elaborate how the intricacies of the traditional festival is being modified into a hybridity as a result of global warming.

Keywords: Global Warming, Jhum, Chapchar Kut, Hybridity, Mizoram.

Uses of Machinery and Equipment in Agriculture and Agro Based Industry: a case study of Rural Economy in Uttar Pradesh

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Abstract

Agriculture and Agro Base Industry have major contribution in GSDP of Uttar Pradesh. Total rural population of Uttar Pradesh is 83.3 per cent. Farm

mechanization plays an important role in providing optimal utilization of resources and increasing the production in agriculture and agro based industry and also in reducing drudgery. Share of agricultural workers and draught animal power sources in total power has come down in recent decade. According to the report 'State of Indian Agriculture 2015-16, GoI', the percentage share of agricultural workers and draught animal power sources in total power reduced from 15.4 to 5.0 per cent and 45.4 to 5.1 per cent, respectively over the years from 1971-72 to 2012-13. This paper discusses on uses of machinery in agriculture and agro base industry. It focuses on technology up gradation is necessary for increasing the productivity in rural economy. This study is based on secondary data mainly collected from Ministry of Agriculture & Farmers Welfare, GOI, state and central government reports. Data analysed in SPSS and MS Excel.

Keywords: agriculture, agro base industry, technology up gradation, rural economy, productivity

Plant Diversity in Home Gardens of Cachar District, Assam: a case study

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Abstract

Home gardens are mixed cropping systems that involves management of multipurpose trees, shrubs, herbs, ornamental and medicinal plants in association with livestock as a source of food and income. The study aimed at enumerating plant species, knowing their uses and understanding the home gardens of Nutan Ram Nagar Village, Cachar district, Assam. A questionnaire survey was adopted for collecting information of 20 different households having home gardens. The size of the home gardens varied from 0.08 ha to 0.64 ha with an average of 0.28 ha. Home gardens forms the land use pattern of the locality and are maintained as a part of tradition. Home gardens are a source of both subsistence and commerce for the farming community. The number of species recorded ranged from 14 to 32 within the studied home gardens. On the whole 62 species were encountered in the home gardens of the studied village with fruit trees as the dominant category. Other than fruits, there were timbers, medicinal plants, ornamental plants and vegetables in the study area. The species diversity of home gardens largely depends on the landholder choices in growing a particular plant species. Based on the growth forms the home gardens are predominated by trees followed by shrubs and herbs. The home gardens of the study area are indigenously managed land use systems that harbour a variety of plant species fulfilling the needs of the rural people as well as a means of conservation.

Thus these traditional management systems will not only act as conservation sites but also supports sustainable uses of bio resources.

Keywords: Assam, home garden, land use, species, traditional

Impact of *Melocanna baccifera* Leaf Litter as Mulching Material on Yield and Growth of French bean (*Phaseolus vulgaris*)

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Abstract

A field experiment was conducted at the department of Forestry, Mizoram University, Tanhril to study the effect of *Melocanna baccifera* leaf litter as mulching potential on French bean. The experiments was conducted in randomized design leading to the establishment of 5 replicates of seven treatments viz. T0- control, T1-leaf unfertilized, T2-culmsheath unfertilized, T3-leaf + culm sheath unfertilized,T4-leaf+ fertilizer, T5-culmsheath + fertilizer, T6-leaf + culm sheath + fertilizer. A period of 4 months observation was conducted and data were collected from soil moisture, soil temperature, soil pH, soil organic carbon, available nitrogen, available phosphorus, and microbial biomass C, N, P and biomass of the plants. Observation for biomass and yield attributes included shoot length, collar diameter, leaf area, above ground biomass and yield starting from the first week after transplantations. The result reveals that bean plants subjected to mulching with T6- leaf + culm sheath + fertilizer treatment has the most significant effect on plant collar diameter, leaf area and plant height, root:shoot ratio, dry mass production and yields compared to other treatments. Mulching enhances soil properties such as soil moisture, spoil pH and soil temperature available N, SOC and total N.

Keywords: *Melocanna baccifera,* mulch, French bean, growth, yield.

Soil Characteristics of Ginger-Based Agroforestry System of Mizoram

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Abstract

Agroforestry systems are the land management practices viable both ecologically and economically than any other land management unit. Degradation in soil

fertility has been caused through various monoculture practices. Intercropping and mixed cropping sustains soil fertility and productivity. In order to assess the soil physicochemical properties of ginger (*Zingiber officinale* Rosc.) and rubber (*Hevea brasiliensis)* intercropping, a study was conducted at Kawnpui, Kolasib District. The study aims to compare the changes under different stages of cropping i.e., Pre-cultivation (PC), Flowering stage (FS) and Post Harvest (PHV) within each treatment i.e., Rubber + Ginger (RG), Sole Ginger (SG) and Control (CTRL). The results showed that soil pH was acidic in all the soils. Higher soil moisture content was noted at FS soil whereas soil from PC and PHV showed lower soil moisture content. RG and SG plots harbored higher amount of Available Phosphorus during Pre-cultivation and Flowering Stage. Higher amount of NO_3^--N and NH_4^+-N were exhibited at PHV and FS. No significant changes were found in soil physical properties. It was also observed that soil physico-chemical properties were influenced by sloppy terrain.

Keywords: Agroforestry, Intercropping, Soil fertility *Zingiber officinale, Hevea brasiliensis.*

Studies on Seed Biology of *Clerodendrum colebrokianum* Walp, a Natural and Potent Shrub of Mizoram, India

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Abstract

Clerodendrum colebrokianum Walp.is a naturally growing plants of Mizoram, belonging to the family Verbenaceae. It is because of the presence of alkaloids, flavonoids, saponin and tannins. The plant is used for the treatment of diabetes, hypertension, antihelminthic. Being such an important medicinal plant as well as vegetables, information on seed biology is still lacking on this plant. Lack of proper management of natural resources, over-exploitation, pollution and climate change, the population of the species are now declining and ENVIS on medicinal plants categorised this species as vulnerable. Sustainable livelihood for rural people can be achieved through cultivation of this plant. The plant is available throughout the year. It is one of the cash crops among the peoples of mizo as a vegetable. The plant is mostly propagated by the seeds and it is the only means of dispersal in Mizoram. Keeping this in view the investigation was carried out. The study of different phenophases revealed that initiation of bud starts in the month of June. Flowering starts in the month of August and continues till December. The plant takes 41 -45 days from initiation

of bud to flowering. The anthesis occurs between 5.30 AM and 8.30 AM. A single inflorescence may contain 50-128 flowers. Though, the fruit setting percentage is very high, but the fruit retention percentage on the inflorescence is low. The length of the inflorescence was 19.9±4.8 cm. From opening of the flower to shedding, the plant takes 7-8 days and after shedding of the flower, the plant required 6-7 weeks to attain maturation of the fruit. With maturity, fruit colour changes from green to black. The harvesting of the fruit starts from November till February. The weight of the seed varies from0.47±0.03 to 0.50±0.02 g, 6.5±0.4 – 6.9±0.2 mm and 5.1±0.4 - 5.4±0.2 mm in length and diameter respectively.

Comparative Study of Physico-chemical Properties of Soil under Three Different Bamboo Stands

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Abstract

Bamboo forests cover a large extent in Mizoram. Around 57% of the geographical area of Mizoram is under bamboo cover found at heights ranging from 500 m-1500 m. There are 35 species of bamboo known to be found in Mizoram. *Melocanna baccifera* is distributed throughout the state and comprised of more than 98 percent of the growing stock of bamboo and the remaining 2 percent are different clump forming bamboo species. Therefore, the present study has been taken up to study the difference in the soil properties specially soil moisture content, soil pH, bulk density, total organic carbon and available phosphorus under *Melocanna baccifera, Dendrocalamus strictus* and *Bambusa balcooa* stands. During the study, it was found that soil moisture content was highest under *Melocanna baccifera* stand (35.81%) and the least in *Bambusa balcooa* stand(25.42%). Soil pH was found to be highest under *Melocanna baccifera* stand(4.8) and the least in *Dendrocalamus strictus* (4.4*)* and under *Dendrocalamus strictus* stand highest bulk density(1.12g/cm^3) was observed while *Melocanna baccifera* had the least (0.93 g/cm^3).Total organic carbon content was found to be the highest in *Bambusa balcooa* (3.27%) and least in *Dendrocalamus strictus* (3.03%). In the case of available phosphorus, the highest was observed in *Melocanna baccifera*(19.8%) and the least in *Bambusa balcooa*(17.37%*).* The results showed that growth of *Melocanna baccifera* stands can lead to more enhancements in soil fertility.

Keywords: bulk density, organic carbon, pH, phosphorus, soil moisture.

Systematic of Rice Intensification (SRI) is a Best Practice of Paddy Cultivation for Sustainable Agriculture: a case study of Karnataka

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Abstract

Rice is life for millions of people in the world, particularly in developing countries. Rice is the most widely grown crop in India. It is cultivated in 45.50 million hectares and has production of 96.43 million tonnes of grain. In Karnataka it is grown in an area of 14.42 lakh hectares with a production of 34.50 lakh tonnes of grain. India occupies the world's largest area under rice, grown under a wide range of agro-ecological conditions.In Karnataka most farmers are adopting Systematic of Rice Intensification (SRI) methods for rice cultivation because of its advantages such as very less seeds, less water and no chemical fertiliser, pesticides and alsorice seedlings are transplanted early 8 to 12 days old compared to 21 days in the conventional method in this using methodssustainable agriculture for future days. In this paper we address (i) the methods that are implemented for promotion of SRI method of Paddy cultivation (ii) the difference between the yield of cultivation in conventional and SRI methods (iii) the advantages or rezones for adopting SRI method in cultivation. The study is reported by using case study method. The data was collected through in-depth interviews conducted to farmers involved in SRI farming.

Keywords: Agriculture, Sustainable, Conventional, Transplant

Floriculture and its Sustainable Agricultural Economical Trends in Barak valley

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Abstract

Post globalisation, floriculture has become an important commercial activity in agriculture. The production is growing at a rate of 8 -10% per annum. There are nearly 120 countries, which are active in floriculture production on a large

scale. Growing at a compound annual growth rate (CAGR) of about 15%.Global floriculture industry is likely to cross Rs. 9 lakh crore by 2018 from present 6 lakh crore. Global floriculture in the sense it includes all cut flowers & foliages, bulbs, cuttings, live plants etc. Floriculture in India is estimated to cover an area of 1.91 lakh/ha with a production of 1031000 MT of loose flowers & 6902 million cut flowers (NBH, 2011). The floriculture activity is very minimum and totally unorganized in Barak Valley. The region abounds in wealth of Orchids, Primulas, Hibiscus, Roses, and various kinds of Lilies etc. Our survey also revealed a significant correlation of annual sale values between the various flower shops available in this region. Thus, sustainable agricultural growth can be successfully achieved through the overall rise in infrastructure support, quality parameters, research and development which will turn increase the future economic growth in Bark Valley.

Keywords: Floriculture, Global market, Infrastructure, Quality management, Sustainable agricultural.

Soil Microbial Populations and Biochemical Properties as Affected by Soil and Litter Amendment in Different Fallow Period Following Shifting Cultivation

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Abstract

Earlier, shifting cultivation was economically viable and ecologically balanced due to prolonged fallow period. However, with increase human population, fallow periods have been substantially reduced to 2-3 years and led to decrease soil fertility and crop productivity. Therefore, the main objective of this study is to understand the impact of soil and litter amendment on soil microbial properties in different fallow period (2 years, 5 years and 10 years). Each site was divided into 3 plots (10m × 10 m) with different treatments as $T_{control}$ (no amendment), T_{soil} (top soil from adjacent forest at 1 t ha^{-1}) and T_{litter} (litter from nearby forest at 5 t ha^{-1}). Soils were analyzed in monsoon (June) and post-monsoon (December). No significant changed in soil moisture content and pH with treatments. Higher total nitrogen, soil organic carbon, microbial biomass C and N, acid phosphatase, dehydrogenase, fungal and bacterial populations were in order $T_{litter} > T_{soil} > T_{control}$. Microbial populations and biochemical properties were significantly high in monsoon compared to post-monsoon. The above finding revealed that soil and litter amendment in fallow land would be able to enhance the soil fertility for longer period and sustain the crop productivity.

Keywords: Shifting cultivation, microbial population, biochemical properties, fallow period, soil and litter amendment

Effects of agroforestry systems on soil properties in Mizoram, India

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Abstract

Agroforestry is considered to be a promising alternative to short-fallow shifting cultivation or other monocropping systems. An on-farm experiment was established in Tachhip village, Mizoram, India to examine the contribution of the leguminous bush Tephrosia candida(Roxb.) and Farm yard manure to improve nutrient cycling. The objective of this study was to compare the effects of agroforestry systems on the physical and chemical properties of soil. The system tested were, Control + Maize, *Tephrosia* hedgerows +Maize, Cow dung + Maize. The results further indicated that supplementation of hedgerow biomass and farm yard manure inputs can sustain maize grain yield at relatively high yields. The management of the hedgerows was crucial in determining their effects on maize crop. Over two cropping seasons, nutrients recycled and inputs were recorded, as well as changes in C-, K-, N- and P-pools, and in pH in the 0–5 cm topsoil layer. Further research is required to understand the ability to improve soil fertility, soil and water conservation and on farmer adoptability through multi-locational trials.

Keywords: Agroforestry, Hedgerow, Nutrient cycling, Farm yard manure

Agricultural Landscape and Its Impact on The Socio-Economic Condition of Rural Livelihood, a Case Study of Jaipanda Watershed, Bankura, West Bengal

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Abstract

Argo-economy is the agricultural based economy in which different cropping pattern, crop species under cultivation and crop productivity are most important. Each region where people depend on agriculture has a unique set of agro

based economy. Proper management of agricultural resource is often hindered due to lack of intense information on various aspects of agro-ecosystem which is required for sustainable agriculture development. Sustainable agriculture is a system of crop production in managed way with relation to the economic development of the area that creates a balance between economic and environmental resources. Hence there is a need to develop a methodology to characterize the agricultural pattern and cropping system and agro based socio-economic development of a region. It can assist mankind in identifying the ecologically sensitive zone based on the information of LULC, soil, crops, irrigation facilities etc. for efficient use of natural resources and inputs for attaining long-term sustainability in agricultural production. Bankura district is mainly a land of agriculture and more than 80% of the total population is residing in the villages and the rural economy is based on agriculture and agro-based small industries. The major crops grown in this district are paddy (Aus, Aman & Boro), wheat, potato, oilseeds, vegetables, pulses, sugarcane etc. and minor crops like maize, bajra, are also grown. Introduction of plantation and horticultural crops have been done in marginal area for better economic upliftment. Integrated Pest Management approach , Rastriya Sam Vikas Yojana Scheme etc.are different scheme for the development of the farmers. SWOT analysis can be done for the analysis of agricultural Strength, Weakness, Opportunity and Threat of this area for the assessment of the agro-economy and socio-economic development, community participation and to suggest measures for sustainable management of the agro-ecology.

Keywords: Argo-economy, sustainability, SWOT, community participation, agro-ecology.

Relation between Cropping System and Soil Nitrogen Content in Galsi II C.D. Block, Barddhaman, West Bengal

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Abstract

Soil nitrogen (N) is considered as an important property of soil fertility and productivity. In natural soil system immobilization, mobilization and microbial activity determine nitrogen content. In agro-pedological system, addition of nitrogen through chemical fertilizer, removal of N by crops and balance of N are determining factors of soil N which was studied in Galsi-II C.D. Block, West Bengal, India. In this study, highest N concentration has been found in rice-mustard (R-M) cropping system (CS) because of highest organic carbon concentration in this CS. IN rice-potato (R-P) CS, N content is 290±27.86 kg ha^{-1} which is 27% lower than R-M CS.

Again, N content is lowest in triple cropped land and highest in legume cropped land. Finally, soil texture, N addition and balance are principal determinants of N in the soil. As N content is highest in leguminous crop, cultivation of lentil, peas and jute are recommended along with organic farming for sustenance of agro-pedological system.

Keywords: Soil Nitrogen, Soil Fertility, Immobilization, and Organic Farming

Improving Physical Properties and Preservative Fixation Using Two Step Royal Treatment for *Melocanna Baccifera* Bamboo

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Abstract

Bamboo is the major source of livelihood in rural parts of North East India. North east India's share is 66.0 % in total bamboo production of India. Among these states Mizoram greatly contributes in bamboo resources and *Melocanna baccifera* is dominant of 22 species of bamboo available in state with 90% share in growing stock. Since *M. baccifera* finds its utility in structural as well as handicraft work, durability becomes an important factor. In this study the basal, middle and apical portions of *M. baccifera* were treated with formulation of Copper sulphate and Boric acid in first step, then with Neem oil at 200 °C for half hour in second step. The impact of two-step royal treatment on preservative fixation was determined by leaching method. The physical properties like moisture content and anti-absorption were also tested following Indian Standard methods. The results showed a sharp decrement in moisture content which infers that this method could be used for quick drying of bamboo. The oil treatment was found to be effective in fixing the water leachable preservative formulation used in first step of treatment. There was improvement in physical properties of two-step treated samples taken from all three portions.

Improving Agriculture through Indigenous Method of Cultivation

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Abstract

Agriculture is the mainstay of economy in Mizoram. All the festival, tradition and custom of the people are closely related with Shifting Cultivation. But, this

system of agriculture is one of the major problems regarding land use, productivity and environmental issues. Improvement of agricultural methods and productivity to reduce this dilemma is a long-way challenge in the field of agriculture even various techniques were introduced by the State Government. The two indigenous method of Ginger cultivation in Khawzawl Block, Champhai District, Mizoram, is analyzes by using observation, interview and empirical evidence. The main aim of the study is to analyze the conditions of shifting cultivation, methods and productivity in the hilly region of Mizoram. The present study reveals that the indigenous approaches of cultivation still practice in the rural areas provide a high productivity and it also promote primitive type of cultivation without adverse effects of land use in the study area. These papers suggest that improving indigenous system of cultivation is highly necessary to obtain local benefits, high yield and no waste of natural resources.

Keywords: Improve, Indigenous, Shifting Cultivation, System, Productivity

Sustainability of Jute Farming and Socio–Economic Issues of the Jute Farmers in Assam

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Abstract

Jute is one of the major cash crops, primarily cultivated by the marginal and small farmers in Assam. The state ranked third in terms of its production in India after west-Bengal and Bihar**.** In this era of environmental awareness, natural fibers are regaining its acceptance among environment conscious consumers across the world. In this context, the sustainability of the fiber cultivation is a crucial issue. This paper tries to analyze the sustainability issues of Jute farming along with the socio-economic issues of the growers in the region. The study is based on primary data collected through field survey of the researchers. Multistage sampling procedure has been used and grower's responses were obtained with the help of a structured schedule. It was observed that there is apathy among the farmers towards farming the crop and increasing cost of cultivation, inappropriate marketing facilities influenced the growers for crop shifting in the area.

Keywords: Sustainability, Jute Farming, farmer's constraints, socio-economic conditions

An Overview of Medicinal and Aromatic Plants of Indian Western Himalaya

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Abstract

Indian Himalaya possesses a rich diversity of medicinal and aromatic plant species and is a mega hot spot centre of biodiversity. Moreover, the medicinal plants found in the Himalaya include species of particularly high medicinal value. These plants are primarily utilized as a source of raw material for pharmaceuticals and traditional health care system without any side effects. Modern system of medicine was not universally accepted in healthcare as having various disadvantages over traditional drug system. This article deals with medicinal and aromatic plants of Indian Western Himalaya regions, which are being used for therapeutic purpose. The needs for cultivation of Himalayan medicinal and aromatic plants have been described in context to their rising demand in the pharmaceutical industries. A representative overview is given on some valuable frequently used Himalayan species, on the basis of their therapeutic action.

Keywords: Medicinal and Aromatic plants, Western Himalaya, therapeutical uses, Over-exploitation, Cultivation

Documentation of Ethno-Medicinal Plants Used in the Treatment of Malaria, Fever and Headache by the Garo Community of West Garo Hills District, Meghalaya

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Abstract

The Garo hills districts in Meghalaya persistently contributed most on malarial attributable deaths. The research on docume ntation of ethnomedicinal uses for the treatment of malaria, fever and headache was conducted in West Garo hills

district of Meghalaya during the year 2014-2016. Sources revealed that the West Garo hills district is co-endemic for *Plasmodium falciparum* and *Plasmodium vivax*, but *Plasmodium falciparum* was the predominant infection (> 82%). The study has documented 20 medicinal plant species belonging to 16 families. The study based on the plant parts used reveals that roots (40%) were most commonly used in the treatment, followed by leaves and barks (35%), whole plant (10%) and seeds having (5%). In the study trees (50%) were recorded to have highly used potential followed by herbs (30%), shrubs (15%) and climbing shrubs (5%).

Keywords: Ethno-medicine; Malevolent spirits; Oja: West Garo Hills; Meghalaya

Influence of Cropping System on Soil Organic Carbon in Mangolkote C.D. Block, Barddhaman, West Bengal

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Abstract

Soil organic carbon (SOC) plays important role in fertility of soil, crop production and prevents global warming because SOC can store 3.1 times of atmospheric C. Rate of decomposition of SOC is determined through addition of organic matter of soil, intensity of tillage and management of soil. With cropping system, manuring and use of fertilizer, SOC varies significantly. In this study, 342 soil samples have been collected from Mangolkote C.D. Block, Barddhaman in 12 pre-categorized cropping systems (CS) and four cropping pattern. The SOC pool is dependent on bulk density, pores, amount of crop residue and application of compost. The SOC concentration is highest in legume based CS, jute (*Corchorus capsularis*)-peas (*Pisum sativam*) (J-P) and rice (*Oryza sativa*)-lentil (*Lens culinaris*)-rice, 50% greater than rice cultivable land. Intensity of crop and removal of nutrients in triple crop and plantation practice are responsible for reduction of SOC concentration. Soil texture particularly sand and clay, bulk density, total nitrogen, application of compost and crop residue are the determining factors of SOC pool in the soil. The cultivation of leguminous crops like lentil and peas should be recommended as best management practice (BMPs) in the rice based CS to enhance SOC concentration and soil fertility.

Keywords: SOC Pool, Global Warming, Manuring, and Management of Soil

Potential of Soil Enzyme Activities as an Indicator of Soil Quality Due to Land Use Change in Acidic Degraded Soils of Mizoram

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Abstract

Soil biota and its activities have been used as an important indicator of soil quality variation due to soil management including land use land cover change. In Mizoram, shifting of traditional paddy cultivation practice to settle agriculture (lowland rice) and forest plantations (secondary forest, teak, jhum, oil palm, arecanut and rubber) are common. The objective was to study the effect of such changes on soil enzyme activities involve in C, N, P and S cycling and its suitability as an effective indicator of soil quality. Results revealed significant differences in soil enzyme activity. The availability of soil moisture and SOC was positively correlated with acid phosphatase (ACP), alkaline phosphates (ALK), aryl sulphatase (ARY), dehydrogenase (DHY) enzymes and overall geometric mean of soil enzymes (G) suggesting the improvement of soil quality through moisture retention by SOC accumulation. Geometric mean (G), an indicator of soil quality was in the following order; forest > arecanut > rubber > oil palm > teak > jhum > paddy. The lower soil quality under paddy and jhum was attributed to tillage operation over the years and involvement of burning reducing the SOC content while under forest and plantation, phytomass accumulation increased the OM. Multivariate analysis (PCA) results further confirm the dominance of soil quality under plantations and forest. Soil enzyme can be successfully use as an indicator of soil quality.

Key words: Microbial activities, acid soil, landuse, soil quality, jhum.

Commercial Plantation in Forest Lands of North-East India and Its Impact on Livelihood Sustainability of the Local People

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Abstract

Forest areas cover more than 70 per cent lands of the seven North-eastern states except Assam and constitute one fourth of the country's total. In order to meet

the growing needs arising from population growth, increase social conflict, economic activities and climate change, commercial plantation has started gradually within these forest reserves after clear felling of the diverse and healthy trees. Deforestation brings change in the forest ecosystem which cannot be restored by creating human made monoculture plantation. In addition to environmental benefits, forest provides rural livelihood security through income generating products (timber and non-timber goods). Plantation forestry, taken up by the states or private operators, has been the only objective to provide raw materials for industry and this has largely ignored the right of the forest dwellers. This paper examines the trend of plantation forestry in north-eastern states using secondary data and discusses how sustainable forestry systems and policies can be developed to provide industrial supplies, promote environmental objectives and support the livelihood of the local people. The study has revealed that greater part of the land brought for large scale commercial plantation of oil-palm, rubber and coffee were earlier used by the tribal people for jhum cultivation. They not only grew rice, maize, vegetables and fruits on jhum lands but also harvested bamboo shoots and firewood on the same patch of land in the non-growing period. Now, the farmers receive cash as one time support against giving up jhum but loose diverse livelihood opportunities. By pressing for plantation farming, forest agencies of the respective states tend to abolish the traditional community forestry management system and in many instances now the farmers, contractors and businessmen from distant towns purchase the community land. It is suggested that the activity of converting forest land into plantation land should be regulated under Forest (conservation) Act, 1980. Instead of forests, degraded forest lands and wastelands could be effectively used for the productive purpose and policy must focus on equitable benefit sharing between the government and the local community. This paper also concludes how sustainable livelihood options including farm forestry and agro forestry have become helpful for reducing rural poverty and promoting community conserved areas.

Keywords: deforestation, monoculture plantation, livelihood security, community forestry management, sustainable livelihood options.

Importance of Soil Seed Bank in Shifting Cultivation Affected Areas

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Abstract

The soil seed bank is the natural storage of seeds, often dormant, with the soil of most ecosystems. It plays an essential role in regeneration of tropical forests as well

as in temperate and boreal forests and also contributes to the diversity and dynamics of most plant communities. Seed bank input is determined by the seed rain. Shifting cultivation is still preferred among the indigenous communities of Northeast India. It has been widely accepted as environmentally destructive and economically unfeasible. It is estimated that 1.73 million hectares of land use is affected by shifting cultivation in Northeast India. Forest cleared for shifting cultivation has three potential sources of regeneration viz., seeds present in the soil at the time of disturbance, post-disturbance seed input, and re-sprouting trunks and roots. Study of soil seed banks in such areas can be helpful in predicting the composition of new plant recruitment. The presence of a well stock soil seed bank permits rapid development of species rich ecosystems during secondary succession. Knowledge of seed bank size and composition facilitates proactive management in shifting cultivation areas by providing early alerts of exotic species presence and of abilities of seed banks to promote colonization by desirable species.

Keywords: Soil seed bank, Ecosystem, Seed rain, Shifting cultivation, Secondary succession

Alternative Agricultural Technique with the Availability of Water in Purula District of West Bengal

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Abstract

Purulia is one of the driest districts in West Bengal. The average temperature in Purulia is 26.3ºc. May and January is the warmest and coldest month respectively and temperature is at an around 33.3ºc and 18.8ºc respectively. Throughout the year the temperature vary 14.5ºc. Rainfall is 200-300mm.There is a difference of 296mm of precipitation between driest and wettest month. Though the amount of rainfall is not inadequate but the undulating surface of this region helps for a high amount of run-off.The crops demanding high amount of water are practiced in this region.Farmers have also keep in their mind that highly productive and highly breeding seeds which demanding less amount of water. This study develops by analyse the decadal variation of climatic component of 60 years (1957-2016) and co-relation among the different weather element of Purulia district. This topic aims to study mainly on the alternative sustainable agricultural crops as well as reschedule the existing agricultural system.

Keywords: Purulia, Arid region, Irrigation demands, New agricultural system, Sustainable agriculture practice.

Crop productivity and Crop Specific Soil Suitability of Arambagh Subdivision in Hugli District, West Bengal

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Abstract

The economy of Hugli district is predominated by agrarian activity. A colossal number of people are directly and indirectly associated with agriculture. But the agricultural production and efficiency are not uniform all over the district rather it varies from block to block. The growths in the production of agricultural crops depends on the many factors such as area cropped, input management and yield. The cropped area and productivity are determined by the quality of soil, monsoon behavior, amount of rainfall, irrigation, availability of agricultural labourers and machineries, climatic changes, prices etc. To examine the cropping productivity and to study the soil suitability are the main objectives of present study. The study mainly based on secondary sources of data such as district statistical handbook, soil of Hugli district by NBSS (Indian Council of Agricultural Research) etc. In order to achieve the objectives of the study, the researcher has followed modern methods to procedure the necessary data and information related to the investigation of the study. Collected data has been compiled, processed and analyzed by GIS software and different cartographic techniques. Due to different physio-economic factors crop productivity is not similar in the study area.

Keywords: crop productivity, soil suitability, GIS

Eri Silk (*Samia cynthia ricini*) and its Importance in Rural Livelihood, a Case in Brahmaputra Valley of Assam

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Abstract

'Eri' is derived from the Assamese word 'era', which means 'castor', as the silkworm feeds on castor plants. Eri silk is also known as 'endi or errandi' in India. The woolly white silk is often referred to as the fabric of peace when it is processed without killing the silkworm. Eri silk are found in places of diverse geo-

ecological backgrounds in northeast India. They grow in high altitude areas that are 300-1,500 meter above sea level and in natural forests. In India it is found naturally in Assam region and in other parts it is grown by artificial techniques. The botanical name of Eri silk is *Samia cynthia ricini* and is also locally known as Eri pat. Eri like Muga (*Antheraea assama*), has a history dating back to thousands of years and enjoys a value-based position. Though there are slight differences in their usage, in the current market, Eri is less costly than Muga silk. For the purpose of the study, the cost discussed is based on 2,000 hectare plantation in the study area which involves individual planters. Costs involved in this analysis were adopted from entrepreneur and villagers involved in Eri rearing. The costs discussed here are based on per year rotation.In this paper an attempt has been made to emphasize the possibilities of Eri silk and its importance for sustaining rural livelihood in the Brahmaputra valley of Assam.

Keywords: Eri, geo-environmental condition, traditional silk, rural livelihood and economic upliftment.

Ethnobotanical Knowledge on Edible Flowers of Mizoram

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Abstract

Since time immemorial, the Mizo tribe of Mizoram state which is located in the North-Eastern region of India use to consume different parts of plant as a source of food. In Mizoram, flowers have been traditionally used by Mizo people in many types of cooking for their specific flavour or for their culinary purposes. From the survey and data collected during the study, 50 species of edible flowers have been listed which belongs to 27 families out of which Apiaceae family (5 species) is dominant followed by Zingiberaceae (4 species). Both wild and cultivated edible flowers used by the local people of Mizoram are highlighted in the present paper. From the listed plants, 20 species of edible flowers are cultivated, 22 known species are collected from wild and the other 8 species are found to be collected from wild as well as cultivated. Among these plants, 30 species are marketable and the other 20 species are non marketable. The botanical name, family, vernacular names in Mizo, market value, mode of uses and their habit, wild or cultivated form and UV value of all the studied plants are provided. So, the study is an attempt to document the traditional knowledge on plant use for consumption by the people of Mizoram and will highlight the importance of edible flowers in local diet as food and also for medicinal purposes.

Keywords: Edible flowers, Mizo people, wild edible plants

Extremity of Weather and Climate of Purulia District in West Bengal and Its Impact on Agriculture

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Abstract

Purulia is generally identified as the most backward and under developed district of West Bengal. Adverse climatic condition, undulating topography and low water retention capacity of soil are generally blamed for this underdevelopment. Purulia is also designated as the most drought prone district of the state. It is mainly due to so called low amount of rainfall and harsh climatic condition of the region. But the district receives more than 1400 mm. rainfall out of which 500 to 800 mm. rainfall moves as surface runoff due to undulating terrain.

May is the hottest month with average daily maximum temperature close to 40°C, thereby increasing the chance of heat wave which takes the most vital role for the destruction of life and property. January is the coldest month with average daily minimum temperature lies close to 12°C which increases the chance of cold wave. In the present study, an attempt has been made to identify the extremity of weather and climate of Purulia and its impact on agriculture. For this study, monthly rainfall and temperature data have been collected from State Agriculture Department, Government of West Bengal.

Keywords: heat wave, cold wave, undulating terrain, adverse climate, surface runoff.

Role of Insect Pollinators for Enhancing Sweet Orange, *Citrus sinensis* (L.) Osbeck Production

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Abstract

The role of insect pollinators on Sweet Orange, *Citrus sinensis* (L.) Osbeck production was studied on three cultivars i.e. Early Gold, Rhod-e-Red and Trovita in factorial randomized block design. Seven insect belonging to Hymenopterans (6)

and Dipteran (1) were identified and collected from nectar and pollen of flower. Observations on number of flowers visited, time spent, initiation time, peak activity, cessation time, fruit set, fruit yield, fruit weight and number of seed were recorded. Additionally, TSS, dry matter and moisture content were also analyzed. The maximum abundance of different insects on different cultivars was observed at 10.01-12.00 noon while it was minimum at 02.01-04.00 PM. The highest number of flowers visited per minute was recorded in *Xylocopa tenuiscopa* (0.710) followed by *Apis cerana* (0.470) and *Apis florea* (04.10) while it was minimum in *Nomia* spp (01.30). The time spent (second per flower) was found highest in *Nomia* spp. (37.20) followed by stingless bee and *Apis cerana* (10.60) and lowest in *Xylocopa tenuiscop* (04.30). Initiation, peak activity and cessation time of different insects was recorded during 6.00-7.00 AM, 10.00-11.00 AM and 4.00-5.00 PM respectively. Significantly higher fruit set, fruit yield/kg, fruit weight (g/fruit), number of seeds, TSS and dry matter content was observed in open pollination than pollinator exclusion. Maximum moisture was observed in pollinator exclusion. Highest fruit set, fruit weight, number of seeds/ fruit, fruit yield/kg and dry matter percent were observed in early gold. The highest TSS and moisture content were recorded in Rhod-e-Red and Trovita respectively. No significant difference was observed in the interaction between modes of pollination and different cultivars.

Keywords: Sweet orange, insect, pollinators, *Citrus sinensis*, production.

Sustainable Agriculture in Rainfed Area of West Bengal through Hapa Irrigation System

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Abstract

Even though after sixty years of independence, agrarian nature of the rural economy in India is well recognized. More than 50% of people in India are still dependent on agriculture for their livelihood. Equilibrating the growth process and connect the rural- urban divide, inadequate infrastructural support, especially limited irrigation facilities coupled with policy bias are burning dispute for Indian economic reform programme linked with agricultural sector. In late the adverse effect of global climate changes, ground water depletion, soil degradation and burgeoning population causing threats to sustainable growth of agriculture basically in rainfed area. Rain fed areas in the country still accounts for 60% of the cultivated area and these areas

are home to majority of rural poor and marginal farmers. Frequent occurrences of droughts and untimely and heavy rains and floods affected the livelihood of rural people particularly those living in the dry zones where the irrigation facility is scanty. In this plethora, there is considerable importance to explore the possibilities of sustainable forms of irrigation to affirm future food security in India. Given this backdrop, the proposed study is an attempt to understand the implementation of rainwater-harvesting tank named Hapa in West Bengal, which can play a very vital role in conservation of water resource in rainfed agriculture. Hapas are small, deep ponds, dug on farmland to store rainwater. They are usually located on medium and high lands. The distinctive shape of a hapa an excavation with vertical sides with a few steps, which gives it good water retention capacity in comparison to village ponds that generally have a wider open area with less depth causing faster evaporation and they dry up before the summer season. So, Farmers could provide irrigation to paddy crop during this kharif season. The specific research objectives include examining the factors that influence choice of Hapa in different agro-climatic conditions and socio-economic setups and their ecological social and economic benefits along with natural resource conservation in West Bengal. Both secondary and primary data will be used for addressing the research objectives and appropriate statistical tools and cost benefits techniques will be applied for data analysis. The proposed study will carry out detailed analysis of selected irrigation structures in district level in West Bengal.

Keywords: Rain fed area, rainwater harvesting tank, hapa, sustainability, climate change and cost -benefit analysis.

Impact of Climate Change and Recent Threats in Agricultural Production, a Case Study of Joynagar Block, South 24 Parganas, West Bengal

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Abstract

South 24 Parganas is well known for agricultural activities. Disparities and variations of climatic conditions in several years subject to positive and negative impact on agriculture, which can be observed in Joynagar block of South 24 Parganas district. Joynagar comprises of Joynagar block I and Joynagar block II. As per the District Census Hand Book of South 24 Parganas (2011), in Joynagar block I, 35% people are engaged in various activities in which 2% are cultivators, 24% are main

workers, which include agricultural laborers, household industry workers etc. and 9% are marginal workers. However, in Joynagar block II, 37% people are engaged in various activities in which 4% are cultivators, 22% are main workers, which include agriculture laborers, household industry workers etc. and 11% are marginal workers. Joynagar block has been experiencing various hazards and it is moderately flood & cyclone prone area, which directly affects on agriculture. In this paper, various methods have been applied to measure the distribution of agricultural land in various years, production amount of various crops in several years. Maps have been drawn from the multidated satellite images to identify the impact of various hazards in agricultural lands of Joynagar block. Therefore, an attempt has been made to point out different climatic parameters i.e. rainfall, temperature, wind pressure, moisture level, and their impact on agriculture of Joynagar block. Moreover, perception study of agricultural laborers and cultivators has been done to know the production cost, various hazardous situations, profit and loss of production in several years etc. However, this research paper is more relevant to identify various climatic conditions and its impact on agricultural production in several years.

Keywords: Hazards, Agriculture, Production, Climatic parameters, Agricultural laborers

Impact of Oil Palm Cultivation on Rural Livelihood, a Case Study of Mamit and Kolasib Districts, Mizoram, North East India

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Abstract

The cultivation of Oil Palm in Mizoram has been started only on 2005, after the completion of ten years; it has positive and negative impact on rural livelihood. The study analyzes the impact of Oil Palm Cultivation on rural livelihood by selecting the two higher producing districts viz. Mamit and Kolasib in Mizoram. All the households who have been properly practicing oil palm cultivation were selected for case study from four villages each of the two districts. The collected data were calculated by multiple regression and Pearlson's correlation mrthods to obtain the impact of oil palm cultivation on different aspects of livelihood. The studies find out that oil palm cultivation has reduced rural poverty while negative impacts were also realized. The people perceptions on land degradation, water quality diminution and environment damage for present and future due to oil palm cultivation were also studies.

Keywords: Oil Palm, rural livelihood, rural poverty, land degradation, environment damage.

Role of Vermicompost Technology for Improvement of Rural Welfare and Livelihood Economy Among the People of Golaghat District, Assam

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Abstract

Vermicompost considered as valuable and eco-friendly fertilizer by the farmer all over the world. Now a day's people concern about the organic fertilizer instead of chemical fertilizer due to harmful effects, the technology of production of this fertilizer can be enhancing the livelihood economy and rural welfare among the small tea grower as well as common village people. For the present study we visited 4 villages including 15 houses and collected the data by direct interview of use of vermicompost in the different crop plants and its importance. This paper want to focus the importance and influence of vermicompost among the people of study area. Use of vermicomposting provides rural welfare and livelihood economy in the study area because it can be produced from waste organic materials of agriculture and home in very low cost amount.

Keywords: Vermicompost, Earthworm, rural welfare, Livelihood, Economy.

In Vitro Regeneration of Chakhao Amubi, Indigenous Black Aromatic Rice (*Oryza sativa* L. *indica*) of Manipur

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Abstract

Northeast India, located in the Indo-Burma mega-biodiversity hotspot region, in known for its huge reserve biological resources. Rice is the main staple food in the region and more than 30,000 cultivars are planted including more than 2,000 local landraces. Among the landraces, an indigenous black aromatic rice (*Oryza sativa* L. *indica*) of Manipur known as chakhao amubi is considered as

one of the most important owing to its anthocyanin content and scented qualities. The major issues related with this local rice are low yield and restricted planting areas. Biotechnology provides a viable option for the genetic improvement of crop plants including rice. For any genetic improvement programs through genetic engineering, an efficient *in vitro* regeneration protocol is needed. In the present study *in vitro* regeneration of chakhao rice was successfully established. Seeds cultured on basal MS media supplemented. High germination and regeneration potential was observed with NAA and 2,4-D supplemented media. *In vitro* germination was recorded within 2 days of culture. Subsequent regeneration and shoot multiplication were observed by the 7th day and well developed roots were observed in 14 days. Successfully regenerated plantlets were hardened and transplanted into soil condition.

Keywords: Chakhoa, black aromatic rice, Manipur, *in vitro* regeneration

Inventorization of Indigenous Medicinal Plants and Practices in Mizoram, North East India

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Abstract

The present study was conducted during May 2014 to June 2015 and was proposed to document the indigenous ethno-medicines, knowledge on traditional medicines and its practices among the Mizo tribes of Mizoram, North East India. Documentation was done using Data sheet for Documentation and Assessment of Local Health Tradition (DALHT) that includes methods of administration, preparation, treatments and dosage etc. In the Mizo health care system it is observed that instead of single drug preparation the local people usually prefer 2 or more combined form of herbal formulations. In this present study 82 plant species are used for different formulations for different diseases like malaria, jaundice, colon ulcer, asthma, typhoid, epilepsy, tuberculosis, cardiovascular and urinary problems etc. A total of 82 plant species belonging to 49 families, 78 genera are used in 45 formulations.

Keywords: Disease; Ethno-medicine; Formulations; Health care system; Epilepsy; Mizo.

Impacts of Human-Wildlife Conflict on Agriculture and Rural Livelihood in Khordha Division of Odisha

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Abstract

Human - Wildlife Conflict are a serious hindrance to both wildlife conservation and livelihood security of people which causes harm to humans, wild animals and property (buildings, equipments, livestock, and crops fields). The main forces behind these conflicts are increased human population, technological expansion, global climate change and anthropogenic activities. Elephant movement in Odisha is reported in 28 out of 30 districts. Largely, they are destined in three elephant reserves comprising 13 districts. In eastern part of Odisha, particularly in Khordha division, elephants are abundant in dense *Shorea robusta* (Sal) forests. From 2004-2005, elephants are seen in Berbera, Patia, Dhani, Mala, Tangi, Barunei, Siko, Jariput and Banki regularly. The study on the conflict was conducted in Sankhajodi village and Jiripada village of Khordha Division in 2015 about the elephant movements and property loss. The reasons of conflict were decline in forest density, fragmentation of corridors, easy availability of food (like paddy, mango, jackfruit, sugarcane, vegetables etc), and bamboo plantations. The results were human injury, cattle injury, crop loss (mainly paddy, mango, jackfruit etc), and damage to bamboos and buildings. In 2015, the total loss was estimated to be Rs 59100 in Sankhajodi village and Rs 80000 from Jiripada village, out of which damage to sugarcane and paddy accounts to a significant loss of Rs 30000 and Rs 45000 in respective villages. Apart from elephants, Khordha is also affected by spotted deer, wild pig, jackal and gaur.

Keywords: wildlife, conflict, fragmentation, corridor, livelihood, conservation

Does Global Warming a blessing for Areca nut cultivators in Mizoram

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Abstract

The problems causes by global warming are multiple. It costs many lives and undue situation globally. Many scientists and scholars talk about the negative

impacts and work hard to mitigate increasing green house gases worldwide by predicting the uncertainty of future generations. However, the effects and responses of global warming might not be similar across the world, particularly the responses of the hilly state like Mizoram. This paper is an attempt to investigate how global warming is responsible for increasing areca nut production in the selected villages of Hortoki and Bilkhawthlir located in the north western part of the state. Literatures tell us that certain plant species have been migrated upward and towards north or south poles following favourable temperatures cause by global warming. Present study is also base on the assumption that during the last few years areca nut attains ideal climatic environment in certain pocket of Mizoram wherein before, the area was not warm enough to bear the nut or even if it bore a nut/fruit it cannot ripe properly. It is interesting to reveals that areca nut plantation becoming much more productive during the last couple of years compared with roughly the previous 20 years or more ago. This reality can be a blessing for areca nut planter in Mizoram.

Key words: Global warming, areca nut, production, ripen, market

Medicinal Plants Used by Tribal Population of South 24 Parganas, West Bengal, India-an Ethno Botanical Survey

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Abstract

Our country is commonly called the Botanical Garden of the world, owing to her wealth of herbal medicines. India with its great topographic and climatic diversity has a very rich and diverse flora and fauna. The uses of plants as medicines have been practiced from an ancient time. From around1500 B.C. Rig Veda is one of the important earliest available documents which emphasizes about herbal medicinal knowledge. Later on Indian herbalists such as Maharshi Charaka and Sushruta worked in search of different herbal plant parts for different aliments of human body. Later on, it is reported that traditional healers use near about 2500 plant species and 100 species of plants serve as regular sources of medicine. World Health Organization has state that 80% of the world's population depends on traditional medicine for its primary health care and has become indispensable for its survival 2. Since times immemorial, plants have been put to medicinal use by the traditional herbalists, Hakims, Vaidays, Ayurvedic practioners and the common man. Herbal medicine is the study and use of medicinal properties of plants therefore medicinal plants

constitute precious resources for mankind. During the past one century, there has been a rapid extension of allopathic medicinal treatment in India but still now the use of natural products as medicine, especially plant products are widely used among various tribal people. Particularly in the remote areas of West Bengal with few health facilities. The information relating to the medicinally useful species and their uses along with traditional knowledge and practices are very fragmentary 10-18. The present study is thus an attempt to document different plant species of South 24 Parganas district used by the local health healers to cure different ailments.

Keywords: Rig Veda, Traditional herbalists, Hakims, Vaidays, Ayurvedic.

Pharmacognostic and Physicochemical Profile of the Leaves of *Trevesia palmate*

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Abstract

The plant *Trevesia palmata* (Araliaceae) is traditionally used in the north eastern region to treat several ailments. The present study aims to investigate the pharmacognostic and physicochemical parameters of the leaves of *Trevesia palmata*. Fresh mature leaves of *Trevesia palmata* were collected from Venglai, Aizawl, Mizoram. After collection, the fresh leaves of the plants were washed and dried by spreading them for overnight. Dried leaves were ground into powder. Some of the fresh leaves were also used. An exhaustive Pharmacognostic studies was carried out by using standard methodology. The leaf has been reported as the major organ used alone or in combination with other plants for treatments of wide variety of ailments such as stomach pain, sore throat, ingestion, liver diseases and pains. In order to ensure the use of only genuine and uniform materials in preparation of herbal formulation, work on standardization was carried out. The morphology, anatomical, phytochemical, physico-chemical and quantitative of the plant have been studied. The leaf of *Trevesia palmata* shows the presence of Alkaloids, glycosides, Flavonoids, Saponins and Tannins.

Keywords: Pharmacognostic, Physicochemical, *Trevesia palmata*, Phytochemical, Alkaloids.

Sustainable Backyard Poultry Farming in Mizoram

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Abstract

Backyard Poultry farming is a traditional farming practice in Mizoram since time immemorial practiced by Mizo women. The present study was carried out to analyze the impact of backyard poultry production interventions amongst the women beneficiaries in hilly areas of Aizawl and Mamit districts of Mizoram, India. Total 200 women poultry rearers were selected from 10 villages. The study reveals that majority of the respondents were from middle age group, literate, housewives, possessed less than 1 hectare of land and belonged to low income category. It has been observed that the interventions through the project activities resulted in higher adoption of improved practices in housing, feeding, heath care and other practices in backyard poultry farming. There has been reduction of age at 1st laying of egg to 5.6 months from 7.5 months, increased in egg production from 72 nos. per bird per annum to 159 nos. per bird per annum, gaining of body weight of adult male and female birds and also increase of average egg weight after intervention in the project area.

Keywords: Backyard, Poultry, Management, Mizoram, women

Changes in Shifting Cultivation in Mizoram, India

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Abstract

Shifting cultivation (*jhum*) has been linked globally to a spiraling cycle of deforestation, environmental degradation and poverty. A frequently-repeated claim is that population growth has led to shorter fallow cycles as more land is brought under cultivation. This paper explores trends in shifting cultivation in Mizoram by comparing a 1996 data described by Daman Singh, with observations collected between 2013 - 2016 by researchers from Mizoram University and the University of

Minnesota. Team members interviewed hundreds of producers in Mizoram during this period. We observed that while shifting cultivation is still practiced, there has been widespread adoption of horticultural and agroforestry practices. Despite rapid population growth, farmers have adapted to changing circumstances. This trend has already occurred elsewhere in South and Southeast Asia, and across the Himalayas, where producers have abandoned shifting cultivation in favor of terraced and higher-value systems. This changes have implications for government policies and programs, economic development and food security. We argue that there are needs for applied research on these new farming systems, and for the development of locally-relevant extension support and curricula to support small-scale agricultural innovators and adopters.

Place of Flower Farming among Horticulture Crops, a Case Study on Howrah District

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Abstract

Howrah district is generally known for its industrialization because new emerges of industries and gradual decreasing dependency on primary sector are sign of this. And with the development of industrialization and commercialization different profitable horticulture crops have emerged. With the effect of National Horticulture Mission 2004-2005 these crops gets more commercial value. Here in Howrah the important profitable horticulture crop is flower and this flower farming has been playing an important role in district economy as well as rural livelihood. Major horticulture crops are concentrated in North western and south western part of Howrah district. Here this paper mainly focusing on the position of flower farming among the horticulture crops in Howrah district on the basis of production, area, growth, productivity and also basis of economic return. Methodologically this work is combination of both primary and secondary data. Secondary data has been collected from different organization, documents and primary survey also been done to understand the economic return. Different Cartographic and Statistical techniques have been use for analysing the data and visualise the findings.

Keywords: floriculture, horticulture, economic return, productivity

Role of Insect Pollinators for Enhancing Sweet Orange, *Citrus Sinensis* (L.) Osbeck Production

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Abstract

The role of insect pollinators on Sweet Orange, *Citrus sinensis* (L.) Osbeck production was studied on three cultivars i.e. Early Gold, Rhod-e-Red and Trovita in factorial randomized block design. Seven insect belonging to Hymenopterans (6) and Dipteran (1) were identified and collected from nectar and pollen of flower. Observations on number of flowers visited, time spent, initiation time, peak activity, cessation time, fruit set, fruit yield, fruit weight and number of seed were recorded. Additionally, TSS, dry matter and moisture content were also analyzed. The maximum abundance of different insects on different cultivars was observed at 10.01-12.00 noon while it was minimum at 02.01-04.00 PM. The highest number of flowers visited per minute was recorded in *Xylocopa tenuiscopa* (0.710) followed by *Apis cerana* (0.470) and *Apis florea* (04.10) while it was minimum in *Nomia* spp (01.30). The time spent (second per flower) was found highest in *Nomia* spp. (37.20) followed by stingless bee and *Apis cerana* (10.60) and lowest in *Xylocopa tenuiscop* (04.30). Initiation, peak activity and cessation time of different insects was recorded during 6.00-7.00 AM, 10.00-11.00 AM and 4.00-5.00 PM respectively. Significantly higher fruit set, fruit yield/kg, fruit weight (g/fruit), number of seeds, TSS and dry matter content was observed in open pollination than pollinator exclusion. Maximum moisture was observed in pollinator exclusion. Highest fruit set, fruit weight, number of seeds/fruit, fruit yield/kg and dry matter percent were observed in early gold. The highest TSS and moisture content were recorded in Rhod-e-Red and Trovita respectively. No significant difference was observed in the interaction between modes of pollination and different cultivars.

Keywords: Sweet orange, insect, pollinators, *Citrus sinensis*, production.

Vulnerability Assessment due to Climatic Variability with Special Reference to Agriculture of Sagar Island, West Bengal

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Abstract

The present study attempts to assess vulnerability due to climate variability in Sagar Island, which is situated within the coastal saline agro-ecological zone of

West Bengal. Using biophysical and socio-economic parameters vulnerability indices have been computed by applying principal component analysis and equal weighted method. Integrating the results of both the methods spatially explicit vulnerable zones have been demarcated. Results reveal that, life subsistence agriculture in 11.8% of the geographical area (2829 hectare) of the Island along the western coast (side) falls under very high vulnerable zone (VHVZ: VI of 84-99%) to climate variability. Comparatively higher values of exposure (0.53 ± 0.26) and sensitivity (0.78 ± 0.14) sub-indices affirm that, the VHV zone is highly exposed to climate stressor with very low adaptive capacity (ADI= 0.24 ± 0.16) to combat vulnerability to climate variability. Hence, food security for a population of more than 22 thousands comprising about 3.7 thousand agrarian households is highly exposed to climate variability. Another 17% of area comprising 17.5% of population covering 20% of the villages in north-western and eastern parts of the Island also falls under high vulnerable (VI= 61%-77%) zone. Findings reveal large spatial heterogeneity in the degree of vulnerability across the Island, and thus, demands devising area-specific planning (adaptation and mitigation strategies) to address the climate variability impact at micro levels.

Keywords: Climate variability, Vulnerability assessment, Sagar Island, Agriculture

Sustainable Backyard Poultry Farming in Mizoram

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Abstract

Backyard Poultry farming is a traditional farming practice in Mizoram since time immemorial practiced by Mizo women. The present study was carried out to analyze the impact of backyard poultry production interventions amongst the women beneficiaries in hilly areas of Aizawl and Mamit districts of Mizoram, India. Total 200 women poultry rearers were selected from 10 villages. The study reveals that majority of the respondents were from middle age group, literate, housewives, possessed less than 1 hectare of land and belonged to low income category. It has been observed that the interventions through the project activities resulted in higher adoption of improved practices in housing, feeding, heath care and other practices in backyard poultry farming. There has been reduction of age at 1st laying of egg to 5.6 months from 7.5 months, increased in egg production from 72 nos. per bird per annum to 159 nos. per bird per annum, gaining of body weight of adult male and female birds and also increase of average egg weight after intervention in the project area.

Keywords: Backyard, Poultry, Management, Mizoram, women

3
Section
Biodiversity

Impact of *Melocanna baccifera* Leaf Litter as Mulching Material on Yield and Growth of French Bean (*Phaseolus vulgaris*)

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Abstract

A field experiment was conducted at the department of Forestry, Mizoram University, Tanhril to study the effect of *Melocanna baccifera* leaf litter as mulching potential on French bean. The experiments was conducted in randomized design leading to the establishment of 5 replicates of seven treatments viz. T0- control, T1-leaf unfertilized, T2-culmsheath unfertilized, T3-leaf + culm sheath unfertilized,T4-leaf+ fertilizer, T5-culmsheath + fertilizer, T6-leaf + culm sheath + fertilizer. A period of 4 months observation was conducted and data were collected from soil moisture, soil temperature, soil pH, soil organic carbon, available nitrogen, available phosphorus, and microbial biomass C, N, P and biomass of the plants. Observation for biomass and yield attributes included shoot length, collar diameter, leaf area, above ground biomass and yield starting from the first week after transplantations. The result reveals that bean plants subjected to mulching with T6- leaf + culm sheath + fertilizer treatment has the most significant effect on plant collar diameter, leaf area and plant height, root:shoot ratio, dry mass production and yields compared to other treatments. Mulching enhances soil properties such as soil moisture, spoil pH and soil temperature available N, SOC and total N.

Keywords: Melocanna baccifera, mulch, French bean, growth, yield.

Decomposition Dynamics of *Flemingia semialata* Roxb. Leaf Litter and its Alloelopathic Potential on the Seedling Growth of *Zea mays* L

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Abstract

Litter decomposition dynamics of *Flemingia semialata*, a nitrogen fixing shrub was studied during 2016-2017 using standard litter bag technique. Meanwhile,

the alleopathic potential of leaf litter on the seedling growth was also evaluated on *Zea mays* in bio-assay. The rate of decomposition in *F. semialata* was a good fit to the exponential decay model of Olson (1963). The litter quality and climatic conditions of the study site (temperature and rainfall) influence the rate of decomposition. The allelopathic effect of leaf litter on the test crop shows a stimulatory effect with an increase in the concentration of leaf extracts. Study on the litter dynamics and its allelopathic effects are needed before the introduction of a species into different land use systems and most importantly agroforestry systems.

Keywords: Allelopathy, Decomposition rate, *Flemingia semialata*, Litter decomposition. physicochemical properties of ginger (*Zingiber officinale* Rosc.) and rubber (*Hevea brasiliensis)* intercropping, astudy was conducted at Kawnpui, Kolasib District.

Spatio-Temporal Changes in Pichavaram and Sundarban Mangrove Forest, a Comparative Analysis

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Abstract

The mangrove wetland forms a dynamic ecotone between land and sea. It is the dominant feature of the tropical ecosystem and influx of freshwater, salinity and sediments act as the regulator of the spatial extension of the forest. The Objectives of the study were to access the spatio- temporal changes and its impact on socio-economic conditions of both the area and to compare it. Data was extracted from toposheet, satellite map using the GIS and remote sensing technology and through various article and website. While extracting the satellite map it was taken care that map should be of same season of the year and the reason behind it is that influx of freshwater (monsoon rain) impact the spatial extension of the forest. The finding of the study is that, ecosystem of both the mangrove wetland is rich in biodiversity, locals depends directly and indirectly for livelihood. In recent decade spatial extension of the Sundarban mangrove forest is shrinking and on the other hand spatial extension of the Pichavaram mangrove forest is increasing in recent decade. The Sundarban Mangrove receives rainfall from South-west monsoon

during summer but on the other hand Pichavaram receive rainfall from South-west monsoon during winter.

Keywords: Spatio-temporal, Socio-economic, Monsoon, Ecosystem, local inhabitants

Afforestation; a Tool to Control the Soil Erosion

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Abstract

The Forest and Tree cover in India has over the years stabilized at around 23 % of geographical area, whereas the National Forest Policy, 1988 lays down the national goal of 33% of forest and tree cover for ensuring ecological security and environmental balance. Since 1990 there has been impressive growth of Indian economy leading to significantly increased demand for timber and other forest produce. As the area under natural forest is difficult to increase, the extension of forestry in non forest areas especially as agro-forestry, farm forestry and wastelands has tremendous potential to increase production of timber and other wood products and reduce the pressure on natural forests. In the recent arena of global warming and climate change, the severe uncertainty in the rainfall occurs in several regions of the country as well as in the world. Global soil cover is a most valuable natural source of wealth of any nation. The deforestation has caused total denudation of previously flourishing landscapes. In this regard, several studies related to vegetation and soils are conducted in different parts of world. The effects of trees on soil physical properties also differ with the age of plantation. It was also observed that effects of Afforestation on soil properties like pore volume and bulk density as function of age of plantations. Some tree species increases the pH and EC of degraded waste lands and also improve the water retention capacity. As the depth of soil increased, the pH changed from acidic to neutral in deep layers as well as soil organic carbon is more than deep layers of Eucalyptus hybrid plantations. For the checking of erosion of riverbanks and sea costs, the tree plantation is must. The techniques should be developed for enhancing the tree cover by the various research institutes.

Keywords: Tree cover, Agroforestry, landscape, erosion, global warming.

Traditional Knowledge and Human Welfare, a Study on Ethno-Medicinal Dependency among Indigenous Forest Dependent Communities of Northern Bengal, India

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Abstract

Forest dependent communities throughout the globe and ages have been depending upon ethno-medicinal plants since times immemorial. The present study site is having several protected forests like Chilapatta reserve forest, Boxa tiger reserve, Jaldapara wild life sanctuary and the area is completely dominated by several indigenous communities. In this study we have documented the ethno medicinal plants used by these communities, their plants used, diseases cured, mode of preparation and application procedure and their utility. The paper has also focused on use value and conservation status of these documented plants. The study was conducted using purposive and random sampling procedure. Three hundred respondents from the study area were interviewed including both the genders and mostly elder age class. A total number of 140 ethno-medicinal plant species represented by 116 genera and 65 families were recorded. Of these ethno-botanically used species, trees dominated the list with 55 species followed by herbs with 39 species and shrubs with 30 species. Maximum number of ethnobotanical plant species of 90 was used by Oraons followed by Mech with 54 species, 44 species by Ravas and least by Biharis with three species. The reported species were used for treating 58 human diseases and eight of domestic animals. Stomach related problems were documented to be treated by maximum number of plants (40 species) followed by cuts and wounds with 27 plant species and least with one species each for 17 diseases or ailments. A total of 140 plant species represented by 116 genera and 65 families were documented which were used by the community of forest fringe villages for medicine, food and other day-to-day purposes. *Centella asiatica* and *Rauvolfia serpentine* were the most valuable species in term of its maximal use with higher use value. The communities should be encouraged with improved cultivation techniques of commercially viable ethnobotanical species through capacity building, timely policy intervention along with strong market linkage. The study also concludes that data base of medicinal plants and their use for treating various diseases shall be available and accessible to the depending communities in the social media and other printed documents.

Keywords: Indigenous, disease, conservation, trees

Biodiversity in India: The Web of Life

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Abstract

Biological diversity is an Index of nation's wealth. It is the basis of human survival and economic wellbeing. The world "Biodiversity" was coined by Walter Rosen (1986), in the National Forum at Smithsonian Institute, Washington. These appeared a series of research Journals entitled "Biodiversity", Tropical Biodiversity, Biodiversity letters, Global Biodiversity etc.

Human existence on this global is because of biological resources. The world biodiversity refers to the variety of living organisms (Flora an Fauna) on earth, which includes the diversity of genetic materials within species, the variety of species, an array of communities, ecosystems and landscape within which species evolve and co-exist. Jutro (1993), recorded around 14 definitions. The definition as per IUCN and UNEP is – The Totality of genes, species and ecosystem in region, de Castri (1996), defined it as "the ensemble and interaction of genes, species and ecological diversity at given place and time. Biological diversity is the variety and variability among living organisms and the ecological complexes in which they occur. It can also be defined as "the diversity of life". Which includes the full range of variety and variability within and among living organisms and the ecological complexes, in which they occur and encompasses ecosystem or community diversity, species diversity and genetic diversity. The expression of biodiversity or species richness is an index of vegetation process success, its stability, composition and adaptation. The stability of microbes, insects, animals and human being comprises the essential target of biodiversity studies. The biodiversity resources enrich the material wealth and also the intellectual property of the country.The International Union for Conservation of Nature and Natural Resources (IUCN) has published the IUCN red list of threatened species. The IUCN Red list is a catalogue of taxa that are facing the risk of extinction. It aims to impart informational about the urgency and scale of conservation problems to the public and policy makers. Several global conventions were organized at Stockholm, Rio-De Janerio, Uruguay, Slavokani, Kyoto etc. for the management of biodiversity crises in developing countries and steps for conservation and enriching same. The present paper aims to discuss pertinently on importance, value of biodiversity consumption and productive use, threats to biodiversity and conservation of biodiversity.

Keywords: Biodiversity, ICUN, Global Conservation, UNEP, Genetic Diversity

Community Based Ecotourism as a Means of Resource Management-An Assessment in Nameri National Park of Assam

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Abstract

Community-Based Ecotourism (CBET) has been gaining impetus as an emerging concept. It is being debated upon as important tool for economic upliftment of communities that have something to offer to fill a tourist's desire for uniqueness. Ecotourism have always been deemed as important resources for livelihood among the community reside nearby protected areas. Here an attempt has been made to evaluate the ecotourism initiatives that have been introduce by Assam (Bhorelli) Angling and Conservation Association (ABACA), an organization started ecotourism ventures in the year 1956 benefiting local populace in terms of income, improved infrastructure, employment opportunities and exposure. The community's capacity to facilitate resource related conflicts has improved following support from development institutions and facilities provided by the organization. An expanding livelihood base is reducing local vulnerability of resources and man-animal conflicts.This paper tries to emphasize on the community based ecotourism initiatives and its impact of on livelihood in the fringe of Nameri National Park in Assam. Through the paper the researcher emphasizes such possibilities on the basis of assessment of potential ecotourism resources of the Park as a means of natural resource management during field experience gained different parts of the study area.

Keywords: CBET, Nameri National Park, Tourist resources, Local community, Ecotourism, Livelihood.

Effects of the Invasive Shrub, *Chromolaena odorata*, on Soil Properties in the Atharamura Forest Ecosystem, Tripura, a Confluence Point of Indo-Burma Biodiversity Hotspot

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Abstract

Invasion of alien species are modifying attributes of soil to facilitate further invasion of other invasive species, which is one of the major threats to biodiversity and

ecosystem stability. *Chromolaena odorata* is one of the most important invader species in Indian subcontinent. It reduces understory vegetation heterogeneity in tropical forests. In this comparative investigation, we assessed the soils properties (soil physiochemical and microbial) of *C. Odorata* invaded forest and in adjacent natural forest in the three topographic strata of Atharamura hill range of Tripura. Soil samples were collected from the top layer (0-15cm) of both invaded (*C. odorata*) and non-invaded forest of different topographic locations in the month of August. Our results showed, soils that were collected from *C. Odorata* invaded forest had a significantly reduced moisture content, WHC, soil porosity, texture, total C, N, K, Ca, Fe, Mg, and microbial population colony, compared to the soils in the adjacent natural sites; while, bulk density, pH, P and Cu is significantly higher in invaded ecosystem compare to the soil in three adjacent topographical natural sites in the forest range. ANOVA also shows the significant difference among the three invaded and non-invaded sites. These results indicate that successful alien invasive species could have profound effects on the physiochemical property and microbial community of the soil.

Keywords: Alien invasive species, Invasion ecology, habitat modification, soil physiochemical, soil microbial

Forest Certification, a tool to Achieve Sustainable Forest Management

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Abstract

Forest Certification is a voluntary, market based mechanism to promote sustainable forestry practices which promotes ethical consumerism. It Provides guarantee that wood products have been harvested sustainably. Among various certification schemes operating globally American Tree and Farm System, Sustainable Forestry Iniatiative, Forest Stewardship Council (FSC) and Programme for Endorsement of Forest Certification (PEFC) are the prominent one. As on June, 2016 total area of 190 million hectares have been certified under FSC covering 81 countries. In India total of 7, 54,911 ha under the forest Management (FM) certification have been certified under FSC.The present study tries to evaluate various benefits and cost associated with forest certification. It also studies future of forest certification in India and various

challenges associated with implementation of Forest certification.As revealed by the management & staff, voluntary mechanism of forest certification ensures responsible management of forest and depots with all the amenities in place like safety measures, prohibition of deleterious chemicals, monitoring and evaluation, proper documentation and training of frontline staff. The benefits of certification are not realized immediately as they come up with a time lag, benefits will trickle down as awareness and sale of certified timber picks up in future.

Key words: Forest certification, Certification schemes, Sustainable forestry practices, Ethical consumerism, Sustainable forestry

Influence of altitudinal change on soil organic carbon of *Quercus leucotrichophora* A.Camus ex Bahadur forests in Dehradun district of Uttarakhand

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Abstract

The Himalayan forest vegetation ranges from tropical dry deciduous forests in the foot hills to timberline. Oak (*Quercus leucotichophora*) is a dominating species and an integral part of the rich Himalayan vegetation. It is an important source of fuel, fodder and other basic requirement of locals. Keeping importance of the species in view, this study was undertaken to understand the influence of altitude changes on soil organic carbon of oak forest in Dehradun district of Uttarakhand. Soil properties such as organic carbon, bulk density, organic matter and soil organic carbon pool were assessed at three different altitude i.e. A1(1300m asl), A2(1750m asl) and A3(2100m asl). Study shows that there is a direct relation between soil properties and altitudinal range. It was recorded that bulk density shows an inverse relation with altitudinal range and depth i.e. with increase in altitude and depth, bulk density tends to decrease. On the other side it was observed that organic carbon percent, organic matter and soil organic carbon pool all increase with increase in altitudinal range. Highest soil organic carbon stock was recorded at A3 (31.84 t/ha) while lowest was at A1(15.52 t/ha). Range of organic carbon percent varied from highest altitude A3(3.95) to lowest altitude A1(2.72). This study has shown that altitude is an important factor in regulating carbon sequestration potential.

Keywords: Altitude, Bulk Density, Himalayas, Soil organic carbon pool, Vegetation.

Assesment of Soil Fertility under Sal (*Shorea robusta*) and Chir Pine (*Pinus roxburghii*) Forests of Mussoorie and Lansdowne Forest Division of Uttrakhand

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Abstract

Soil is one of the basic natural resources on which all forms of terrestrial life co-exist. In the present study the soils of two forests representing the species, Sal (*Shorea robusta* Gaertn) and Chirpine (*Pinus roxburghii* Sargent) were studied for soil quality and health of the forests. Sal (*Shorea robusta* Gaertn. f.) is an angiospermic dicot perennial tree species of the family dipterocarpaceae whereas Chirpine *(Pinus roxburghii)* is the most common genus of the family Pinaceae, which in turn is the largest family within the coniferales. The objective of the present study was to documented for the chemical characteristics i.e. pH, O.C. and Available N, P, K of soils of two dominant species *Shorea robusta* and *Pinus roxburghii* which is totally different in nature of occurrence and dissimilar forest. The Study was conducted in Ghumkhal and Bajawala areas of Lansdowne and Mussoorie Forest Division of Uttarkhand. Samples were taken at 0-15cm. or 15-30cm depth with three replications of each site. The results obtained showed that the *Shorea robusta* forest had relatively good soil characteristics as compared to the *Pinus roxburghii* forest. The soil pH under *Shorea robusta* forest was 6.11, whereas it was almost slightly acidic in *Pinus roxburghii* forest of average pH is 5.77. Average available nitrogen, phosphorus and potassium content was quite higher in *Shorea robusta* forest as compared to *Pinus roxburghii* forest. Thus from this study, the proper management of the forests will improve the quality of soils and the good forest.

Keywords: pH, Vegetation, Soil Fertility, Organic Carbon, Primary nutrients.

Consensus on Equations of Ecological Sensitivity across India

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Abstract

The paper simultaneously stems from and illustrates India's diversity – a diversity that relays to natural resources before transcending to anthropological socio-cultural diversifications. In this day and age when there should be discussions on the level of "overexploitation" of natural resources, my experiences in academic

circles across the country befuddles me with the "political correctness" element of ecological preservation. After elaborating on this issue, the paper proposes that before exchanging views on the use and management of natural resources, there is a need for awareness on the very discrepancy of natural resources available across the country (particularly flora). Such is achieved after contemplation of spatial and temporal variations (with emphasis on indigenous culture) – where culling flora is not only intrinsic but also necessary (addressing issues of survival). Finally, the paper will discuss the possible complications that could arise out of a single overarching policy resultant of assumptions, and provide alternate suggestions.

Keywords: Consensus, Ecological Sensitivity, Flora, Policy-making, India.

Forest Cover Change and its Implications on Human Elephant Conflict in the Forest fringes of Dhansiri and Doldoli Reserve Forest, Karbi Anglong, Assam

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Abstract

Human elephant conflicts are a serious threat to conservation and livelihood of people in the forest fringe areas and are becoming more prevalent as human population increases, expansion of human settlements and the consequent destruction of habitat and other human and environmental factors put people and wildlife in greater direct competition for a shrinking resource base. Dhansiri reserve forest the largest reserve forest out of the 14 reserve forest of Karbi anglong covering an area of 770.08 sqkm is rich in elephants; this reserve forest covers the Intaki National park of Nagaland which is both rich in birds and animals. It also borders the Doldoli reserve forest 123.32 sqkm; Barlangpher district RF and Tamulbari RF. Conflict between elephant and people is a major conservation problem throughout this region. With the decrease in forest cover due to ever-increasing human population and encroachment, the conflict is becoming more serious daily. Raiding of crops by wild elephants is a familiar phenomenon all over the area. Elephant depredation in human settlements is another cause for conflict in this region.Therefore, this paper highlights the changes in forest cover in the reserve forest and role of fringe population in the forest quality and quantity through time and mapping of human-elephant conflict zones through GIS and remote sensing.

Keywords: Forest fringe, Human-elephant, Conflict, Reserve forest, GIS

A Comparative Study of Gestural Communication on Three Species of Macaques (Assamese macaque, Rhesus macaque and Pigtailed macaque) in Mizoram

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Abstract

Communication by facial expressions and body postures play an important role in the social context of macaques. Macaques use gestures to mediate both competitive and cooperative interactions within their group. Comparison of communication patterns across different animal species can provide evidence of the adaptive significance of signals and their phylogenetic history. Variation in social organization between rhesus, assamese and pigtailed macaques should be accompanied by differences in social communication. Previous studies investigating the use of nonvocal signals in each of these three species and comparing the size of their gestural repertoire suggested that this is indeed the case. The present study expands the previous comparative investigation of gestural communication on these three species by investigating the frequency of occurrence of nonvocal signals and their use in relation to possible adaptive significance. A comparative study of gestural communication was carried out in three species of macaques, namely, assamese macaque (*Macaca assamensis*), rhesus macaque (*Macaca mulatta*) and northern pigtailed macaque (*Macaca leonina*). The study was conducted at Aizawl Zoological Park where each group of species was housed in an open enclosure of 840m^2. The group of Assamese macaque, rhesus macaque and pigtailed macaque consists of 14 individuals, 16 individuals and 9 individuals respectively. Observations were recorded by the Focal Sampling and sampling all occurrence method (Altmann, 1974) for all activities associated with gestural signals. To determine the variation levels of gestural signals for different activities among three species of macaques, Kruskal-Wallis test was employed (SPSS ver. 16.0). The significant differing levels of gestural signals as indicated by Kruskal-Wallis test were subjected to pairwise comparison between species by Wilcoxon Mann-Whitney test. The type of gestural communication observed on assamese macaque includes lip-smack, bared-teeth, eyebrows, touch face, touch genitals, present, mock bite and embrace. The type of gestures observed on rhesus macaque includes lip-smack, pucker, teeth chatter, bared-teeth, present and mock bite. The study group of pigtailed macaque showed gestures such as lip-smack, pucker, teeth chatter, bared-teeth, eyebrows, present and mock bite. The observation on the three group of macaques showed no significant variation in the number of

lip smack (χ^2=1.837; p>0.05), bared-teeth (χ^2=2.762; p>0.05), present (χ^2=1.441; p>0.05) and mock bite (χ^2=0.262; p>0.05). Significant variation was shown by the species in eyebrows (χ^2=13.464; p<0.05), embrace (χ^2=8.120, p<0.05), pucker (χ^2=20.273; p<0.05) and teeth chatter (χ^2=8.12; p<0.05). Touch face and touch genitals were observed only in assamese macaques.

Keywords: gestures, focal sampling, lip-smack, present, embrace

Comparative Study of Physico-Chemical Properties of Soil Under Three Different Bamboo Stands

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Abstract

Bamboo forests cover a large extent in Mizoram. Around 57% of the geographical area of Mizoram is under bamboo cover found at heights ranging from 500 m-1500 m. There are 35 species of bamboo known to be found in Mizoram. *Melocanna baccifera* is distributed throughout the state and comprised of more than 98 percent of the growing stock of bamboo and the remaining 2 percent are different clump forming bamboo species. Therefore, the present study has been taken up to study the difference in the soil properties specially soil moisture content, soil pH, bulk density, total organic carbon and available phosphorus under *Melocanna baccifera, Dendrocalamus strictus* and *Bambusa balcooa* stands. During the study, it was found that soil moisture content was highest under *Melocanna baccifera* stand (35.81%) and the least in *Bambusa balcooa* stand(25.42%). Soil pH was found to be highest under *Melocanna baccifera* stand(4.8) and the least in *Dendrocalamus strictus* (4.4*)* and under *Dendrocalamus strictus* stand highest bulk density (1.12g/cm^3) was observed while *Melocanna baccifera* had the least (0.93 g/cm^3).Total organic carbon content was found to be the highest in *Bambusa balcooa* (3.27%) and least in *Dendrocalamus strictus* (3.03%). In the case of available phosphorus, the highest was observed in *Melocanna baccifera*(19.8%) and the least in *Bambusa balcooa*(17.37%*).* The results showed that growth of *Melocanna baccifera* stands can lead to more enhancements in soil fertility.

Keywords: bulk density, organic carbon, pH, phosphorus, soil moisture.

Impact Assessment of Forest Cover Changes of Havelock Islands in Andaman's, a Study through Geospatial Technique

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Abstract

The changes in forest cover aggravate the land degradation. The forest cover changes observed in the study area has a negative impact on both the environment and socio-economic settings. Susceptibility to forest degradation is understood that the forest resources can be influenced or degraded by human activities. In reality, forest resources are degraded not only by human activities but also due to other natural factors too. However, in this area human activities were taken in to consideration, because the unplanned actions such as illegal logging, exploitation of forest resources for fuel wood and charcoal production as well as expansion of agricultural lands are the main factors that cause forest degradation and land use change. In this study, forest area was estimated and its changes from 1979 to 2016 were estimated using remote sensing and GIS. It is identified that forest area has dramatically decreased and converted into settlement and agricultural land (forest area decreased 576 ha & settlement with agriculture land increased 607 ha.). So geospatial techniques are used to finding the transformation of forest land to human settlement and agricultural land.
Keyword: degradation; Susceptibility; charcoal; geospatial.

Ithai Barrage, It's Negative Impact on the Socio-Economic Life of the People Living in the Neighbouring Areas

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Abstract

The Ithai Barrage was constructed on the Imphal River under the Loktak Hydro-Power Project in the year of 1983 in the state of Manipur. The height of the barrage is 11 m. and has a length of 59 m respectively. It was installed with the objectives of a multipurpose project. The main purpose of the project comprises power generation of total 105 MW and especially 35 Megawatt from the Ithai Barrage

to fulfill the power demand of Manipur, Assam, Meghalaya, Nagaland, Arunachal Pradesh, Mizoram and Tripura. Another basic purpose of the project is to elevate the irrigation up to an area of 23,000 hectares (57000 acres) in the Manipur Valley. But, now the problems arise in the region is that the Majority of the area neighboring to the barrage gets filled in water if rain heavily pours down incessantly. The problems become more intensified during the monsoon season and it happens to a situation of flood in the catchment region. The basic objective kept in the present study is that how the construction of the Ithai Barrage negatively impacts upon the socio-economic life of the people living in the vicinity and also how it affects the livelihoods of them. Therefore an attempt has been made in the present study to explore the impacts of the Ithai Barrage on the socio-economic lives of the people inhabiting the area around the barrage.

Keywords: Ithai Barrage, Multipurpose**,** Lift Irrigation, Loktak Lake, Flood

Rational Resource Management and the Role of Traditional Knowledge among the Santhal and the Bhumij Tribes of Binpur II Block, Paschim, Medinipur, West Bengal

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Abstract

This research work tries to examine the man-environment relationship as evolved through practice of traditional knowledge over space. Rational utilization of natural resources specially land, water and forest, their management and conservation techniques adopted by the Santhal and the Bhumij communities of Binpur II block, Paschim Medinipur district, West Bengal are identified through empirical survey. The study attempts to explore the faces of modification of hostile physical environment to productive cultural environment with the application of traditional knowledge. Ethno-methodological techniques have been adopted for showing biographies of land use/land cover, resource harvesting, sacred sites, toponym of land categories, folk songs, folk stories and information related to resource conservation etc. Ecological transects were carried out to take actual information of landuse practice and management techniques adopted to conserve natural resources. ArcGis 10.1 is used to prepare land cover map with the help of field information and Digital Elevation Models (DEM). Erdas Imagine 13 and TCX converter are used. Normalized Difference Water Index (NDWI) map has been prepared with help of Landsat TM. All these scientific tools are used for scientific analysis of the land in the study area. The result is compared

with the existing land use practices as guided by traditional techniques. Community mapping were done using spatial information technologies and indigenous tenure systems. Moreover an inventory of traditional conservation methods is made which are imbedded in their life practices to use, manage and conserve natural resource base.

Keywords: Natural resource, Santhal and Bhumij, Inventory, Traditional knowledge (TK), Resource conservation

Landuse/Landcover Changes of Jiadhal River Basin, Assam

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Abstract

Landuse/landcover change was quantified for the year, 1990, 2000, 2010 and 2016 using Landsat imagery ETM+, TM. Rapid and timely monitoring and predicting of LULC changes are important and significant. Currently Geographic information System (GIS) is one of the important tools for detecting LULC change. The study was carried out in the Jiadhal River Basin, Assam. The river originates from West Siang district of Arunachal Pradesh and flows to plain of Assam in braided pattern carrying huge sediment load and high flood weaves in the monsoon season which is the major problem in the study area. Human intervention in the upstream is adversely impacting the downstream of the river which are responsible for the geo-environmental changes of the study area. Downstream is highly populated and source of living in and around the river basin is mainly agriculture which is resulting to extensive landcover changes. It is found out that maximum land has converted to river sand, built-up area and agricultural land in the last 30 years.

Keywords: Landuse/landcover, Change Matrix, Environment, Jiadhal River Basin.

Spatio-Temporal Changes in Pichavaram and Sundarban Mangrove Forest: A Comparative Analysis

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Abstract

The mangrove wetland forms a dynamic ecotone between land and sea. It is the dominant feature of the tropical ecosystem and influx of freshwater, salinity and

sediments act as the regulator of the spatial extension of the forest. The Objectives of the study were to access the spatio- temporal changes and its impact on socio-economic conditions of both the area and to compare it. Data was extracted from toposheet, satellite map using the GIS and remote sensing technology and through various article and website. While extracting the satellite map it was taken care that map should be of same season of the year and the reason behind it is that influx of freshwater (monsoon rain) impact the spatial extension of the forest. The finding of the study is that, ecosystem of both the mangrove wetland is rich in biodiversity, locals depends directly and indirectly for livelihood. In recent decade spatial extension of the Sundarban mangrove forest is shrinking and on the other hand spatial extension of the Pichavaram mangrove forest is increasing in recent decade. The Sundarban Mangrove receives rainfall from South-west monsoon during summer but on the other hand Pichavaram receive rainfall from South-west monsoon during winter.

Keywords: Spatio-temporal, Socio-economic, Monsoon, Ecosystem, local inhabitants

Afforestation; a Tool to Control the Soil erosion

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Abstract

The Forest and Tree cover in India has over the years stabilized at around 23 % of geographical area, whereas the National Forest Policy, 1988 lays down the national goal of 33% of forest and tree cover for ensuring ecological security and environmental balance. Since 1990 there has been impressive growth of Indian economy leading to significantly increased demand for timber and other forest produce. As the area under natural forest is difficult to increase, the extension of forestry in non forest areas especially as agro-forestry, farm forestry and wastelands has tremendous potential to increase production of timber and other wood products and reduce the pressure on natural forests. In the recent arena of global warming and climate change, the severe uncertainty in the rainfall occurs in several regions of the country as well as in the world. Global soil cover is a most valuable natural source of wealth of any nation. The deforestation has caused total denudation of previously flourishing landscapes. In this regard, several studies related to vegetation and soils are conducted in different parts of world. The effects

of trees on soil physical properties also differ with the age of plantation. It was also observed that effects of Afforestation on soil properties like pore volume and bulk density as function of age of plantations. Some tree species increases the pH and EC of degraded waste lands and also improve the water retention capacity. As the depth of soil increased, the pH changed from acidic to neutral in deep layers as well as soil organic carbon is more than deep layers of Eucalyptus hybrid plantations. For the checking of erosion of riverbanks and sea costs, the tree plantation is must. The techniques should be developed for enhancing the tree cover by the various research institutes.

Keywords: Tree cover, Agroforestry, landscape, erosion, global warming.

Impact of Changing Land use Pattern on the Ecology of the Ganga River

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Abstract

During the last few decades, the Ganges basin experienced large changes in the land-use pattern with increases in built-up areas and extension of agricultural lands followed by a large decline in forest cover and water bodies. Effects of these modifications are invariably reflected in the water quality of the Ganga River. For the Ganges basin, information on a holistic view of these issues are very scarce despite recent researches highlighting their significance. The present study was an attempt to explore, along a 518 km middle stretch of the Ganga River between Kanpur upstream and Varanasi downstream (26°30′ N; 80°19′ E and 25°19′ N; 83°01′ E), the effect of land use modifications on water quality and ecological attributes of the river. The study stretch was divided into eight stations with three sub-stations in each for detailed sampling and analysis. The effects of land use differences were well reflected in surface runoff chemistry. Surface runoff emerging from agricultural sub-catchment showed highest concentration of nutrients while the concentration of dissolved organic carbon (DOC) was higher for woodland sites. The magnitude of such inputs varied depending upon the area under cultivation and the amount of fertilizers used. The concentrations of nutrients and DOC in urban runoff were comparable to those emerging from agricultural lands possibly because of higher input of these

in the form of atmospheric deposition. Concentrations of DOC and nutrients in river water showed positive correlation ($p<0.001$) with nutrients in runoff. The effects of these inputs, although variable, were observed in terms of increased chlorophyll **a** biomass and gross primary productivity in the river. The study has relevance in designing action plan for management of water resources in general and for the Ganga River in particular.

Keywords: Atmospheric deposition, DOC, Ganga River, Land use, Nutrients, Runoff, Water resources

Degradation of Sundarban Forest vis-à-vis Vulnerability of coastal livelihood, a Geoinformatics Approach

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Abstract

This study assessed the status of coastal communities living in a fringe of Indian Sundarban mangroves forest, upon which community depends for subsistence and livelihoods. In spite of the world's largest contiguous mangrove swamp and world heritage site, Sundarban faces several challenges both due to the present climate change as well as huge population pressure. We used in-depth interviewing and a household questionnaire to investigate present livelihood threats of Gosaba block. Gradual increasing salinity in the water and soil has severely threatened the health of mangrove forests and the quality of soil and agricultural crops. The study also identified 4 broad group occupants viz., (i) Resource dependent, (ii) Wage earner, (iii) Self resilient, and (iv) Government servant. Resource dependent shared 63.9% among others. A Relative Occupational Priority Index (ROPI) was developed, assessing the degree of strength among primary occupations. Crab collection and fishing scored 60.97 numbers, followed by agricultural activities with 21.38 numbers. The venture of coastal people for resources collection into forest ecosystem as part of livelihood encountered very often wildlife conflict. To address these problems through mapping, geospatial techniques have been applied and an appropriate management plan has been suggested for sustainable growth of the region.

Keyword: Sundarban, relative occupational priority index, people's livelihood, salinity, geospatial techniques

Conservation and Sustainable Use of Biological Diversity by the Instrumentality of Biological Diversity Act, 2002 with Special Reference to North East India

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Abstract

Biological diversity is the variability among living organisms from all sources and the ecological complexes of which they are part and includes diversity within species or between species and ecosystems. Conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of the use of biological resources are the upmost important goals for survival of present and future generations. Law is an effective instrument to bring these goals. The Biological Diversity Act, 2002 is enacted to achieve these goals. Moreover, India is a party to the UN Convention on Biological Diversity, 1992. In order to achieve these goals, the National Biodiversity Authority, State Biodiversity Board and Biodiversity Management Committee are established at National, regional and local levels. Apart from this Central Government of India is also duty bound to discharge certain specific functions under the scheme of the Act. Exemplary penalties are also provided for contravention of the provisions of the Act to bring. In this aspect, the paper will peruse the effectiveness and *modulus operandi* of this legislation in conserving, sustainability and equitable sharing of biological diversity in this fragile region of North East India in the light of judicial pronouncement, international standard and law of the land.

Keywords: Biological diversity, conservation of biological diversity, sustainable use, equitable sharing, biological resources, law, exemplary penalties.

Ecosystem services from homestead production system – A case in a deforested area of Bangladesh

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Abstract

Ecosystem services are the benefits that people receive from nature. In the recent years, a big decline in biodiversity is observed due to human activities, and

species are becoming extinct much faster than at any time in the past. Homestead is a diversified and complex production system that provides various services and functions. A study was designed to investigate the ecosystem services in a homestead of southeast region of Bangladesh where deforestation is a big concern. A total of 50 households covering three villages near the Teknaf reserved forest were surveyed from June to August 2016 using a well-structured interview schedule. The data revealed that household settlement has been started since 28 years ago with an average of 0.15 ha of homestead area. Among the tree species 66% were native. Tree density was high (776 trees/ha) in the homesteads due to dominance of betel nut tree, although the Shannon Index (0.67) indicates a low tree diversity. A large numbers of crop, tree, poultry and livestock are found in the homestead that supplies food, fodder, fuel etc. All the households use firewood for cooking, of which only 26% are supplied from homesteads. A well-designed homestead could accommodate more trees for various ecosystem services and functions and ultimately restore forest ecosystem and biodiversity.

Keywords*:* Homestead, tree diversity, deforestation, Teknaf forest, ecosystem services.

Forest Resources Traditional Medicines and Sustainable Livelihood of Trial Population of North East India

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Abstract

About 4 billion hectares, or about 31 percent of the world's land area, is covered with forest. The sustainable management of this forest estate is critical for three reasons. First, forests are home to, and sustenance for, hundreds of millions of people, including some of the world's poorest. Second, deforestation results in severe local and global\environmental damage. Third, controlled/sustainable commercial exploitation of forest products could contribute to economic growth. However, the intrinsic characteristics of forests make sustainable management a challenge. Deforestation and degradation continue without much compensating gain for economic development or poverty reduction. While afforestation and regrowth have added eight million hectares (mostly plantations) to the global forest estate, the loss of natural forests continues at an unsustainable rate. This loss, mainly due to the conversion of tropical forests to agricultural land, is intricately linked to commodity prices. There have been major changes in the ownership and management of forests. The scenario of forest in north east India is not much different from that of the

global scenario as mentioned above. The deforestation in the north east has added a question mark to the lives of many indigenous and poor people who have been using many forest products as food, shelter and health care. The descriptive and analytical method of study will be made in this present paper and data will be collected mainly from secondary sources.

Traditional Knowledge and Human Welfare, a Study on Ethno-Medicinal Dependency among Indigenous Forest Dependent Communities of Northern Bengal, India

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Abstract

Forest dependent communities throughout the globe and ages have been depending upon ethno-medicinal plants since times immemorial. The present study site is having several protected forests like Chilapatta reserve forest, Boxa tiger reserve, Jaldapara wild life sanctuary and the area is completely dominated by several indigenous communities. In this study we have documented the ethno medicinal plants used by these communities, their plants used, diseases cured, mode of preparation and application procedure and their utility. The paper has also focused on use value and conservation status of these documented plants. The study was conducted using purposive and random sampling procedure. Three hundred respondents from the study area were interviewed including both the genders and mostly elder age class. A total number of 140 ethno-medicinal plant species represented by 116 genera and 65 families were recorded. Of these ethno-botanically used species, trees dominated the list with 55 species followed by herbs with 39 species and shrubs with 30 species. Maximum number of ethnobotanical plant species of 90 was used by Oraons followed by Mech with 54 species, 44 species by Ravas and least by Biharis with three species. The reported species were used for treating 58 human diseases and eight of domestic animals. Stomach related problems were documented to be treated by maximum number of plants (40 species) followed by cuts and wounds with 27 plant species and least with one species each for 17 diseases or ailments. A total of 140 plant species represented by 116 genera and 65 families were documented which were used by the community of forest fringe villages for medicine, food and

other day-to-day purposes. *Centella asiatica* and *Rauvolfia serpentine* were the most valuable species in term of its maximal use with higher use value. The communities should be encouraged with improved cultivation techniques of commercially viable ethnobotanical species through capacity building, timely policy intervention along with strong market linkage. The study also concludes that data base of medicinal plants and their use for treating various diseases shall be available and accessible to the depending communities in the social media and other printed documents.

Keywords: Indigenous, disease, conservation, trees

Carbon stock potential of *Pinus roxburghii* forests in Garhwal Himalayan

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Abstract

Chir pine is a prominent forest cover in Uttarakhand Himalaya. Of 24,414.80 km^2 area under forests; it occupies 3,943.83 km^2 which is 16.15% of the state. The objective was to understand carbon storing potential of Chir pine in different altitudes of Garhwal Himalaya. Fourteen forest stands in four altitudes i.e., <1000m (Khola, Rudraprayag, Khairakhal), 1001-1400m Kandikhal, Mayali, Badiyargarh, Daddi) 1401-1800 (Pokhal, Agrora, Lansedown, Gumkhal) and >1801m (Ranichauri, Dandichilli, New Tehri) were selected. The method for estimation of carbon stock, three plots were selected in each site of a size (20 × 100=2000m^2) for trees (>30cm diameter), within this plot a sub-plots (5m × 40m=200m^2) was used for smaller trees (stem diameter 5-30cm) and within sub-plot, 6 smaller sub-plots of 0.5 m^2 size were laid for collecting litter.

The finding indicates that, tree density ranged from 135.00±5.00 to 575.00±90.14 ind. ha^{-1} in Daddi and New Tehri respectively. The highest aboveground carbon stock (96.00±8.36 t ha^{-1}) was in Kandikhal and the lowest in Gumkhal (26.68±9.48 t ha^{-1}). The belowground tree carbon was again reported highest in Kandikhal (28.58±4.81 t ha^{-1}) and the lowest in Gumkhal (9.19±2.87 t ha^{-1}). The litter production was found high in summer season followed by rainy and winter seasons.

Keywords: Tree carbon, Chir pine, Altitudes, Garhwal Himalaya

A study on the Diversity and Density of Soil Microarthropods in Relation to Soil Edaphic Factors in Acacia plantation

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Abstract

Microarthropods in soil play an important role in maintaining the soil fertility through the litter decomposition process. The main objective of this study was to investigate the diversity and density of soil microarthropods in relation to soil edaphic factors in *Acacia* plantation. Soil samples were collected at monthly intervals from the period of April, 2016 to December, 2016 by using a standard soil corer. The extraction of soil microarthropods was done by using the modified tullgren funnel apparatus. Shannon-Wiener diversity index (H') was employed to express the diversity index of soil microarthropod community. The collembolan population was found to be mostly dominated in the soil samples followed by oribatid mites. The peak population of total microarthropods was recorded in December, 2016 (5.30 ± 1.35 No./m^2 X 100^2) and least (0.96 ± 0.24 No./m^2 X 100^2) was reported in September, 2016. April month shows the higher diversity value (1.96) and minimum was in the month of December, 2016 (1.39). Linear regression analysis revealed that soil temperature ($r=-0.73$, $p<0.05$) showed negatively significant effect and soil pH ($r=0.74$, $p<0.05$) showed positive and significant influence on the soil inhabiting microarthropod population. This study suggests that the edaphic factors have a cumulative effect on the soil inhabiting microarthropods population.

Keywords: Microarthropods, Collembola, Oribatid, *Acacia*, Diversity

Floral Biodiversity in Buffer Zone of Dampa Tiger Reserve and Impact of Developmental Activities

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Abstract

Mizoram, A north eastern hilly state a part of Indo-burma biodiversity hot spot is a very rich and unique bio-geographic area. Dampa Tiger Reserve is

located in the western part of Mizoram, in the Mamit district. A plant biodiversity survey was conducted in the buffer zone of Dampa Tiger Reserve to assess the present status and possible impact of proposed developmental activities on floristic diversity. The buffer zone area of Dampa tiger reserve spreads from W. phaileng to marapara region of Mizoram covering about an area of 488Km^2. To achieve the desired sampling intensity about 30 quadrats of 400m^2 size were laid out for assessing floral biodiversity along the west of Marapara to W. Phaileng road as per the buffer zone map provided by forest department. A total of 203 species of plant species belonging to 160 genera and 73 families were documented from the study site. Out of this 96 tree species, 86 species of herbs, shrubs and climbers and 21 species of Bamboo, orchids and ferns were documented. As per Shannon-wiener index of diversity, the values H' = 3.457 and 5.373 was found for the tree species and others plants (herbs, shrubs, climbers) respectively. Since the area is fragmented already due to plantations of oil palm, orange dominated orchards and about 4 village settlements. Further, developmental activities like proposed power supply lines may affect the diversity of native and threatened species of flora present in the area. Henceforth, there is an urgent need for proper alternative conservation measures.

Keywords: Tiger Reserve, Biodiversity, Flora, Quadrat, Shannon-weiner index, Threatened species

Biodiversity; Utility, Threats, Conservation Hotspots and a Sustainable Model

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Abstract

Biodiversity is considered to be one of the most precious resource issues of 21st century. Present paper presents the multifaceted aspects related with biodiversity particularly in context of its enormous direct/indirect uses, threats and conservation issues. Biodiversity is an integral component of environment and intimately linked with economy as well as environment. It boosts the socio-economy and hence livelihood by providing direct benefit through food, fibres, timbers, medicines, dyes, emulsifiers, non-timber forest produce (NTFP) etc.and concomitantly has the potential to cope up with climate change and thus maintain a healthy environment by offering indirect benefits.

Further, biodiversity is inextricably linked with human health. Traditional knowledge of biodiversity reflected through ethno-medicinal plants, demonstrated to be linked with human health as well as socio-economy of tribal people. In current scenario, global biodiversity is declining at an alarming pace due to habitat fragmentation, invasions, pollution and climate change.Invasion is one of the most severe threats to biodiversity and adequately addressed in present paper. In view of its protective, productive and regulatory function we need to conserve the biodiversity and present paper attempts to discuss the issue with special focus on global biodiversity hotspots. Finally, present paper concludes by suggesting an eco-sustainable model based on agroforestry systems.

Keywords: Biodiversity hotspots; socio-economy; livelihood; invasion; climate change

Effects of the Invasive Shrub, *Chromolaena odorata*, on Soil Properties in the Atharamura Forest Ecosystem, Tripura, a Confluence Point of Indo-Burma Biodiversity Hotspot

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Abstract

Invasion by alien plants are capable to modifying attributes of soil to facilitate further invasion of other invasive species, which can be a major threat to biodiversity and ecosystem stability.

Chromolaena odorata is one of the most important invader species in the Indian subcontinent. It reduces understory vegetation heterogeneity in tropical forests. In this comparative study, we assessed the soils underneath *C. odorata* in order to determine different properties (soil physico-chemical and microbial) in comparison to the soils in adjacent natural forest in the three topographic strata of Atharamura hill range of Tripura. Soil samples were collected from the top soil (0-15cm) beneath the canopy of both invaded (*C. odorata*) and non-invaded of three different topographic locations in the month of August. Results found, soils that were collected from underneath *C. odorata* had a significantly lower moisture content, WHC, soil porosity, texture, total C, N, K, Ca, Fe, Mg, and microbial population colony, compared to the soils in the adjacent natural sites, while, bulk density, pH, P and Cu is significantly low in invaded ecosystem compare to the soil in three adjacent topographical natural sites in the forest range. ANOVA also shows the significant difference among the three

invaded and non-invaded sites. These results indicate that successful alien invasive species can have profound effects on the physiochemical property and microbial community of the soil.

Keywords: Alien invasive species, Invasion ecology, habitat modification, soil physiochemical, soil microbial

Conservation Status in Community Reserves of Mokokchung District, Nagaland

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Abstract

Community conserved areas (CCAs) play an important role in biodiversity and landscape conservation as well as meeting local objectives of sustainable livelihoods. Such mode of community conservation is a common feature in north eastern states of India like Nagaland, Meghalaya and Mizoram. A study was conducted in Mokokchung district of Nagaland to observe the factors causing depletion of biodiversity in these community reserves and conservation methods undertaken by the communities where village councils act as important forest management institutions to promote and protect the forest in the rural areas. Kanglatu biodiversity reserve and Tzula (Dikhu green zone project) in Mokokchung district (Nagaland) were started by the local community in order to preserve their forest. The data have been collected by field observation, discussion with the community members and forest department staff and from secondary sources such as booklets and reports, text and reference books regarding the community reserve. It was found that these community reserves have been successfully conserved and managed by the local community members with the help of forest department. Any kind of illegal collection and felling inside the reserved area are restricted with heavy fines. Community members in both the reserve areas are planning to promote ecotourism to increase their economy.

Keywords: Biodiversity, Community Reserve, Forest degradation, Sustainable livelihoods

Relation of Soil Bulk Density and Elevation with Some Soil Physico-Chemical Properties in Pare River Basin of Arunachal Pradesh

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Abstract

Bulk density of a soil varies with the soil structural conditions. Knowing the soil properties, one can carry out proper soil management to increase crop productivity. Characterization of spatial variability and relationship with elevation is essential for crop planning and management. The main objective of this study was to assess the relationship of the bulk density of soil with texture, porosity, pH, organic matter content and NPK. Here, soil sampling was carried out in a mountainous watershed and analyzed in the laboratory for 108 soil samples (1-30 cm). The mean and median values of the soil properties of the watershed vary little indicating symmetrical distribution of soil at the point of sampling. Soil porosity and void ratio were highly related with the soil bulk density with negative correlation. Sand and silt content of the area were negatively correlated with the elevation indicating higher content at the valley areas. Clay content was found generally higher at the higher elevation. Bulk density was found lower in higher elevation regions. Soil pH inversely varies with the soil bulk density and directly with elevation while soil organic carbon content varies inversely with the elevation.

Keywords: bulk density, elevation, organic matter content, pH, NPK.

Diversity, Structure and Carbon Stock Assessment of Floristic Component in Home Gardens of Terai Region of West Bengal, India

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Abstract

Addressing the global problem of reversing plant diversity and improving carbon stock requires multiple innovative ways like home garden. The need

is to study their structure and diversity which varies with type of owner and their place of occurrence. The present work was carried out at districts like Cooch Behar and Jalpaiguri in terai region of West Bengal. The floristic qualitative parameter and diversity indices of the home gardens were estimated. A total of 142 species belonging to 59 families and 123 genera were recorded. The documented flora consisted of 71 tree species, 62 herb species, 4 shrub species, three palms and two bamboo species. The highest species richness observed in a home garden was 42 and lowest was 12. The species diversity index or Menhinick's index of the home gardens was 1.41. Shannon and Wiener index that determine diversity was inversely proportional to concentration of dominance and the corresponding value is 3.29. A high index value is suggestive of more diverse and stable plant communities in the home gardens. The plant and total carbon stock varied in the home gardens and the range recorded was 18.78-84.38 and 45.05-142.48 Mg/ha, respectively. Home gardens of terai zone of West Bengal provide a high diversity of resources for subsistence of local households and significantly contribute to conservation of native biodiversity and have a great potential to store carbon for longer duration. The gardens should essentially be an ideal strategy for climate change and mitigation involving small land owners without any high cost involvement as the total carbon stock in the home gardens are found to be highly correlated with the socio-personal and socio-economic variables.

Keywords: Density, Index, Home garden, family, Index, management.

Edible plants of traditional (Meitei) homegardens in the Hailakandi District, Assam, India

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Abstract

The Meitei homegarden (*Ingkhol*) traditionally represent complex systems with diverse cultivated plant varieties maintained from generations after generation by the Meitei community. Through the use and cultivation approach they are conserving varieties of plants some of which are very uncommon in natural habitat. The present study was done with the objective of understanding and exploring the contribution of homegarden flora to household food supply. This study was conducted at a Meitei village Nimaichandpur (Hailakandi, Assam, India). Fifty homegardens were surveyed to acquire information on edible plants. Based on the information's provided by the villagers, plants were identified following standard literatures and herbariums. A total of 95 edible plants belonging to 74 genera and 47 families were recorded. 43 herbs 11 shrubs and 41 tree species. Family Fabaceae comprises the highest no. of

species (9) followed by Rutaceae (8) and Cucurbitaceae (6). Plant parts utilized as important sources of food included: edible fruits (48 species), leafy vegetable (15 species), roots and tubers (7 species), culinary herbs or spice (5 species). Food plants in Meitei homegardens contribute to their livelihoods needs and measures should be undertaken to preserve the traditional knowledge base of the Meitei community on plant utilization and management which may help in conserving the plant diversity.

Socio-Economic Analysis of Different Agroforestry Systems in Mizoram, India

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Abstract

Rural communities depend on a number of social, cultural and natural/ environmental resources to acquire their livelihoods. In Mizoram, rural livelihoods tend to be limited and often inadequate to meet the needs and requirement. This paper presents the socio-economic status of the rural livelihoods of Muallungthu and Tachhip, two small villages, 15km from the capital of Mizoram. Hence this study was carried out with a purpose to know the socioeconomic status of farmers practicing agroforestry. Using Data collected from both primary and secondary source, it is analyzed through Spss. The study focuses on the factors that affect the adoption of agroforestry, based on natural capital, physical capital, financial capital and human capital. Based on a thorough analysis of the socioeconomic dynamics, it can be concluded that the government and other policy makers need to recognize the felt and spelt needs of the farmers and make concerted efforts to respond to the needs expressed by the community in order to achieve sustainable livelihoods and rural development.

Keywords: socio-economic,sustainable livelihood, agroforestry.

Flowering and Regeneration of bamboo (*Dendrocalamus longispathus* Kurz.) and its impacts on soil in natural forests of Mizoram

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Abstract

Bamboo distributes throughout the sub-tropical forest of Mizoram. Out of about 25 indigenous bamboo species growing under natural forests in Mizoram 5

species have flowered during the past 10 years, these are *Melocanna baccifera* (Mautak), *Dendrocalamus hamiltonii* (Phulrua), *Schizostachyum dulloa* (Rawthla), *Dendrocalamus longispathus* Kurz (Rawnal) and *Bambusa mizorameana* (Talan). A study was carried out on the important ecological parameters such as seeds production, soil seed bank, seed viability, seed germination and seedling establishment of of *Dendrocalamus longispathus* Kurz. The impact of bamboo flowering on soil nutrients level such as pH, C, NPK variation, was also studied. The study can be used for theoretical modeling of bamboo regeneration after gregarious flowering which occurs after long intervals, as well as for resource management of *Dendrocalamus longispathus* Kurz. which is one of the most common and widely used bamboos in north-east India and Mizoram in particular.

Keyword: Bamboo flowering, *Dendrocalamus longispathus, regeneration, soil nutrients*

Biodiversity

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Abstract

The biodiversity is the variety and variability among living organisms and the ecological complexes in which they occur. Himalayan region has a great wealth of biodiversity in its forests, rangeland, wetland and marshy land. But today this is facing number of issues which is threatening human survival, environment, biodiversity.To identify the most valuable tree and shrub species for rural area. Distribution, phenology, regeneration and uses of these species. To study the various method of biodiversity conservation program. To make a statically data sheet for density, frequency and abundance of species. We worked under state forest department (Tehri range) and study about biodiversity. Identify the most valuable plant species and their distribution, phelogy, regeneration and uses. We also take a samle for density, frequency and abundance of species in study area. The most valuable tree species are Cedrus deodara, Rhododendron arboreum, Taxus bacccata, Alnus nepalensis, Pinus roxburghii, etc. Study different traditional and scientific biodiversity conservation methods.

Biodiversity Conservation through Education

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Abstract

Biodiversity, short for biological diversity, refers to the variety of different species of plants and animals living on Earth. It is essential to maintain rich diversity

for survival of mankind and to build a harmonious environment. According to the Global Environment Outlook 4, species extinction is occurring at 100 times the natural rate, and is expected to accelerate between 1000 and 10000 times the natural rate in coming decades. Thereby humans should start taking environmental issues seriously. There are many methods for biodiversity conservation, among which Education can be considered as one of the most suitable one for biodiversity conservation. Through education, critical thinking skills can be developed in peoples about biodiversity conservation and encourage them to be aware, act on their own to conserve biodiversity and make optimum use of them. Therefore this study is an attempt to explore how biodiversity can be conserved through education.

Keywords: Biodiversity, Conservation, Education.

Ecological Gap Analysis for Biodiversity Conservation in Indian Sundarban

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Abstract

Biodiversity in simple words, means the vast variety of plant and animal life including microorganisms existing in any region. Now an emphasis is being laid on the biodiversity conservation. The Sundarban is the world's largest remaining contiguous, biodiversity-rich mangrove ecosystem, recognized as a site of national and international importance for conservation of biodiversity. The threats to the Sundarban mangrove eco-system are arising partly due to biotic pressure from the surrounding environment and, partly due to human induced or natural changes in the upper catchments. Various effort has been made to maintain the ecological balance, conservation of biodiversity and sustainable utilization of the resources of the Sundarban. In present paper, an attempt is being made to identify the gaps in how much of critical biodiversity is protected and to assess the ecological healthiness of the protection under effective management.

Keywords: Sundarban, Biodiversity, Ecology, Gap Analysis

Environmental Literacy for Conservation of Earth Natural Resources; Life skill perspective

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Abstract

The earth planet is enriched with enormous natural resources. The earth physical resources are drastically altered or exploited by the human society in the name of development. The development achieved reducing the balance of nature is destined to gradually disturb the interactions among the geosphere atmosphere, biosphere, lithosphere, and hydrosphere and thereby posting a grave threat to the humanity on the whole. Since human activities are at time against the course of nature, major disasters occur quite often leaving major adverse impacts on the lives and natural resources. Disastrous disasters reduce the natural resources to a substantial level. The paper is aimed to discuss on conservation of earth natural resources and community resilience by a way of environmental literacy. The paper discusses on the global community plans and practices on saving mother earth and provides some suggestions for conservation of earth natural resources. The paper concludes that there is an urgent need for capacity building of school children and Government servants in making the community to commit towards the achievement of the Sustainable Development Goals (SDGs). Methodologically the study is a blending of literature survey and survey research technique.

Keywords: Sustainable Development Goals, Natural Disaster, Environmental Literacy, Community Resilience, Lithosphere

Challenges and Potentials in the Management of Biodiversity of A City, a Case of Gurgaon- Manesar Urban Complex (Gmuc)-2031

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Abstract

With the speedy increase in urban population, the world by year 2050 will have more than 70% of its population residing in urban settlements. This will require more land to accommodate this unprecedented growth and have serious

implications on fertile arable land, vegetal cover especially the woodland and grassland, traditional water bodies, quality of air and wildlife habitat. This will create imbalance and disorder in the existence of man in the nature which is quite visible in the loss of biodiversity especially in the urban settlements. Still, the fact remains that these adverse impacts could be minimized to a greater extent by addressing and integrating bio-geographic elements in the city and urban planning with a conscious focus on regional planning. This focus and integration has been analyzed in a case of Development Plan of Gurgaon-Manesar Urban Complex (GUMC) -2031 which would help imbibe and nurture symbiotic relationship between man and nature.

Keywords: Biodiversity, Bio-geographic, Symbiotic relationship, Urban planning, Smart cities.

Tree Diversity Pattern in a Sub-Humid Tropical Foothill Forest of Indian Eastern Himalayas

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Abstract

Diversity of tree species in tropical areas varies from place to place due to variation in climatic condition. A studywas thus conducted at Chilapatta Reserve Forest, West Bengal India to assess its tree diversity and also to document its floristic characteristics. Stratified random nested quadrate sampling was adopted for analyzing the quantitative characters. One hundred fifty eight tree species were recorded, of which twenty nine are yet to be identified. Identified species represented43 families and 91 genera. The tree diversity index, concentration of dominance, Shannon and Wiener indexand evenness index estimated was 2.07, 0.018, 4.70 and 1.43, respectively. Highest and lowest frequency recorded was 1.73 and 54.39 while relative frequency varied from 0.01to 5.15.Tree density ranged from 0.44 to 172.81 individuals ha^{-1} and relative density ranged from 0.005 to 1.96 %.Most of the species were widely distributedand its abundance ranged from 1.00 to 17.83 while relative abundance ranged from 0.12 to 1.89. %. IVI ranged between 0.13 and 8.74. The tree stratum was clearly distinguished in to three layers according to the size of the trees i.e. the height they attained (tall, medium and low heights). The forest can be classified as dense forest having more or less continuous tree canopy with more than 80 % interception of incident PAR. Higher IVI value indicates ecological significance of the tree species in the forest. The rarer tree species with poor representation need

proper attention to determine their conservation status and key functions. Mapping concentration areas of these species and further study on their key ecological and cultural functions would help identify locations for conservation actions and determine which wildlife species may depend on them in the forest. Forest manager can use such information on rare and common species like to help manage wildlife habitat as well as provide cultural resources values of these species. The tree density, dominance and diversity will indicateits changes and susceptibility to anthropogenic stressors among various vegetation categories and their formation.

Keywords: Chilapatta Reserve Forest; tree; Diversity; Eastern Himalaya

Comparative Study of Physico-chemical Properties of Soil under Three Different Bamboo Stands

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Abstract

Bamboo forests cover a large extent in Mizoram. Around 57% of the geographical area of Mizoram is under bamboo cover found at heights ranging from 500 m-1500 m. There are 35 species of bamboo known to be found in Mizoram. *Melocanna baccifera* is distributed throughout the state and comprised of more than 98 percent of the growing stock of bamboo and the remaining 2 percent are different clump forming bamboo species. Therefore, the present study has been taken up to study the difference in the soil properties specially soil moisture content, soil pH, bulk density, total organic carbon and available phosphorus under *Melocanna baccifera, Dendrocalamus strictus* and *Bambusa balcooa* stands. During the study, it was found that soil moisture content was highest under *Melocanna baccifera* stand (35.81%) and the least in *Bambusa balcooa* stand(25.42%). Soil pH was found to be highest under *Melocanna baccifera* stand(4.8) and the least in *Dendrocalamus strictus* (4.4*)* and under *Dendrocalamus strictus* stand highest bulk density(1.12g/cm^3) was observed while *Melocanna baccifera* had the least (0.93 g/cm^3).Total organic carbon content was found to be the highest in *Bambusa balcooa* (3.27%) and least in *Dendrocalamus strictus* (3.03%). In the case of available phosphorus, the highest was observed in *Melocanna baccifera*(19.8%) and the least in *Bambusa balcooa*(17.37%*).* The results showed that growth of *Melocanna baccifera* stands can lead to more enhancements in soil fertility.

Keywords: bulk density, organic carbon, pH, phosphorus, soil moisture.

Biodiversity in Sundarban Ecosystem, Its Dwindling Trend and Recommended Suitable Sustainable Measures

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Abstract

The sunderbans is the world's largest mamgrove forest and a unique ecosystem .It is home to an estimated 425 species of wildlife,including 300 species of birds and 42 species of mammals, including the bengal tiger.the forest is also a reproductive ground for numerous fish species and acts as a buffer to protect the coastline against cyclones,rising sea tides and other hazardous natural events.

The Indian Sundarbans mangrove forest in the estuarine phase of the River Ganges covers an area of 9630 km2, out of which 4264 km2 is classified as Reserve Forest. Any study in order to arrive at reliable results,must proceed on basis of a set of GIS and REMOTE SENSING techniques and suitable procedure to collect the data through primary and secondary data. Primary data collected through primary survey with the help of prepared questionnaires schedule. scondary data from satelitte imageries NATMO, toposheet fron surey of india ,literature review on related topic,environmental offices etc. Gradually decreasing bioversity of sundarban. Most of local depend on sundarban for their livelihood.

Keywords: Biotic region,Sustainablity, Livelihood,Biodiversity,Mangrove forest

Soil Conservation and Forestry

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Abstract

Soil conservation is the practice of protecting the soil against erosion or deterioration. Soil erosion is the deep problems in Himalayan region. A sequel to the deforestation is typically large scale erosion, loss of soil nutrients and sometimes total desertification. To protect and preserve the soil. ; To increase the vegetation cover. ; To increase productivity of sloppy land. ; conserve of hilly land to green and stable land. ; To create a more option for livelihood. We worked under state forest department and study the various methods for soil conservation by forest department. Study of different methods are reforestation, afforestation program in barren land,

trenches management, binding with cement motar, galli palking and check dam. Study the different agricultural techniques for soil conservation. Protet the soil under different conservation program. To identify and study the different species (Quercus lecotricofora, Morus alba, Cedrus deodara, Albizia lebbecck, Bauhinia variegate, Ficus racemosa,etc.) which planted on these sites. Terracing or terrace farming is one of the best methods for soil conservation in hilly area.

4

Section

Multidisciplinary

Occupational Structure and Sectoral Transformation of Workers in Barasat Sub-Division of North 24 Praganas District, West Bengal

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Abstract

Employment and occupation are interrelated; and in rural India, one often means the other. But statistics relating to the occupational structure seldom indicate the actual amount of employment of manpower in the different occupation. The different localities of the study area have various types of economic functions of which there may be dominant one. The dominance of workers varies from decade to decade in the study area. To trace the changes of occupational structure and find out the causes and consequences of shifting of workers from primary to other sectors of economy the present study has been carried out with literature review, collection of secondary and primary data related to occupational structure and changing pattern of work force participation. The 2011 Census of India recognized four major occupational group cultivators, agricultural labourers, household industries and workers in other sectors. As the employment status the percentage of workers i.e., Work Participation Rate (WPR) in the study area has increased from 26.73 percent in 1961 to 35.54 percent in 2011. Modern economic development consisted mainly in a continuous transfer of population from agriculture activities to those connected with secondary and tertiary as well as quaternary economic activities. The percentage of 'other than Primary workers' to total main workers had increased from 39.74 percent in 1961 to 78.40 percent in 2011due to lack of work in agricultural sectors and pressure of land, low wage rate of primary workers mainly of agricultural workers, rapid rate of urbanization as well as industrial development.

Keywords: occupation, employment, economic, workers and shifting.

Survival of Street Children Using the Activity Spaces in Kolkata, a Geographical Appraisal

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Abstract

The problem of street children is one of the major social problems. No country or city anywhere in the world today is without the presence of street children,

but the problem is most acute in developing countries. Thousand of street children seen in our populous cities like Mumbai, Kolkata, Delhi, and Chennai. The number of street children is increasing gradually. Poverty, unemployment, rapid urbanization, rural-urban migrations are the root causes of street children. Being deprive from many of their, they have escaped to the street as a safe place for living. Street children always related with the urban spaces. After coming to the streets, these children have to cope with the new situation every day. They also adopt or develop many complex livelihood strategies and a variety of different informal or even illegal activities in public space and form supportive social networks in order to survive in street life. Street children use the different suitable urban spaces as their earning, living, entertaining spot these places are activity place or space. In these places, they are very much active to survive. Therefore, the social practice and territorial concept is very much important in the livelihoods of young people on the street. Four hundred and fifty street children are included from the different parts of Kolkata with the help of purposive non-probability sampling methods. This paper tries to explore the spatial practice and activity space concept and copping situation of street children in Kolkata.

Keywords: Street children, Activity space, survival and livelihood

Application of Geoinformatics in Identification of Geomorphic Characteristics and LULC of Ajodhya Hill, Purulia, West Bengal

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Abstract

Application of geoinformatics techniques in the context of identification of geomorphic characteristics of Ajodhyahill region, situated in plateau fringe of chotonagpur plateau, Purulia district has great significance. The study is formulated for identification of geology, climatology, pedology, drainage system; vegetation as well as geomorphologic characteristics of the region. Geomorphological process is mainly operated through this system. Another objective is to identify, determine and classify the land use and land cover system.

The study can be done through literature review, study and analysis of topographical sheet and other map, Secondly analysis, interpretation and generate cartographic profile of climatic data to establish a prominent scenario of micro and meso climate. Thirdly application of remote sensing data (ETM+, TM, LISS-IV) through remote sensing software, fourthly analysis of SRTM and ASTER data through ArcGIS for surface analysis, fifthly application of image transformation techniques for make better interpretation of satellite data of this area. Foothill region are characterized by very much interactive complex relationship between geology and physiographical parameter. It has experiencing that there is a change of relief, slope, hill shade, soil condition and LULC in respect of change of elevation.

Keywards: Foot hill, Surface analysis, Image transformation, Land use Land cover, Geomorphology

Seasonal variation in Soil Carbon and Nitrogen of different land use types of Mizoram

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Abstract

Land use change in tropical ecosystems causes significant modifications in Soil Carbon and Nitrogen, attributes. Changes inland use and improper soil management may prejudice Carbon cycling, decrease soil organic matter and increase CO2 emissions. The present study focuses on the effects of different land useon SoilCarbon and Nitrogen. Soil samples (0–15 cm depth) were collected from five land use namely rubber plantation (RP), oil palm plantation (OPP), bamboo forest (BF), fallow land (FL) and natural forest (NF) for pre-monsoon, mid monsoon and post monsoon. The samples were analyzed for pH, soil moisture (SM), soil organic Carbon (SOC), soil organic matter (SOM), soil microbial biomass carbon (SMBC), total nitrogen (TN), NH4+-N and NO3--N. All the land use were significantly different (P=<0.01) for SM, pH, TN and NO3--N whereas only pH, NH4+-N and NO3--N showed a significant difference in seasons. Soil pH was lower than 5.5 in all the sites indicating that the surface soil was highly acidic. The results also showed that soil carbon and nitrogen were highly affected by soil moisture. The findings demonstrated significant effect ofland use changeon the surface soil nutrient status and organic matter.

Keywords: Land Use, Soil, Soil moisture, Organic matter, Soil fertility

Landslide Hazards Zonation along State Highway between Aizawl City and Aibawk Town in Mizoram using Geospatial Techniques

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Abstract

Road transport network is one of the most common victims of landslide disaster which in turn affects the population. Landslide is one of the most common geo-environmental hazards in Mizoram due to its fragile geologic conditions and unplanned developmental activities. The present study investigates the Landslide Hazard Zones along State highway between Aizawl city and Aibawk town in Mizoram. This highway is the most important road connecting northern and southern parts of the state. The study utilized the Remote Sensing and Geographic Information System (GIS) techniques. The road was buffered 50 m. on both sides to delineate the study area. The Important factors which induced landslide were identified and also five types of thematic layers such as slope morphometry, geological structures like faults and lineaments, lithology, relative relief and land use / land cover generated. These thematic layers were ranked and weighted based on their relative importance in causing landslides. Each class within a thematic layer was assigned an ordinal rating from 1 to 10 as attribute information in the GIS environment. These attribute values were then multiplied by the corresponding rank values to yield the different zones of landslide hazard. The ground information on landslide occurrences were also considered while classifying the different zones of landslide hazard. The resulting Landslide Hazard Zonation map classified the area into five relative hazard classes like very high, high, moderate, low, and very low. The final map generated will be used by engineers and the administrators for maintenance and monitoring of this state highway to ensure smooth running of transport between the state capital and other important district headquarters in the southern part of Mizoram. Landslide inventory was also conducted and remedial measures suggested.

Keywords: Landslide Hazard Zonation, Remote Sensing, GIS, Aizawl city, Aibawk town.

Degradation of Sundarban Forest vis-à-visVulnerability of coastal livelihood,a Geoinformatics Approach

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Abstract

In spite of the world's largest contiguous mangrove swamp and world heritage site, Sundarban faces several challenges both due to the present climate change as well as huge population pressure. We used in-depth interviewing and a household questionnaire to investigate present livelihood threats of Gosaba block. Gradual increasing salinity in the water and soil has severely threatened the health of mangrove forests and the quality of soil and agricultural crops. The study also identified 4 broad group occupants viz., (i) Resource dependent, (ii) Wage earner, (iii) Self resilient, and (iv) Government servant. Resource dependent shared 63.9% among others. A Relative Occupational Priority Index (ROPI) was developed, assessing the degree of strength among primary occupations. Crab collection and fishing scored 60.97 numbers, followed by agricultural activities with 21.38 numbers. The venture of coastal people for resources collection into forest ecosystem as part of livelihood encountered very often wildlife conflict. To address these problems through mapping, geospatial techniques have been applied and an appropriate management plan has been suggested for sustainable growth of the region.

Keywords: Sundarban, relative occupational priority index, people's livelihood, salinity, geospatial techniques

People's Participation and Management of Kolkata's Public Space

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Abstract

Public space characterises by the accessibility, visibility and participation of the common people whichencompasses playgrounds, streets, footpaths, parks and squares, open space for cultural and political assemblage, and has a myriad role in supporting a just and democratic society where people can meet, talk, express their opinions and participate in varied activities. However, as urban space goes through phases of transition, the space-people dynamics also change. Often they may seem to evolve as financially more productive and socially, barren. It emerges from literature,

that spaces denoted as public were never truly and absolutely *public*, as it has been subject to nuanced usages. While public space is said to be the object of concern, the focal point for enquiry consists of changes that are inherent in regulatory practices that affect the freedom of citizen to use this space as they perceive it. Kolkata being one of the most crowded cities in the developing world experiences limitations compromising the space sharing needs of the citizens. That public spaces are contested in terms of *who gets what and how*, has recently emerged as an important dimension of urban research in India. This study aims to explore the critical dynamics of socio-spatial transformation of space as used by citizens and regulated by the authority. It further aims to bring out the following aspects: *firstly*, the value and nature of public space as accessed by citizens; *secondly,* the policy and protection of public space. It requires evaluating the process and nuances of use of public space from individual as well as institutional perspectives generating unique urban landscape. The study is assisted by evaluating theoretical context of public space and its role in civic live and empirical evidences of management and people perception through different methods of qualitative survey, across selected locations from Kolkata.Primary findings highlight the historical legacy of vibrancy vis-à-vis present day deterioration due to increasing dependence on virtual space and privatisation.

Sand Mining and Its Impact on the Physical Health of the River and the Livelihood of the People, a Case Study of Umtyngar River, Meghalaya

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Abstract

The removal of sand from its natural occurrence is described as sand mining. Focusing on sand mining and its environmental and socio-economic impacts, this paper seeks to explore the current state of sand mining and extraction mechanism and to assess its impact on the river health of Umtyngar river, Meghalaya with reference to the river channel and also on the livelihood of the local community. Using primary data in the form of in-depth interviews, questionnaires and PRA tools, the study found that primarily unemployment influenced people into sand mining. Also, very high profits and regular income from the sales of sand were

found to be some of the positive effects of sand mining on livelihoods. With the aid of GIS tools using temporal data for analysing the river health, the study revealed that rampant instream and inland riparian zone sand mining causes an increase in bank erosion and channel shifting of Umtyngar River. In addition, it was found that improper sand mining activities along the river which forms a tributary of the Umiam River on which the Mawphlang Dam, a major source of drinking water supply to the city, is situated has resulted in serious environmental implications to the dam especially during the rainy season when all the sand and pebbles flow from the excavation site.

Keywords: sand mining, livelihood, river health, bank erosion, Umtyngar River

Socio-Economic Transformation in the Backdrop of Climate Variability, a Case Study of a Santal Village in Bankura District of West Bengal, India

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Abstract

In search of the livelihoods burden among the scheduled tribe under unfamiliar climatic events, the present study aims to investigate the impact of climate variation on the present socio-economic condition of the Santal tribe living in a village (*Gidhuria*) located at the drought prone district (Bankura) of West Bengal, India. Structured schedule, focus group discussion and key informant interviews were used to collect data from 58 families. The results revealed that about 90% of the villagers engaged in rainfed agriculture. The declining monsoon rainfall, rise of temperatures, shifting season and dryness of top soil in the agricultural land for the last 15 years may heavily impact on agricultural production, socio-cultural life and livelihoods of the Santal villagers in a negative way. The perception regarding climate variability among villagers was also supported by the meteorological data of that region. Though they tried to cultivate high yielding varieties of paddy but failed to get sufficient yield due to water scarcity, economic barrier to use modern technology and frequently occurring dry seasons. The development programmes (like Grain Bank) were

often failed to meet their challenges. These erratic conditions have forced the villagers to migrate in other districts or urban areas in search of their secondary earning as daily wage labour which form a new socio-economic dimension for their survival.

Keywords: Climate variability, Santal tribe, socio-economic status, paddy production, Bankura district

Morphometric Analysis and Prioritization of Sub Watersheds of Tons River Catchment

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Abstract

In lesser Himalayan region, hilly watersheds with diversified land uses and fragile ecosystem are responsible for accelerating soil erosion of varying degree. An attempt was made to delineate and analyse the soil erosion prone regions in micro watersheds of Tons river catchment. The erosion status of the watershed is one of the prime criteria for assessing its vulnerability to soil erosion and can be investigated by estimating the watershed morphological parameters besides the hypsometric integral. The Tons river catchment was analysed using ArcGIS to generate the natural drainage network and stream orders using Strahler's method. It was observed that total length (111.4km) of first order streams (223) followed by second (82), third (35) and fourth (10) order stream indicating that the sub watershed is more prone to flood. Besides this, lesser forest cover and elongated basin size with lower circulatory ratio (0.50) and higher ruggedness number (4.19) indicated its proneness to erosion. Moreover, low values of drainage density (3.04), stream frequency (6.16), drainage intensity (2.02) and bifurcation ratio (2.72) indicated that the surface runoff is not quickly disposed off, which would cause localized flooding and landslides. However, out of 15 sub watersheds, seven sub watershed have high hypsometric integral (HI) (>60%), indicating an inequilibrium stage and high susceptibility to soil erosion. But, one sub watershed was in monadnock or stabilized stage (HI<35%) indicating its minimal erosion proneness. Nonetheless, it can be recommended that seven sub watersheds with less forest cover and at inequilibrium stage should be prioritized and judicious soil and water conservation measures should be taken up to prevent erosion.

Keywords: Watershed morphology, Hypsometric integral, ArcGIS, Soil erosion, Watershed prioritization.

Site Suitability Analysis for Identifying Potential Water Harvesting Sites in Lachigad Watershed, Uttarakhand

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Abstract

The problem of water scarcity is most prominent in many regions in Uttarakhand. Due to Water problems many villagers specially the women often walk more than 2 Km through strenuous mountainous terrain to reach the nearest source of water. Therefore, the water scarcity compel the youngsters to migrate to other places or to NCR regions in search for job opportunities as agriculture activities could not be carry out. Lachi Gad watershed is situated in Pauri Garhwal District of Uttarakhand. The total population is approximately 1600 mostly farmers, women's and ailing elders. The present study aim's to identify suitable potential sites for rain water harvesting structures in Lachigad Watershed, Uttarakhand using Geoinformatics techniques. Therefore, to identify the suitable sites for water harvesting structures like Percolation tanks, Check dams, contour trances etc, we have taken different layer such as landuse/Landcover (LULC), slope information, soil characteristic, climate data, geological structure and drainage characteristics etc. Landsat ETM+ and IRS LISS-IV imagery is use for Landuse/ Landcover (LULC) analysis. GIS techniques are use for generating Buffer zone map and to calculate the weighted value in different classes using weighted overlay analysis. Lachi Gad watershed has been defines into four classes i,e. Very high, High, Low and Very Low. The analysis indicate that there are many sites in Lachi Gad watershed, that can be properly managed for water recharge and conservation which can be beneficial for drinking, domestic use and agricultural activities for the villages.

Keywords: Water Scarcity, Villages, Potential, Lachi Gad, Watershed and Geoinformatics techniques.

A Study on Reproductive and Child Health Status in Uttar Dinajpur District, West Bengal

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Abstract

The meaning of Reproductive and child Health does not embrace a different package of services rather it was also based on the notion of gender, health, and development. A pregnant woman needs antenatal care which is very much necessary in order to survival for both mother and child. Subsequently the follow up is necessary in the form of natal care during delivery and after birth the post natal care. Apart from the above precautions the care should be taken in management of unwanted pregnancy. With the passage of time, the child should be brought under immunization scheme in order to reduce the proneness of contaminated and degenerative diseases. Despite the need of hour to implement the schemes some critical challenges has been arose in the form of ignorance by rural women, poor nutritional status, lack of institutional delivery, ignorance about the low weight among the rural pregnant women, disagree to accept the unwanted pregnancy management. The main essences of this study is to highlight the block level disparity in acceptance of reproductive and child health care on side and to unearth the causes behind such disparity in Uttar Dinajpur district. Uttar Dinajpur district secure the rank i.e.15th for malnutrition status and 13th on the basis of Human Development Index in West Bengal. The district also ranks 443rd out of 593 districts in India for prenatal care visits. The study depends on both the primary and secondary data sources. In order to fulfill the above objectives primary data has been procured by applying questionnaire and schedule. In this regard random sampling technique has been adopted. As the district is comprised of urban and rural body the questionnaire and scheduled is framed according to the area to unearth the views and perception about the people. After procuring data from different sources the data are manipulated, tabulated in an organized manner. Secondary data has been procured form the various reports and block and district level information centres. Descriptive and Inferential statistical techniques are applied in order to proof the hypothesis. A thorough study has been carried out in order to evaluate the program me implemented for reproductive and child health in areal aspects.

Keywords: Reproductive, Child Health, Socio-economic, Literacy, Disparity.

Spatio-Temporal Changes in Pichavaram and Sundarban Mangrove Forest: A Comparative Analysis

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Abstract

The mangrove wetland forms a dynamic ecotone between land and sea. It is the dominant feature of the tropical ecosystem and influx of freshwater, salinity and sediments act as the regulator of the spatial extension of the forest. The Objectives of the study were to access the spatio- temporal changes and its impact on socio-economic conditions of both the area and to compare it. Data was extracted from toposheet, satellite map using the GIS and remote sensing technology and through various article and website. While extracting the satellite map it was taken care that map should be of same season of the year and the reason behind it is that influx of freshwater (monsoon rain) impact the spatial extension of the forest. The finding of the study is that, ecosystem of both the mangrove wetland is rich in biodiversity, locals depends directly and indirectly for livelihood. In recent decade spatial extension of the Sundarban mangrove forest is shrinking and on the other hand spatial extension of the Pichavaram mangrove forest is increasing in recent decade. The Sundarban Mangrove receives rainfall from South-west monsoon during summer but on the other hand Pichavaram receive rainfall from South-west monsoon during winter.

Keywords: Spatio-temporal, Socio-economic, Monsoon, Ecosystem, local inhabitants

Climate Change and Snow Cover Dynamics in Uttarakhand Himalaya

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Abstract

The maximum changes that occur in the mountain regions result from variations in snow cover due to adverse effect of increasing temperature. Snow is one of the important aspects in Himalaya regions. The Himalayan mountains have experienced by the unusual warming in last century. Therefore, the present study mainly focused on the changing pattern of climate and snow cover. For conducting the present study, monthly temperature data (1957-2013) was used for assessment of climate change and Landsat

satellite imageries (1997 and 2015) were used for identifying snow cover change variation. The non-parametric tests and Normalized Difference Snow Index (NDSI) were used for trend analysis of temperature and snow cover changes respectively. The study reveals that the mean maximum temperature of two different stations e.g. Mukhim and Tehri are having statistical significant increasing trend in annual average are about 0.07 0^C and 0.04 0^C respectively and the snow cover area were declined at an average rate of 6.3 km^2/ year. The study also expresses the snow cover classification in Bhilangana watershed in four types' viz., frost, fine, medium and coarse snow. The investigation of snow cover is heterogeneous in nature over the study area. The declining snow cover has become a serious threat towards the peoples of foothill regions.

Keywords: Climate change, Snow covers dynamics, Non-parametric tests and NDSI.

Impact of Climate Change on Human Comfort and It's Relation in Market Rise of Electronic Gadgets: A case Study of Kolkata City, India

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Abstract

People of Kolkata city are suffering from uncomfortable weather condition with rising temperature and humidity rather the climatic conditions are changing and also it has an adverse impact on the human health and comfort as well as it's also indirectly leading the market of electronic gadgets. Some of the weather elements determine human comfort likely temperature, relative humidity, solar radiation etc. Most extremely the rising temperature of the city Kolkata is determining the status of human comfort. Temperature influences human bodies through internal and external heat while the internal body heat is lesser effective than the external body heat regarding the human comfort. Humidity level is also a determining factor in respect to human comfort. The comfortable weather condition may have 73^0 to 83^0F temperature and 27% to 80% humidity as per summer human comfort level. In the recent time people are taking some of electronic goods and gadgets (Air-condition, Cooler, Refrigerator, Fan etc) which can make artificial comfortable weather condition. The present study has analysed the changes in climatic condition of Kolkata city to identify the rising temperature and humidity in respect to human comfort based on the IMD data through statistical analysis and it also tried to find out how the rising temperature and humidity leading the market rise of electronic gadgets in Kolkata city.

Keywords: Climate change, Human comfort, selling of electronic goods.

Climate Change Impacts on Sundarbans: Essential for Climate Future

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Abstract

This Paper assessed the impacts of Climate change on the first climate hotspot of South Asia, Sundarbans region, an inhabited ecological region which is geopolitically divided between India and Bangladesh. This study examines the information collected during visits to Islands of Gosaba, Bali, BakKhali and Sagar of Indian Sundarbans Delta. We interviewed local populations and Officials in these areas to understand how Climate change is changing socio-economic and cultural landscapes of Sundarbans Island after being hit by the severe Cyclonic Storm Aila in 2009. This cyclonic storm was one of the worst natural disasters to affect over the Bay of Bengal and caused extensive damage in India. The storm was responsible for at least hundred deaths across India and more than million people were left homeless. The result of our study showed that there is necessity of legal, regional and development programmes for the protection and conservation of ecological region of Sundarbans. Mangroves Forests of Sundarbans served as protective shield to coastal communities and the loss of these mangroves forests due to climate change will manifold the risks to livelihood of local populations and biodiversity from storm surge, sea level rise and flooding. Planetary management in form of water management is the most attractive feature of the inhabitants of the region. To conclude, this is high time that Climate moral-ethical and adaptation education needs to be expanded regarding 'climate sensitive' Sundarbans delta in order to solve the uncertainty otherwise new hierarchies of power changing the discourse of apprehension about climatic future.

Climate Change Impact on Glacio-Hydrological Processes in Shaune Garang Basin, Western Himalaya

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Abstract

The vulnerability of the Himalayan Glaciers getting impacted by the effects of climate change has now been well documented and appreciated. Himalaya the

habitat of the largest number of glaciers outside polar monarchy is now being focused for the in-depth research but the data is scarce because of the unforgiving terrain and the limited facilities available to researchers. The importance of the these glaciers along with seasonal snow cover and permafrost is well known to human kind due to the large number of river basins originating from Himalaya which are the primary source of fresh water supply in the densely populated downstream areas and also for the hydropower, irrigation and industrial use. Even a minute change in temperature and precipitation affects the snow and glacier of the region followed by the impact on the water supply to downstream areas. Due to extreme weather conditions and harsh terrain, the observations of the hydro-meteorological parameters are scarce and fragmented making less understanding of the processes in this region. Under this condition, the temperature index based glacio-hydrological analysis serves as an important tool to understand about the glacio-hydrological processes to conclude the impacts on the water regime of this region. The present study is an attempt to understand the hydro-meteorological process based on the observed discharge, as well as daily, seasonal and annual mass loss in Shaune Garang basin located in Western Himalaya. The field observations coupled with satellite observations (changes in area covered by different land covers) and meteorological parameters were used to develop and validate a glacio-hydrological model which enabled us to estimate basin scale discharge and mass balance. The degree day factor on the Shaune Garang region varied between 2.6±0.4 $mm°C^{-1}day^{-1}$ to 9.3±0.3 $mm°C^{-1}day^{-1}$ depending on the land cover and altitude. The model showed very good performance during validation period with value of coefficient of determination (R^2) 0.9 and root mean square error (RMSE) 1.05 m^3sec^{-1}. Further, the validated model was used to estimate long term monthly discharge (1985-2008) and annual specific mass balance (2001-2008) in the basin. The simulated discharge in the basin shows a decreasing trend for the simulation period. The simulated mass balance shows loss of mass by the glaciers in the basin except for two years. The results are in agreement to the explanations made on other glaciers in the region. In addition, the comparison of simulated annual specific mass balance and melt season discharge shows weak positive correlation suggesting association of more positive mass balance with high discharge and vice-versa.

Keywords: Glacio-hydrological model, degree day factor, discharge, mass balance, climate change

Diversity and Dynamics of Rural Landscape in the Brahmaputra Floodplain, Assam

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Abstract

The Brahmaputra floodplain in Assam is overwhelmingly dominated by rural landscapes of diverse nature. As the floodplain is characterized by very high drainage density and presence of large number of wetlands, forest areas and grasslands on the one hand and various kinds of human responses to the floodplain environment on the other, the diversity of landscape development is quite obvious. The distribution of large number ethnic groups with different socio-cultural background has notably added to the landscape diversity in the valley. Interestingly, the rapid growth of population, particularly in the fertile floodplains, has diversified the pattern and intensity of landuse leading to remarkable change in the floodplain landscapes. With the growing demand for natural as well as agricultural resources there have been perceptible changes in the indigenous landuse practices, which are visibly manifested in the pattern of landscapes. Thus, maintaining necessary sustainability in the rural landscape system has become a challenging task. The present study is an attempt to investigate the pattern of rural landscape diversity and its dynamism at micro spatial level. The study is based on primary information collected through household survey carried out in a floodplain village of the valley.

Keywords: Landscape diversity, floodplain, rural landscape.

Morphometric Analysis of Jamuna Watershed, Assam with Application of GIS tool

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Abstract

Morphometric analysis is a logical choice and a basic unit, as all hydrologic and geomorphic processes occurs within a watershed. Analysis of morphometric

parameters with the help of Geographical Information System (GIS) is a proven and viable method of characterizing the hydrological behavior of a watershed. In the present study, the Jamuna river watershed having extension $25^0 41'$ N to $26^0 27'$N latitude and $92^0 32'$ E to $93^0 41'$ E longitude, has been considered and therefore, the linear, aerial and relief parameters of the basin is accomplished after delineation of basin map using Survey of India toposheet of 1:50000 and LANDSAT satellite data in GIS environment.

Keywords: Morphometric analysis, GIS, Watershed, Jamuna river, Hydrological processes

An Analysis of Spatial Patterns of Persons with Disabilities in West Bengal

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Abstract

Persons with disabilities are much weaker and deprived section of the society. According to World report on disability (WHO, 2011), 15 per cent of the population globally presents with disabilities, among them physical disability is most prevalent. In this paperan attempt has been made to observe the spatial patterns of persons with disabilities by types, sex and rural -urban residence in the districts of West Bengal. The research paper is exclusively based on secondary sources of data which have been taken from Census of India publications, New Delhi. Advanced statistical techniques have been used to analyze the data. Apart from, advanced cartographic techniques and GIS-MapInfo has also been used to visual presentation of the data. The study reveals that the study area is much concentrated of in seeing disability followed by any other disabilities where, mental illness is least in size. Majority of males are facing any other type of disabilities while, in seeing disability is more pronounce among females. Study also shows that immensity of disabled peoples found in the southern section of the state while northern part is found to be more in multiple disabilities.

Keyword(s): Persons with disabilities, in seeing disabilities, multiple disabilities, regional patterns, rural, urban

Changes in Land Cover Pattern in Relation to Historical Episodes, a Case Study of Dooars Region with Special Reference to Alipurduar District

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Abstract

The conflict interest between development and environmental sustainability has drawn the keen interest among the academicians in recent times. Global population growth and infrastructural development has modified the natural landscape in large extent even in the remotest part of the world. In recent past it has been experienced that often developmental strategies do not care about the environmental ethics. Dooars region, a most important biodiversity zone in Eastern India have been undergoing the same processes which will definitely turn into an alarming problem in coming days. Being located in the Himalayan foothills, river dominated Dooars region has a great biodiversity in terms of flora and fauna but deforestation has taken place in a large scale this region in recent times. In addition, Railway tracks, National and State highways have been constructed through the forest areas which has affected the ecological condition of the Dooars region. Change in land use is inevitable and cannot be stopped particularly in this era of development and urbanization. Therefore, monitoring and analyses of land use and land cover is significant particularly for sustainable development. An attempt has been made in this paper to analyze the changing land use and land cover pattern of Dooars region with special reference to Alipurduar district, West Bengal. For this study satellite imageries of different decades have been analyzed with GIS and Remote Sensing techniques. An attempt has also been made in this study to explain the changes in land use pattern of Alipurduar district by evaluating the historical episodes witnessed by the region.

Keywords: Land Use Land Cover, Deforestation, Sustainable Development, Remote Sensing, Historical Episodes

Population and Habitat Status of Phayre's Leaf Monkey (*Trachiphythicus Phayrei*) in and Around the Inner-Line Reserve Forest of Cachar District, Assam

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Abstract

The population status of Phayre's leaf monkey is very scarcely known in Inner-line Reserve Forest (ILRF) is least known endangered species habituated from Assam other than Mizoram and Tripura states of India. The assessment of population and habitat status is a vital tool for preparation of conservation action plan of the species. The present study was conducted from Nov 2015 to Mar 2017 using line transect method and supplemented by sign searches and judicious use of villager information. The study aimed to find the population and habitat status in two different category, protected (ILRF) and non-protected area. From protected area two localities (Dholaikhala and Balichuri) were recorded and from non- protected area 5 localities [Dargakona Tea Estate (T.E.), Rosekandi T.E., Iringmara T.E., Borojalenga T.E. and Borokhai T.E.] were recorded. A total of 9 groups comprising 126 individuals were recorded. The average group composition was estimated at 14 individuals per group (range 9–23, SD = 4.30). The population comprises 19.84% adult males, 26.98% adult females, 23.80% Sub-adults, 15.87% juveniles, and 15.87% infants. There prefer dwelling habitat was found in bamboo-dominated forests and large canopy tree for roosting. They were also present in the fragment patches of Tea Estates outside protected area. The protected area were mostly encroach with jhum cultivation and paddy field. Thus, the habitat of this arboreal species is fragmented due to settling of human habitation and other anthropogenic disturbances in ILRF causing stress in the population.

Keywords: Primates, fragmentation, anthropogenic disturbances, bamboo, canopy

Climate Change of Kolkata in West Bengal and Its Impact on Migratory Birds

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Abstract

Climate is the most important astringent of nature. But the climate of West Bengal is changing day by day. The onset and withdrawal of monsoon are delayed and

the extent of delay may be up to a fortnight. Kolkata (22°34'N-88°22'E) is a district of West Bengal. Kolkata is experiencing most vulnerable condition to climate change. Kolkata enjoys tropical wet and dry climate. The highest recorded temperature is 43.9°c and the lowest temperature was 3°c. To understand the impact of temperature and rainfall characteristics are been analysed through statistical techniques and graphical representation. After analysing all the data temperature is rising day by day. As a result of climate change is definitely affecting the migratory pattern of the birds in their different phenological events. The earning scopes become decreases day by day from migratory birds visiting the sanctuary. This topic concentrates mainly on the co-relation between migratory birds in relation to the variation of climatic components.

Keywords: Kolkata, climate change, temperature, rainfall, migratory birds.

Impact of Out Migration on Socio Economic Conditions in Pasolgad Watershed, Garhwal Himalaya

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Abstract

Out migration is a common phenomenon from center and western Himalaya, particularly with reference to Garhwal and Kumaon of Uttarakhand. Out migration has been projected as a severe geographical problem in the area by various scholarsof different fields in the literature of 1970, 1980 and 1990s. Out migration have positive as well as negative impact on socio economic and ecological development process. As a result of it the socio economic status of Uttarakhand, is changing and this has further implication. Out of 13 districts in Uttarakhand, 3 districts namely Almora, Their Garhwal and Pauri Garhwal are maximum number of out migrants. Keeping this view in mind, Pasolgad watershed of Pauri Garhwal district from Garhwal Himalaya has been selected to do details study to understand impact of out migration on socio-economic conditions. The study has mainly based on the questioner based primary survey over the study area. The study has come up with very interesting result, positive as well as negative.

Hypsometric Analysis and Geomorphic Development of the Rupin Drainage Basin in Western Himalaya: Using Remote Sensing and GIS Techniques

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Abstract

Hypsometric analysis (hypsometric curve and hypsometric integral) is defined as geomorphic stage of watershed and estimate of its maturity. The present study area reveals on different stages of Rupin Drainage Basin and all the 47 sub-basin of the study area. In the study area, the shape of hypsometric curve and hypsometric integral values are represents the impact on climate, geologic and tectonic topographical changes. The present study area is located in Rupin Drainage Basin which situated Himachal Pradesh and Uttarakhand Himalayan Region and it is part of the Higher Himalaya and Lesser Himalaya. The altitude of Rupin Basin is varies in between 1275 m to 5469 m from MSL. Rupin River is the main tributary of Tons River which confluence Supin River at Naitwar Village. The total area of the rupin basin is 536.19 km^2 and the area is occupied by 33% in Uttarkashi District of Uttarakhand and 77% in Shimla District of Himachal Pradesh. The major drainage pattern reveals created by glacial, peri-glacial and fluvial actions and in this particular region, glacial, peri-glacial and fluvial process of the entire geomorphic agent is working. The present study area was carried out using based on Remote Sensing data (ASTER DEM 30 m spatial resolution) and GIS techniques.This entire period of erosion can be divided into three stages viz. old stage (HI < 0.3), in which the watershed is fully stabilized, mature stage (HI 0.3 to 0.6), and young stage (HI > 0.6), in which the watershed is highly susceptible to erosion. The hypsometric value of whole basin is 0.49 whereas the hypsometric values of all the 47 Sub-basin ranges from 0.45 to 0.65 which indicates the present study area there are two stage of geological development viz. mature stage and young stage. The hypsometric integral indicates that surface runoff is the dominant process of the study area. Hypsometric curve map, hypsometric integral map and geological map have been prepared by using GIS techniques to understand the geomorphological characteristics of the Rupin Basin.

Keywords: Hypsometric analysis, RS & GIS, ASTER DEM, Lithology.

Investigative Methodology; Unearthing Mizoram's Hydropower Potential and the Failures of its Realisation

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Abstract

As the world continues down the path of depletion of natural resources, the imperative need intensifies still to harness alternative reusable energy sources that are within the grasps of today's technology – such as hydropower. The paper begins with a discussion on the universal advantages and disadvantages credited to dams and the harnessing of hydroelectricity, and in weighing in the pros and cons, discuss the methods of minimising said disadvantages. By the end, the paper will have shown that the Mizoram situation is not even remotely close to such a discussion. There is a persisting nonchalant and dismissive attitude towards this facility, the reasons ranging from the possibilities of the dynamics of politics to the sheer incompetence of government officials. The theoretical aspect of the paper introduces my proposed "Investigative Methodology" as a viable research tool, and defends it with the provision of a combination of information and observable everyday experience.

Keywords: Investigative Methodology, Hydropower, Governmental Incapacity, Mizoram.

Comparison of Rainfall Records of Mizoram, India by Means of Isohyetal Maps Generated Using GIS Techique

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Abstract

Climate is one of the most important factors which controls human's activities like agriculture, forestry, supply of water, industries, etc. The elements of climate that control the economic development of a region are mainly rainfall and temperature. Mizoram is blessed with abundant rainfall and the amount of annual rainfall varies from place to place due to variation in elevation and topography. Rainfall data of Mizoram has been recorded by different agencies. Since, rainfall data is highly crucial for planning different kinds of developmental schemes, well-organized rainfall record and reliable isohyetal map is highly essential. The objective of the study is to compare

rainfall data recorded by different agencies using a GIS technology in order to establish trustworthy isohyetal map of the state. All the rain gauge stations were plotted in a GIS environment with the amount of average annual rainfall as their attribute. Then, Isohyetal maps were prepared for the entire state from each of the records separately. Spatial interpolation technique through Inverse Distance Weighted (IDW) approach has been used in the present study for generating spatial distribution of rainfall. The resulting maps prepared based on different records show different isohyetal maps for the state. These diverse maps indicate the dissimilarity of records of different agencies for the same environmental factor. However, these maps may be fine-tuned to composed dependable maps showing the average amount of rainfall in order to carry out different developmental activities for the entire state.

Keywords: GIS; Interpolation; Isohyetal map; Mizoram; Rain gauge.

Value Chain Analysis of Maize in Mizoram

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Abstract

Kaplinsky and Morris (2011) described Value Chain as the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transportation and the input of various producer services), delivery to final consumer, and final disposal after use. A preliminary study on Value Chain of Maize was conducted in three (3) Villages viz. Sesawng, Sihfa and Kawnpui. Data was collected using an Interview Schedule at each level of Value Chain. These farmers are subsistence farmers and produce Maize for the purpose of sales. In these selected Villages, maize is cultivated integrating with other jhum crops under shifting cultivation system. During harvesting period, there are two types of marketing channel that existed - 1) Direct selling by the famers to urban market/rural village and 2) Marketing through rural traders/commissioners in the village. In the latter channel, the farmers either delivered their produce at the rural trader's home or the rural traders collected it from the farmer's home at their own expense. From the preliminary assessment of the Maize value chain, among the various actors, the farmers received most benefits in terms of cash through direct marketing channel whereas in marketing through rural traders/market seller receive more benefits.

Management of Tista River Basin as Single Unit to Resolve the Conflict into Cooperation between India and Bangladesh

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Abstract

Demand for fresh surface water increasing in South Asia along with increasing number of population in the region while the effects of glacier melting along with declining number of glaciers and vagaries of monsoon rainfall significantly impact on the availability of water in the river basins of the region. It has been recorded, since, 1950 the availability of water declined at the rate of 70 percent (The Asia Foundation, 2013). The river Tista flowing from the Himalayan uphill Sikkim state of India and debouches near Sevoke of northern part of West Bengal plain crossing more than 100 km. in the plain, it enters into Bangladesh and joined as one of major tributary of the River Bramhaputra (Jamuna). Different geopolitical conditions as well as the question of life and livelihood of the riparian population with increasing demand of water from basin to off-basin created a water stress situation while the water supply has reduced dramatically throughout the basin and both the countries affected seriously. Thus, the Tista water sharing is not only important for India and Bangladesh but also important for the river itself in terms of sustainable river environmental flow (E-flow) and large ecosystem services. In a broad perspective the Tista Water sharing has observed as quantitative sharing of water between two countries where involvement of third party as state government of India makes it more conflicting in nature. But there are several other conflicts exists rather than the broad issue of political-quantitative deal of water like the inter-sectoral conflict (irrigation versus domestic supply), upstream versus downstream, basin versus sub-basin etc. those need to be recognised in the light of justified water sharing. This study have proposed probable suggestions for the river basin management as single unit by both the countries and by keeping all of the issues from human to river and river to human in fundamental concern.

Keywords: Tista water sharing, Geopolitics, E-flow, Basin management as single unit.

An Assessment of Meteorological Drought of a part of Western Tract of West Bengal for the Need of Water Conservation of the Area

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Abstract

According to India Meteorological Department if the rainfall during a year or a southwest monsoon season (June-September) over an area is less than 25 percent of the normal will be defined as a drought situation. Drought is a very common and recurrent phenomenon in the western tract of West Bengal. It is mainly due to so called low amount of rainfall and harsh climatic condition of the region. But the amount of rainfall and the number of rainy days are not so much less compared to the Gangetic West Bengal; sometimes it is higher than the Gangetic West Bengal. The western tract of West Bengal actually includes 99 CD blocks located in 13 sub-divisions of 5 districts viz. Purulia, Bankura, Birbhum, Asansol and Durgapur sub-division of Barddhaman and Paschim Medinipure excluding Ghatal sub-division. But for the present study three districts have been selected namely Purulia, Bankura and Paschim Medinipure excluding Ghatal sub-division. For the purpose of identifying the meteorological drought 40 years data of rainfall, potential evapotranspiration and dew have been collected from Agriculture Meteorology Division of the State Agriculture Department, Government of West Bengal. A number of statistical techniques viz. semi average method, 5 years moving average method and coefficient of variability have been calculated for the identification of rainfall trend and its reliability.

Keywords: meteorological drought, rainfall trend, western tract of West Bengal, water conservation, undulating terrain

Social Area Analysis of Toto Tribe in Alipurduar District, West Bengal, India

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Abstract

Tribal people are commonly conservative and rarely exposed to the outside world unless and until they accept significant changes of the modern world with the

passage of time. In the present study, an attempt has been made to analyse the social area of one of the primitive tribal groups, popularly known as Toto. Toto is an isolated group of tribal people residing in a small village named Totopara in Alipurduar District of West Bengal. Social area analysis of such tribal people is one of the important fields that can determine their level of development with associated changes they have been experiencing. The study has been carried out based on both primary and secondary data including a semi-structured interview schedule. Results reveal that noticeable changes are observed within Toto tribe in terms of their social life particularly in the sphere of demography, education, health, culture and economy. These changes have brought significant imprint on their age old traditions also.

Keywords: Social Area, Tradition, Education, Culture, Society

Application of Geomatics in Fire System Management of Kolkata Municipal Corporation Area, West Bengal

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Abstract

In Kolkata Municipal Corporation, West Bengal, density of settlements is increasing because the number of houses and infrastructures located within and adjacent areas are increasing and becoming prone to urban fires. Fire managers, responsible for the planning and implementation of urban fire prevention strategies, need integration of fire protection systems with various other disciplines such as nature conservation, riparian zone management, aesthetics, etc. In Kolkata, the different land uses form a complex mosaic in the landscape and subsequently create varying degrees of fire hazards in the region, particularly in the high density areas. The fire prone zones of Kolkata Municipal Corporation (KMC) area has increased dramatically in many areas, and the past five years have seen a substantial increase in the number of fires and area burned, causing loss of cores of rupees due to damage of properties, and even the loss of lives. Geomatics, the new technological support of these days, may be immensely beneficial for management of the fire hazard to a great extent. This paper is an attempt to explore the possibilities of application of Geomatics in fire hazard management in the KMC area of West Bengal.

Keywords: Remote Sensing, GIS, GPS, Vulnerability Analysis Fire Hazard, Fire Risk, Fire System Management (FSM).

Population and Development in the Third World, a Case Study of India

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Abstract

Most of the developing countries of the World are suffering from the vicious cycle of rapid population growth and underdevelopment. Lower levels of investment on human capital slow down the development which further reduces investment on human capital. The vicious cycle can be broken down by a better coordination of management between their natural and human resources. As a result, worldwide the developed countries show a better population scenario in terms of fertility and mortality and other parameters etc. than the developing countries.A case study of India in this paper has been carried out to show the covariation of improvements of some of the key sectors of the economy with the improvements in the key parameters of population growth. The study shows that due to the sustained efforts of the government for improvement in food supply for the growing population, the food production of cerealsbetween 1951 -2001 could grow by 4.44 times as compared to the population of India which could grow 2.85 times only for the same period. A better resource management could also lead to an impressive growth in sectors like education and health also. Sectors like employment, health and other social sectors etc. have not shown a satisfactory improvements and Government has yet to go to a long way to achieve meaningful goals in these sectors.

Gender Inequality in Formal Banking: The Indian Scenario

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Abstract

Women's inclusion in formal Banking sector is recognized as a noteworthy aspect of women empowerment process in terms of financial autonomy. In India, Women's real financial individuality to manage their finances is not withstanding with the positive outcomes of independent financial decision making and mainly determined by multiplicity of gender driven issues. The present paper seeks to

analyze the State wise, Bank Group wise and Residence wise gender inequality in the number of individual Bank accounts and deposited amount of individual in India during 2005-06 to 2015-16using the Modified Sopher's Disparity Index of Kundu and Rao (1986). Based on similaritiesof women's access to formal Banking, States and Union Territories in India have been clustered considering seven selected standardized variables using Hierarchical Cluster Analysis (Anderberg, 1973) for the study period. The factors influencing women's access to formal Banking during 2010-11 has been identified by a Multiple Linear Regression Model (Hocking, 1976) on the basis of selected variables. The results show that, State wise, Bank Group wise and Residence wise gender disparity existin the access of formal Banking from 2005-06 to 2015-16.

Keywords: Cluster Analysis, Disparity Index, Financial Autonomy,Gender Inequality, Multiple Linear Regression Model

Geomorphic Evolution and Landscape Development of Tut Drainage Basin

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Abstract

Mizoram is tectonically active as evidenced by many geomorphic signatures. The development of landscape is influenced by various external processes aided by active tectonics in the Tut watershed which is located in the north-western part of Mizoram. An attempt has been made in this study to evaluate the landscape changes with the help of various geomorphic indices. The geomorphic indices were estimated by standard formulae in order to correlate the active tectonics and erosional processes in the watershed. The values of some significant geomorphic indices such as valley floor width-to-height ratio index (0.4-0.67), elongation ratio (0.34) and hypsometric integral (0.47-0.70) indicate the active incision in the watershed. It is evident from the geomorphic signatures that the area is prone to severe erosion in the evolution of the Tut drainage basin

Keywords: Geomorphic indices, active tectonics, landscape development, active incision, geomorphic signatures

Dynamics of Organic Wastes Treatment on Soil Characteristics and Growth of *Brassica oleracea*

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Abstract

Wastes materials of organic in origin is been considered as a resource for agricultural fields in spite of discarding away as wastes. In the present study four different types of organic wastes namely sugarcane bagasse, fish scales, wastes flowers and pineapple peels were collected, air dried till constant weight and shredded into small pieces. They were treated with soil and put in earthen pots. Saplings of *Brassica oleracea* (cabbage) having same growth stage were planted in the pots. Three pots without treatment of the wastes were maintained as control pots and same saplings were planted in these pots. The change in soil properties and growth pattern of the saplings were observed. It was found maximum increase in soil organic C (0.53kg/ha) was found in the pots treated with flower wastes and minimum (0.16kg/ha) in sugarcane bagasse treated pots. Maximum increase in total N was found in fish scales treated pots (261.67kg/ha) and least in sugarcane bagasse treated pots (52.34kg/ha). Maximum increase in height of *Brassica oleracea* was found in the pots treated with fish scales (31.0cm) and least in sugarcane bagasse treated pots (19.6cm). The results obtained indicate that fish scales and flower wastes can be used in crop fields of *Brassica oleracea*.

Keywords: fish scales, organic C, pineapple peels, sugarcane bagasse, wastes flowers.

Variation in Blood Biochemical Profile of Indigenous Chicken 'Sikhar' of Mizoram India due to Age and Sex

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Abstract

Effect of age and sex on blood biochemical profile of indigenous bird of Mizoram called Sikhar was investigated. Total protein (TP), albumin (Alb), total cholesterol (Tch), sodium (Na), potassium (K), chloride (Cl), calcium (Ca), inorganic phosphorus (Pi) and magnesium (Mg) were estimated in 44 plasma samples collected from two

age groups *viz.* young (1-6 months) and adults (6-12 months) comprising of male and female birds. Data were analyzed statistically to find out significant differences between different groups. TP, Alb, Glo, Tch, Pi and Mg were influenced by age with higher values of TP, Alb, Glo and Tch in adult birds and higher Pi in young birds. Respective values of TP, Alb, Glo, Tch, Na, K, Cl, Ca, Pi and Mg in young and adult birds were 3.56±0.10 and 5.05±0.20 g/dl, 1.19±0.08 and 1.55±0.10 g/dl, 2.37±0.13 and 3.50±0.12 g/dl, 155.41±6.06 and 120.97±6.15 mg/dl, 143.09±1.95 and 146.77±1.09 mEq/l, 3.46±0.14 and 3.40±0.18 mEq/l, 108.73±1.67 and 110.86±1.14 mEq/l, 11.51±0.18 and 11.64±0.58 mg/dl, 7.01±0.08 and 4.36±0.26 mg/dl and 2.00±0.05 and 2.56±0.17 mg/dl respectively. Blood biochemical profile of young birds was not influenced by sex while TP, Glo and Ca of adult birds were influenced by sex with higher values in females than the males.

Keywords: biochemical, indigenous chicken, Sikhar, age, sex

Temporal Analysis of Rainfall Variability of Nagaland

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Abstract

Nagaland has mainly a rugged hilly terrain. Its topography rises abruptly from the Brahmaputra valley eastward. The torrential monsoon rains are integral features of the state's weather. Nagaland is located in the north eastern region of India; the state of Nagaland shares the international border with the country of Myanmar to the east and Arunachal Pradesh state and some parts of Assam state in the north, Assam to the west and Manipur to the southern parts. It lies between 26º6' N to 27º4' North latitudes and 95º20' E to 95º15' East longitude and has an area about 16,579 Sq.km. with the population of 19,80,602 (2011). The maximum average temperature recorded in summer is 32 degree Celsius while minimum is as low as 4 degree Celsius in winter. Some regions in the state are subject to frost winter. The state records an average annual rainfall of 2000mm to 2500mm. Nagaland is drained by four chief rivers of Doyang, Jhanji, Dhansiri and Dikhu. The rivers are the tributaries of the mighty Brahmaputra River with their sources in the mountain ranges of the state. The economy is dependent on agriculture which forms the chief occupation of the tribal inhabitants. Nearly one-third of the land area is cultivated by the shifting cultivation technique. The forest regions are being cleared to practice jhum cultivation which has caused the depletion of the natural

vegetation of Nagaland. The surface water resource of the Nagaland is studied by analyzing rainfall data over a period of 30 years (1986-2015) and worked out mean rainfall, rainfall intensity, rainfall variability and rainfall ratio on monthly, seasonal and annual basis. About 16 rain-gauge stations were selected within Nagaland to analyze the rainfall data. The average rainfall is 1536mm and total surface of water resources is 25,465,344,000m^3. On the basis of mean rainfall the annual average groundwater recharge worked out that is 818mm.

Keywords: Rainfall, Rainfall Variability, Temporal analysis

Survival of Street Children Using the Activity Spaces in Kolkata, a Geographical Appraisal

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Abstract

The problem of street children is one of the major social problems. No country or city anywhere in the world today is without the presence of street children, but the problem is most acute in developing countries. Thousand of street children seen in our populous cities like Mumbai, Kolkata, Delhi, and Chennai. The number of street children is increasing gradually. Poverty, unemployment, rapid urbanization, rural-urban migrations are the root causes of street children. Being deprive from many of their, they have escaped to the street as a safe place for living.Street children always related with the urban spaces. After coming to the streets, these children have to cope with the new situation every day. They also adopt or develop many complex livelihood strategies and a variety of different informal or even illegal activities in public space and form supportive social networks in order to survive in street life. Street children use the different suitable urban spaces as their earning, living, entertaining spot these places are activity place or space. In these places, they are very much active to survive. Therefore, the social practice and territorial concept is very much important in the livelihoods of young people on the street. Four hundred and fifty street children are included from the different parts of Kolkata with the help of purposive non-probability sampling methods. This paper tries to explore the spatial practice and activity space concept and copping situation of street children in Kolkata.

Keywords: Street children, Activity space, survival and livelihood

Landslide Hazard Zonation along State Highway between Aizawl City and Aibawk Town in Mizoram Using Geospatial Techniques

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Abstract

Road transport network is one of the most common victims of landslide disaster which in turn affects the population. Landslide is one of the most common geo-environmental hazards in Mizoram due to its fragile geologic conditions and unplanned developmental activities. The present study investigates the Landslide Hazard Zones along State highway between Aizawl city and Aibawk town in Mizoram. This highway is the most important road connecting northern and southern parts of the state. The study utilized the Remote Sensing and Geographic Information System (GIS) techniques. The road was buffered 50 m. on both sides to delineate the study area. The Important factors which induced landslide were identified and also five types of thematic layers such as slope morphometry, geological structures like faults and lineaments, lithology, relative relief and land use / land cover generated. These thematic layers were ranked and weighted based on their relative importance in causing landslides. Each class within a thematic layer was assigned an ordinal rating from 1 to 10 as attribute information in the GIS environment. These attribute values were then multiplied by the corresponding rank values to yield the different zones of landslide hazard. The ground information on landslide occurrences were also considered while classifying the different zones of landslide hazard.The resulting Landslide Hazard Zonation map classified the area into five relative hazard classes like very high, high, moderate, low, and very low. The final map generated will be used by engineers and the administrators for maintenance and monitoring of this state highway to ensure smooth running of transport between the state capital and other important district headquarters in the southern part of Mizoram. Landslide inventory was also conducted and remedial measures suggested.

Keywords: Landslide Hazard Zonation, Remote Sensing, GIS, Aizawl city, Aibawk town.

Application of Geoinformatics in Identification of Geomorphic Characteristics and LULC of Ajodhya Hill, Purulia, West Bengal

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Abstract

Application of geoinformatics techniques in the context of identification of geomorphic characteristics of Ajodhyahill region, situated in plateau fringe of chotonagpur plateau, Purulia district has great significance. The study is formulated for identification of geology, climatology, pedology, drainage system; vegetation as well as geomorphologic characteristics of the region. Geomorphological process is mainly operated through this system. Another objective is to identify, determine and classify the land use and land cover system.

The study can be done through literature review, study and analysis of topographical sheet and other map, Secondly analysis, interpretation and generate cartographic profile of climatic data to establish a prominent scenario of micro and meso climate. Thirdly application of remote sensing data (ETM+, TM, LISS-IV) through remote sensing software, fourthly analysis of SRTM and ASTER data through ArcGIS for surface analysis, fifthly application of image transformation techniques for make better interpretation of satellite data of this area. Foothill region are characterized by very much interactive complex relationship between geology and physiographical parameter. It has experiencing that there is a change of relief, slope, hill shade, soil condition and LULC in respect of change of elevation.

Keywords: Foot hill, Surface analysis, Image transformation, Land use Land cover, Geomorphology

Sand Mining and Its Impact on the Physical Health of the River and the Livelihood of the People, a Case Study of Umtyngar River, Meghalaya

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Abstract

The removal of sand from its natural occurrence is described as sand mining. Focusing on sand mining and its environmental and socio-economic impacts, this paper seeks to explore the current state of sand mining and extraction mechanism and to assess its impact on the river health of Umtyngar river, Meghalaya with reference to the river channel and also on the livelihood of the local community. Using primary data in the form of in-depth interviews, questionnaires and PRA tools, the study found that primarily unemployment influenced people into sand mining. Also, very high profits and regular income from the sales of sand were found to be some of the positive effects of sand mining on livelihoods. With the aid of GIS tools using temporal data for analysing the river health, the study revealed that rampant instream and inland riparian zone sand mining causes an increase in bank erosion and channel shifting of Umtyngar River. In addition, it was found that improper sand mining activities along the river which forms a tributary of the Umiam River on which the Mawphlang Dam, a major source of drinking water supply to the city, is situated has resulted in serious environmental implications to the dam especially during the rainy season when all the sand and pebbles flow from the excavation site.

Keywords: sand mining, livelihood, river health, bank erosion, Umtyngar River

A Study on Relief Characteristics of Tuirini Watershed, Mizoram

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Abstract

The Turini watershed spreading in an area of about 411 km^2 in Mizoram is vulnerable to high rate of erosion due to high degree of slope in addition to heavy precipitation and the sedimentary nature of the terrain. An attempt has been made in this study to analyse the significant topographic parameters such as absolute relief, relative relief, dissection index and average slope using the techniques of remote sensing and Geographical Information Systems in order to understand the appropriate causes for the high rate of erosion in the watershed. It is surmised that the higher values of dissection index, high degree of slope and high drainage density values indicate that the area is prone to high degree of erosion.

Keywords: Absolute relief, relative relief, dissection index, average slope

Determination of Hydraulic Conductivity of Soil from Grain Size Analysis

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Abstract

Hydraulic conductivity is the ease with which water/fluid can move through porous spaces in soil. It is generally determined either through an empirical approach by which hydraulic conductivity is correlated to soil properties or through an experimental approach whereby hydraulic conductivity is calculated by experimentation. In this study, 25 set of soil samples with sand texture from top soil (0 – 30 cm) were collected from different locations of Pare river basin, Arunachal Pradesh. Sieve analysis of soil samples was performed to determine their classification and particle size distribution characteristics. The results showed reliability in predicting the from soil properties. The following equation was developed from multiple linear regressions on data (R^2 = 0.71): $K_s = 12.076d_{10}+5.493d_{60}-7.585d_{50}-0.693$ where, d_{10}, d_{50}, and d_{60} and are the soil particle diameter(mm) for which 10%, 50% and 60% of all the soil particles are finer by weight and K_s is the saturated hydraulic conductivity (m/day). The regression analysis showed that d_{10} played a more significant role with respect to K_s and could be treated as the most effective parameter. Further, when all three parameter were used as input for predicting K_s, estimated K_s was better than single and two parameter linear equations.

Keywords: Hydraulic conductivity, Pare river basin, sieve analysis, particle size distribution and linear regression.

Efficacy of L- Carnitine Supplementation on the Tuibur (Tobacco Smoke Infused Water) Induced Oxidative Stress and Antioxidant Status in Testis of mice

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Abstract

A unique smokeless tobacco products (liquid preparation), made by passing tobacco smoke through water till the preparation turns cognac in colour and has

a pungent smell is used in Mizoram locally known as *tuibur (tobacco smoke infused water).*The major alkaloid component of Tuibur is nicotin, a pharmacologically active and addictive alkaloid component of most of the smokeless tobacco products causing oxidative stress in reproductive organ leading infertility. L-Carnitine is a quaternary ammonium compound biosynthesized from the amino acidslysine and methionine and exert a substantial antioxidant action, thereby providing a protective effect against oxidative stress. The aim of the present study was to determine the ameliorative effects L-Carnitine supplementation against Tuibur induced oxidative stress and antioxidant status of testis.Two different dozes of L-Carnitine (100mg/kg and 200mg/kg) were supplemented against Tuibur (260mg/kg) and Nicotine (0.6mg/kg) orally treated animals for 90 days.The oxidative stress (lipid peroxidation) and antioxidant status (superoxide dismutase, Glutathione reduced and Glutathione S-Transferase) were determined. The results showed significant increased in antioxidant enzyme levels and decreased in lipid peroxidation in L- Carnitine zsupplemented groups in compared to tuibur and nicotine treated groups.

Keywords: Tuibur, L- carnitine, Testis, Antioxidant, oxidative stress.

Scope of Recourse Re-generation by following 3R Policy from Urban Solid Wastes, a Study on Kolkata Municipal Corporation, West Bengal, India

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Abstract

'3R' refers to Reduce, Reuse and Recycle. 'Reduce' stands for minimizing resource wastages, 'Reuse' indicates optimum usage of resources in their original form and 'Recycle' means converting wastes into new products. Nowadays huge amount of solid wastes are generated regularly at every urban centres around the world and conventional open dumping is mainly followed by maximum municipal bodies, which ultimately creates several environmental problems such as land, water, air, odor, visual pollution etc. But this curse can be converted into blessings when wastes will be managed methodically. Even it can be strengthen our economic backbone. The present study has been done on two wards of Kolkata Municipal Corporation

i.e. ward number 115 and 122. The prime objective of the study is to find out a sustainable policy of waste management for Kolkata. Information is collected through door to door questionnaire survey from households and Solid Waste Management Department of Kolkata Municipal Corporation. People's attitudes and initiatives taken from the responsible authority to convert wastes into recourses are taken as indicators. The major findings have revealed that the potentialities of sustainable waste conversion are quite satisfactory in case of Kolkata but a proper master plan is needed to be formulated immediately.

Keywords: Solid waste generation, disposal, recycling, 3R policy, management.

Estimation of Soil erosion of the Muhuri River Basin, Tripura, using GIS and Remote Sensing to Recognize Priority Areas for Conservation

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Abstract

Soil erosion becomes a common problem with the expansion of cultivated land and various anthropogenic activities. Estimation of soil erosion is significantly useful for watershed development programme of a basin. Modelling of soil erosion is more imperative where river sedimentation problems are soaring. In the present study, the Universal Soil Loss Equation (USLE) integrated with GIS and Remote Sensing has been used to estimate the soil erosion of the Muhuri River basin, Tripura, India. Moreover, the study has assessed the potential priority areas for soil conservation in the basin. Average annual soil erosion has been estimated by multiplying five parameters, i.e., rainfall erosivity factor (R), soil erodibility factor (K), topographic factor (LS), crop management factor (C) and conservation support practices (P). The whole study area has been sub-divided into 16 sub-watersheds in order to identify the priority areas. The results indicate that the estimated annual potential soil erosion ranges between 3.07 to 101.06 t ha^{-1} $year^{-1}$. About 52 percent area of the whole basin fall under low soil erosion zone, whereas, moderate, high, very high and severe erosion potential zones occupy about 38 percent, six percent, three percent and two percent area respectively. Though the result is not decidedly alarming still the basin is in need of contemplation for developing awareness among the people for soil conservation.

Keywords: Muhuri Basin, soil erosion, USLE, sub-watersheds, awareness

Empowerment of Women in West Bengal: The Role of Kanyashree Prakalpa

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Abstract

In the arena of developmental studies the central theme is to analyses the impact of various developmental projects on the indigenous people of a definite area. The impact of any development project is not only limited to the economic field but also has social and cultural aspects. The arena of social change in West Bengal and India has accelerated in recent years; though there are numerous problems of gender inequality prevails till today. Women are the most important focus group in the study of marginality. A section of women in West Bengal are commonly portrayed as among the most oppressed, and majority of them are grounded in both poverty and patriarchy. Marginality have been researched extensively, especially during the 1960s and 1970s within the context of rapid urbanization in country like India, because developmental projects are not actually democratic. The objective of This paper is tries to analyze the life of women who are affected in the process of marginalization and how the "kanyashree" acts as a helping tool of women and also create a positive impact on reducing child marriage, improving maternal health, school dropouts and girl child trafficking in present time on the basis of various report of central and state government and interaction and perception analysis of local people in root level. Survey reveals that Murshidabad, Malda, Birbhum, Purulia, Bankura, Dakshin Dinajpur, South 24 Parganas, Nadia and Coochbehar are more vulnerable districts where there is the highest incidence of child marriage in the state. According to the DLHS -3, 2007-08 percentages of child brides were 54.7%, which has reduced to 32.1% in the year 2012-13.

Keywords: Marginality, Kanyashree Prakalpa, child marriage, girl child trafficking.

Expansion of Food Processing Industry in Rural Areas of West Bengal: A New Horizon in Rural Livelihood

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Abstract

The rural livelihood of West Bengal, a monsoon fed State of India, depends mainly on agricultural activities. This State is going through seasonal rhythm

that provides different crop combinations on one hand and diversification of the products on the other. Different districts of this State produce various kinds of agricultural resources which may be used as raw materials for food processing industries. Through the expansion of this category of industry optimum utilization of agro- resourcesis possible and wastage of perishable agro-products out of bumper crops may be minimized. The prime objective of this study is to identify the role of food processing industry on rural livelihood and economy. This study is based on primary and secondary data. Various statistical techniques have been applied based on stratified random sampling. Surplus labours of agricultural sector can easily be utilized through establishment of food processing and canning industry. Adoption of proper agro-marketing strategies is most important factors for expansion of this industry. To secure the market abolition of intermediaries between market and the farmers is necessary and more emphasis to be given on contract farming by which one farmer can easily sell his products with good margin of profit.Introduction of cooperative system is a pre-requisite for the success of the rural people. Initiatives have already been taken by the State Government through set up of agri-export zone, quality control laboratory, and agglomeration of industries under one large umbrella like Food Park which may provide a new horizon of livelihood to the rural people in future.

Keywords: different crop combinations, surplus labour force, agro-marketing strategies, contract farming, cooperative system, Food Park

Detection of Virulence genes of *Salmonella* Typhimurium from Fish Sold in Local Markets of Aizawl, Mizoram, India

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Abstract

Salmonella Typhimurium has been considered as one of the major cause of food borne diseases worldwide transmitted to human mainly by contaminated food. Polymerized chain reaction is a reliable method for detection and identification of food borne pathogens. The study observed the *Salmonella* strains isolated from 60 raw fish samples collected from local fish markets of Aizawl during September – November, 2015. The *Salmonella* strains were isolated by using conventional phenotypic methods and sero typing of the isolates was based on agglutination with somatic (O) and flagellar (H) antigens. The *Salmonella* isolates were further confirmed by detection of *16S rRNA* gene and screened for the presence of virulence

genes namely *invA, stn, pefA, spv C* and *sefC*. From the 6 phenotypically positive *Salmonella* isolates, 4 isolates were serotypically detected as *S.* Typhimurium. All the four *S.* Typhimurium strains were positive for *16S rRNA ,invA, stn, pefA* and *spv C* genes.

A Comparative Analysis on the Aquifer Disposition of Kamrup and Darrang Districts, Assam

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Abstract

The aquifer system of any area is determined by the geological, lithological and physiographic settings. The aquifer system of the entire Brahmaputra valley including Kamrup and Darrang district is of unconsolidated formation. The lithology of a rock unit determines the aquifer disposition in terms of porosity, permeability and water saturation. The Kamrup and Darrang districts of Assam comprise spatially different lithological characters providing different aquifer disposition and ground water potentiality. For the duration of 102 years (1901-2002), The Kamrup and Darrang districts have the ranges of total annual rainfall amounting 5429.84 mm to 2301.26 mm and 3859.71 mm to 2001.71 mm. The quantity of gross dynamic GWR of Kamrup and Darrang districts are 1035.44 mcm and 1121.73 mcm (CGWB report, 2013). The comparative assessment of aquifer disposition in different lithological zones in the study area will assist in understanding the potential ground water. The Kamrup and Darrang districts of Assam extend in between $25^0 42' 03''$ to $26^0 50' 10''$ N and $90^0 48' 01''$ to $92^0 27''$ E. This paper attempts partly to highlight the comparative pattern of aquifer disposition in different ground water potential zones and partly some relevant aspects in the study area based on the collected data.

Keywords: Aquifer, Lithology, unconsolidated, Replenishable, disposition.

Spatio-Temporal Analysis of Channel Morphology of Raidak River-II in Alipurduar District, West Bengal, India

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Abstract

The Raidak River-II channel is dynamic in nature due to fluvial process of erosion and deposition at different rates. This dynamic change is mainly influenced by

the volume of water, size and quantity of erosional materials contained in river Raidak-II in different season especially in monsoon. At Alipurduar district, there are numbers of bar, islands of various size have been formed and also transformed their shape, size and location in every year. The channel of Raidak river-II is not static also. It has been migrated in different direction. In order to understand the morpho-dynamics of the Raidak river-II channel at Alipurduar district, a period of 40 years (1978-2016) has been taken for analysis. The study is based on both primary and secondary data. The temporal change of the channel morphology have been studied from topographical map and LANDSAT MSS, TM, ETM+ digital data in three different periods i.e,1978-1990, 1990-2001 and 2001-2016. Different morphological features of the channel have been computed from SOI topographical map, landsat images in four different years – 1980, 1990, 2001 and 2016. Primary data were collected during field visit in 2016 in different seasons (pre-monsoon,monsoon and post monsoon). The study is mainly discussed the channel morphology and temporal change of channel morphology.

Keywords: channel morphology, fluvial process, and temporal change

Health Status of Elderly in Hingnara Gram Panchayat, Chakdaha C.D. Block, Nadia, West Bengal

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Abstract

Aging is a contemporary global issue as elderly are suffering from economic insecurity, health problem, insufficient shelter, mental disorder, loneliness and different sorts of inhuman treatments etc.This empirical research work has been done in Hingnara Gram Panchayat of Chakdaha C.D. block in Nadia district, West Bengal through the method of purposive sampling of 315 respondents. 58.73% aged people who do not have any source of income. 32.69% aged people have been suffering with two to four types of diseases at a time mainly from arthritis, heart problem, low and high blood pressure, gastrointestinal, respiratory disorders, diabetes including cough and cold.51.80% of aged people have consulted with quack doctors due to their low level of income. Health condition of the remaining elderly population are as normal only (24.5%), good (9.5%) and very good (5.7%). It is

indicated that health condition of the aged is not satisfactory.On the other hand, in this study area, 30.2% of the elderly people are under underweight condition (BMI<18.5), 42.5% belong to healthy (BMI 18.5-24.9) and 24.4% in 25-29.9 BMI and 2.9% in >30 BMI (obese).Thus, this research study has been focused to find out the realistic measures for the miseries.

Keywords: Aging, Economic Insecurity, Loneliness, BMI

Impact of Climate Change on Human Comfort and its Relation in Market Rise of Electronic Gadgets, a Case Study of Kolkata City, India

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Abstract

People of Kolkata city are suffering from uncomfortable weather condition with rising temperature and humidity rather the climatic conditions are changing and also it has an adverse impact on the human health and comfort as well as it's also indirectly leading the market of electronic gadgets. Some of the weather elements determine human comfort likely temperature, relative humidity, solar radiation etc. Most extremely the rising temperature of the city Kolkata is determining the status of human comfort. Temperature influences human bodies through internal and external heat while the internal body heat is lesser effective than the external body heat regarding the human comfort. Humidity level is also a determining factor in respect to human comfort. The comfortable weather condition may have 73° to 83° F temperature and 27% to 80% humidity as per summer human comfort level. In the recent time people are taking some of electronic goods and gadgets (Air-condition, Cooler, Refrigerator, Fan etc) which can make artificial comfortable weather condition. The present study has analysed the changes in climatic condition of Kolkata city to identify the rising temperature and humidity in respect to human comfort based on the IMD data through statistical analysis and it also tried to find out how the rising temperature and humidity leading the market rise of electronic gadgets in Kolkata city.

Keywords: Climate change, Human comfort, selling of electronic goods.

Prevalence of New Castle Disease in Village Chicken of Mizoram, India

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Abstract

The poultry industry in Mizoram is still dominated by village chicken production and high incidence of diseases is the top ranked constraint in this enterprise. New Castle disease (ND) is the most devastating disease and frequent outbreaks are reported with high mortality rates in affected flocks. The occurrence of NewCastle disease was studied on the basis of farmer's perception, history, clinical signs and post mortem findings in 1387 numbers of birds from 60 numbers of randomly selected households keeping village poultry in Mizoram. The serological detection of the virus was carried out on 170 randomly collected sera samples from surviving birds of ND affected flocks or in-contact birds, apparently healthy unvaccinated birds and slaughtered chicken in local market by using haem agglutination inhibition (HI) test. The overall incidence of ND was 23. 14% with mortality rate of 18.60%. However, the overall sero prevalence of ND virus was recorded as 35. 88% with 86. 67% in in-contact/ surviving birds, 17.14% in unvaccinated apparently healthy birds and 18.18% in slaughtered birds. The distribution of antibody titre (log2) was found in the range of 0 to 9.

Keywords: New Castle disease, prevalence, haemagglutination inhibition, village chicken, Mizoram.

Zonation of Landslide Susceptibility and Risk Assessment in and around Serchhip Town, Mizoram

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Abstract

A landslide is the downward-slope movement of soil, rock or organic material under the influence of gravity. It can be caused by a variety of reasons like intense or prolonged rainfall, earthquakes, geomorphology, slope variations and human activities. Landslides includes debris flow, slide, toppling or falling movements, and many landslides exhibit a combination of two or more types of movements. Mizoram is one of the most landslide disastrous prone in India. The State experienced landslides

yearly during monsoon season. The extent of damage caused varies considerably from place to place, mainly caused by human activities, geological processes assisted by environmental processes. The study area lies in the southern part of the Aizawl district. Remote Sensing and GIS techniques are used. Satellite data are utilized for mapping and preparing landslide hazard zones. Risk assessment is the final goal. The main objectives are to assess the risk, vulnerability of landslides, mapping and classify the zones of landslide hazards and suggest preventive and remedial measures, methods involves extensive fieldworks and data collections, creation of thematic layers and data analysis. From the present study, it is observed that human activities paired with natural factors have made many parts of Serchhip highly prone to landslides.

Keywords: Mizoram, Serchhip, Landslide, Remote Sensing, GIS.

Sustainability of Rurban Settlements in an Urbanizing Milieu, a Probe into Selected Parts of Haora District, West Bengal

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Abstract

Rurban settlements are basically hybrid settlements symbolizing a blend of *rural* and *urban characteristics.* Between the dualism of two dichotomous but interactive components of human settlement, viz. urban and rural, a concept pertaining to their hybridization has been emerging significantly. The present study focuses on the issues of sustainability of rurban settlements in selected parts (Domjur and Panchla Blocks) of Haora — the smallest but the most urbanized district (excluding Kolkata) in West Bengal, India. The urban landscape of the district is dominated by a large number of census towns and only three statutory towns with 63.38% urban population as against 36.62 % rural population. The prime objectives of this research are: i) to observe the process of rurbanisation in Haora District, ii) to identify the rurban centres (ii) to analyse the potentials of these identified settlements in terms of their infrastructure and (iii) to suggest the necessities to be introduced in these settlements. The methodology applied here includes rurban index, gravity model, functional classification of rurban centres, correlation and regression analysis and cartographic representation of data collected through primary and secondary sources.The sustainability ofthese quasi-urban settlements depends largely on strengthening the intrinsic services which simultaneously de burden the urban areas; it may ultimately lead to balanced regional development.

Keywords: Rurban, Sustainability, Census Town, Quasi-Urban, Regional Development

Migration and Development: A Study on Financial Capital Formation of Seasonal migrants in Golamunda Block, Kalahandi, Odisha

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Abstract

Migration in general and seasonal migration in particular is becoming a livelihood strategies and a source of development for many people throughout the country. The study area will be selected of critical drought prone area of Odisha i.e. kalahandi district and particularly Golamunda block from where people are migrating on a seasonal basis to different parts of the country to earn their basic livelihood. The aim of the paper is to see the formation of financial capital and utilization of their saving in a rural migrant prone area of the country. The paper will be based on the primary survey as taking the three villages of dominant caste categories viz. scheduled caste, scheduled tribe and others dominant caste village. This study will observe the income and expenditure in a monthly earn seasonal basis of some of the selected variables. The study will also depict the utilization of saving in their villages and try to figure out the significant factors which are mostly beneficial to the poor migrants who are going out seasonally and getting the benefit out of it.

Keywords: Migration, Financial Capital, Seasonal Migration, Drought Prone Area, Livelihood

Growth Hormone Gene Polymorphism and its Association with Performance Trait in Mizoram Local Pig "Zovawk"

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Abstract

In North eastern India, pork is the choice of meat. There is very high demand for the meat of Mizoram local pig "Zovawk" because of its deliciousness. The porcine growth hormone (GH) gene is considered to be one of the most important candidate genes that can influence porcine performance traits because of its crucial

function in growth and metabolism. So looking to the importance of local pig "Zovawk" in the region a study was undertaken to find association between growth hormone gene variants and growth rate in zovawk. The PCR-RFLP digested product revealed three genotypes in Mizo local pig population. The genotype AA was found predominantly (0.45) as compare to the other genotypes AB and BB in the population. The frequency of A and B alleles were 0.60 and 0.40 in the population. The different genotypes did not show any significant effect on the growth performance at different age groups in the population. This may be further verified by including more samples in the study.

Keywords: Pig, Zovawk, Growth formone, performance

Acute Toxicity Study of Various Extracts of *Calocasia gigantean* (Blume) Hook.f. on Swiss Albino Mice

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Abstract

The acute toxic effects of different doses of various extracts of *Calocasia gigantean* (CG) was studied in mice. The intraperitoneal administration of different CG extracts showed a dose dependent increase in the acute toxicity in mice. The toxic effects of ethanol extract were highest when compared to the chloroform and aqueous extracts of *Calocasia gigantean*. The $LD_{50}$was 0.2 g/kg b. wt. for ethanol extract, whereas it was 0.3 g/kg b. wt. for chloroform and aqueous extracts respectively.

Keywords: Acute toxicity, *Calocasia gigantean,* intraperitoneal, ethanol and $LD_{50.}$

Changing Scenario in the Cultural Landscape of Bhojpuri Region, a Case Study of Muradev Village in Varanasi District

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Abstract

The word 'Bhojpuri' implies a language and the people who speak that language. People in several districts of western Bihar and eastern Uttar Pradesh, some area of Jharkhand and a little stretch of Nepal alongside the lower range of the

Himalayas speak Bhojpuri in their unique local flavours. A cultural landscape is as a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values. The present work is based on case study of Muradev village in Varanasi district. Here the study attempts to analyse the agricultural and settlement based changes which occurred during different phase of time. As we know that "cultural landscape is the mirror of society", thus the whole study is focused on how the cultural landscape of a village witnessed by the several changes like biological, technological, economic and other governmental policies. As there is scarcity of social histories on this region, we will begin with the socio-historical knowledge generated by colonial administrative officers specifically, Grierson and O'Malley. The methodology of the study is selective interview, participatory mapping and observation. The study map is prepared with the help of ArcGIS software.

Keywords: Bhojpuri, cultural landscape, settlement.

Economic Dynamicity of Sunderban, a Perception Study

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Abstract

The dynamicity of an economy due to natural hazards is determined by a complex set of influences. Being a dynamic platform of riverine aspects the admixture of sweet and saline water, sever tropical cyclones, devastating floods result a problematic condition for the people living in the fragile environment of Sunderban cost. Major natural disasters have sever negative short run economic impacts. Due to such frequent disasters the loss of soil fertility and loss of crops ultimately affects the local economy of that region. It has changed the land use pattern as well as the socio-economic structure and livelihood of that region. The main objective of the study is to represent the dynamically changing scenario of socio-economic pattern of Sunderban region and suggest some mitigating methods to sustain it. Some secondary weather data and some primary data about the socio-economy and livelihood of that region are analyzed in this study. It is found that the people are in search of alternate economy instead of the prevailing traditional process.

Keywords: Fragile environment,frequent disaster, Life and property loss, Changing scenario, Alternate economy.

Education, Health and Women Empowerment in West Bengal

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Abstract

Women's empowerment in West Bengal is dependent on many different factors some importance are economical, educational and social status (caste and class). Education is the key factor for women empowerment, women prosperity, development and welfare of the women's. Education is one of the landmarks of women empowerment because it supports them to responds to the challenges, to confront their traditional role and change their life according to the society need. In West Bengal there is continued inequality and vulnerability of women in all sectors like Education, Social, Economic, Political, Health Care, Nutrition etc. This is an attempt to find out the gap between male-female literacy rate in West Bengal in relation with educational facility and women empowerment. Paper brings the notion that the major reason for spatial inequality of education and women empowerment in West Bengal. For this study all districts of West Bengal are categorized into five groups these are very high, high, medium, low and very low. The present study has been based on mainly secondary sources of data. It has been found that average literacy rate of West Bengal in 2011 were 77.08 compared to 68.64 of 2001. If things are looked out at gender wise, male and female literacy were 82.67 and 71.16 respectively and the growth of women's education in rural areas is very slow then the urban in 2011. Workforce participation rate of women is 18.08, male is 57.07 and total 38.08 respectively in 2011.

Keywords: Education, Female Literacy Rate, Health and Women Empowerment.

Grass Root Level Analysis of Food Security Status of Small Farming Households in Koch Bihar District, West Bengal

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Abstract

Food security is one of the major dimensions of health condition of the people. In the most recent times, no human right has been so frequently and spectacularly violated as the right to food. In the light of the global food crisis, this paper analyzed

the food security status of farming households in Koch Bihar District of West Bengal.The proper nutrition is important to lead a good quality of life and thereby a healthy development of the rural people. Descriptive statistics were used to assess the socio-economic characteristics of the households and the Food Security Index was used to measure the household food security status. The nutritional dimension is integral to the concept of food security. Major objectives of the study is to find out the nutritional status and level of food security of the farming households which has been obtained with the help of some general physical examination and dietary assessment in the study area and also examine the body mass index status of adult and children. This paper also presents some micro level sustainable policy measures and suggestions to improve the food and nutrition security and health condition of the farming households in the study area. The study is basically based on both primary and secondary data sources relating to food security of the farming households in the Koch Bihar district. In the study area, it is observed that more than 40 percent farming households among the selected households of Koch Bihar district face food insecurity problem and also has poor health condition. Lack of food is the major causes of malnutrition in the study area, where more than 35 percent people face underweight problem.

Keywords: Food Security, Farming Households, Nutritional Status and Socio-economic Condition.

Community Based Wetland Entitlement and Food Security: A case study in *Hail Haor* (Hail Wetland)

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Abstract

Bangladesh has enormous wetland where one sixth portion population are living. These wetlands are also major sources of fish and rice; however, wetland resources are declining because of over fishing and loss of habitat. Consequently, substantial number of people have been confronting food insecurity problems. Government has adopted community based resource management initiatives with local NGOs for ensuring wetland resource conservation and food security. This study measured the

impact of community resource management on food security including food access, stability and utilization among the co-management shareholders. Sen's entitlement failure theory has followed for theoretical framework. Data has collected by social survey as well as different statistical methods like Direct Calorie Intake (DCI), Gini coefficient (GC) and Discrimination Index (DI) have been used for calculating food security situation. Study found that, two groups of people like resource user group (RUG) and resource management organization (RMO) are involved with the co-management. However, RMO have better food access, stability and utilization capacity than the RUG. Most of the member of RMO are rural elite and they have better resource access due to the local power dynamism. Although resources are abundant, RUG people cannot access in wetland resources. Consequently, its reducing their food stability around the year. Moreover, these sever food instability also deteriorates their nutrition, sanitation and hygienic conditions.

Keywords: Community based organization, Entitlement, Food security, Resources management, Resources user groups.

Evaluation of Phytochemical and Acute Toxicity of Various Extracts of *Croton caudatus* Geiseler

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Abstract

Croton caudatus Geiseler is widely used in the northeast region of India to treat several diseases in humans. The aim of the present study was to investigate the phytochemical basis of its medicinal use and the acute toxic effects of various extracts of *Croton caudatus* leaf (CCE).The mature leaves of *Croton caudatus* were collected, dried and powdered. The powdered material was sequentially extracted in petroleum ether, chloroform, ethyl alcohol and water. The cooled liquid extracts were concentrated by evaporating their liquid contents under reduced pressure at room temperature. And concentrated *in vacuo* and stored at -70°C until further use. Qualitative phytochemical analysis, TLC profiling and the acute toxic effects of different doses of various extracts of *Croton caudatus* leaf were carried out using standard protocols. The *Croton caudatus* was found to contain alkaloids, phytosterols, saponins, phlobatannins, cardiac glycosides, flavonoids, phenolics and terpenoids. The intraperitoneal administration of different CCEs showed a dose dependent

increase in the acute toxicity in mice. The LD_{50} was 0.25 g/kg b. wt. for aqueous CCE, whereas it was 0.5 g/kg b. wt. for chloroform and ethanol extracts, respectively.

Keywords: *Croton caudatus*, phytochemical, TLC, LD_{50} and acute toxicity.

Extent of Empowerment in Rural Community Health Workers, a Case Study of ASHA Workers in Rural Murshidabud

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Abstract

The ASHA worker (Accredited Social Health Activists) is the female cadres of villages who are selected and trained to provide preventive healthcare to the community specifically Reproductive and Child Health. National Rural Health Mission flagship programme initiated various measures to build capacity of these selected health workers to increase communities' participation in health decisions and eventually lead to empowerment. In this backdrop the current study tries to measure whether ASHAs have gained empowerment in real terms. To reach to this objective a sample of 193 ASHAs were surveyed in Khargram Block of Murshidabud. A health empowerment index is formed considering eight domains like production, autonomy in health decision, financial control etc. The 'Health Empowerment Index' highlights that the empowerment is quite low in ASHAs. They are conceived as link workers and not the community based representatives who can take decisions on health requirements of the community. There is still room for improvement of participation of ASHA workers within the framework of National Rural Health Mission through greater capacity building in terms of training, selection, financial support and incentives.

Floristic Composition and Structure of Urban Landscapes of Agartala, Tripura

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Abstract

Urban parks, gardens and natural landscapes are better known for their non-market or intangible benefits than market or tangible benefits. An urban forest

assessment is essential for developing a baseline from which to measure changes and trends. Urban open green spaces play an important role in offering town-dwellers a more stress free environment, irrespective of sex, age or socio-economic background. This paper assesses the perennial land use type, their floristic composition and structure of the urban forests of Agartala, Tripura. Multi-Stage Sampling was used to access the species composition, number, crown characteristics and tree characters. The results showed that the maximum landuse type in the urban ecosystem belongs to the open spaces followed by housing area. A total of 111 species belonging to 91 genera and 48 families were reported. Three endangered and two vulnerable species were also reported. The maximum volume, frequency, abundance and density were observed for *Careya arborea* (2.25), *Artocarpus heterophyllus* (39.29), *Hevea brassiliensis* (12.50)and *Caryo tamitis* (2.46), respectively. It was visualized that species occurring on landscapes used by various households had most of the species which contributed directly to their multifarious uses and similar was true with other landuse practices.

Keywords: Urban forestry, Land use type, Floristic composition, Tree diversity, Urban ecosystem.

Application of Remote Sensing and GIS for Hypsometric Analysis of Chite Lui Watershed in Aizawl District of Mizoram

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Abstract

Geographic Information System (GIS) aided Hypsometric analysis of watershed i.e. area-elevation analysis is generally used to understand the stage of geomorphic evolution such as youth, mature and old stages. Hypsometric Integral quantifies the geologic stages of development and erosion prone-ness of the watersheds. The present study emphases on identifying the erosion status of watersheds and prioritizes them for undertaking soil and water conservation measures. The total number of six sub-catchments of Chite Lui watershed analyzed in the present study and hypsometric analysis was carried out for all of them using digital contour lines which are generated by using Arc GIS on CARTOSAT Digital Elevation Model (DEM) data. Survey of India (SOI) toposheets on 1:50,000 scales are used for the drainage boundary delineation. The Hypsometric curve for the sub-catchment were prepared by using the Strahler's (1952) percentage method from which the ratios of a/A and h/H were plotted. Hypsometric Integrals were

estimated by using Elevation-relief ratio method. In the sub-catchments like C and D catchments widening is accompanied by significant channel networking and high rate of erosion leading to mass accumulation and simultaneous deposition increases at their mouths. The hypsometric curve of sub-catchments B, E and F shows S-shape indicating mature stage of development of the sub-catchments. The Hypsometric Integral values for the six sub-catchments ranges from 0.47 to 0.56 which signifies that the watershed is attaining equilibrium (mature) stage of development.

Keywords: Hypsometry, GIS, CARTOSAT, Chite Lui watershed, Aizawl district.

Identification of Surface Temperature areas and its Relation with Vegetation Cover Using RS & GIS at Agartala, Tripura

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Abstract

Agartala is the capital of Indian State, Tripura and second largest city in North-East India after Guwahati both in area and population. The area of Agartala in 1901 was 8 sq. km. but after 1971, the area of Agartala is expanding with its own pace due to huge influx of refugees from erstwhile East Pakistan. Agartala is acted as the nucleus of urbanization in the state and attracted migrants from different parts of the state. Rapid urbanization and decreasing vegetation cover at Agartala last three decades negatively alter the city's temperature regime and vegetation cover. The knowledge of surface temperature and vegetation cover, both are important to a range of issues and themes in earth sciences central to urban climatology, global environmental change and human-environment interactions. In the study, an attempt has been made to estimate the surface temperature over Agartala area using Landsat imageries of different years to find out the relation between vegetation cover and to understand the micro climate of the city using remote sensing data. When climate is not favorable, than sustainability of that area is hampered. People have to bear the extreme events and pay for it as they have not maintained the quality of environment. The results suggest that the methodology is feasible to estimate NDVI, surface emissivity and surface temperature with reasonable accuracy over the study area.

Impact of Population Pressure on Landscape Changes in Aizawl City, a Spatio-Temporal Analysis Using Geoinformatics

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Abstract

Aizawl is one of the rapidly urbanized hill cities in the country. The rapid development has led to unplanned expansion of the city even over steep and precipituous slopes with heavliy loaded structures. As the terrrain of the area is composed of unconsolidated sedimenatry formations it is prone to frequent slope failures and subsequent physical land degradation at several places in the city. An attempt has been made in this study to analyze the possible causes for drastic landcsape changes based on the integration of multi-thematic layers, multi-date satellite imagery and digital elevation models using the advanced tools of ArcGIS software. The population pressure appears to be one of the main causes for the landcsape changes as revealed by the block-wise spatio-temporal analysis of the population data. It has been estimated based on the digital terrain analyses that about 20 km^2 out of the total area of about 120 km^2 of the city is under the threat of physical degradation of the land due to drastic land use changes mostly by human induced causes in addition to some peculiar physical factors like highly undulating topography, nature of the rock material, heavy precipitation and tectonic influence to certain extent.

Keywords: Slope failure, landscape changes, land degradtion, spatio-temporal analysis, teconic influence.

Integrated Watershed Management in Minnesota, USA

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Abstract

This paper will describe water planning in the State of Minnesota from the perspective of a local watershed management organization. The paper provides a primer of Minnesota watershed management law which created the Mississippi Watershed Management Organization (MWMO). I will describe basic water policy and structures, e.g. state agency roles vs. local units of government roles, as defined by state statute; then, I will describe the MWMO organizational structure and how it operates at the local level to set environmental standards and goals, raises funds, and

implements planning, assessments, modeling, monitoring and implements projects byfocusing on some of the current collaborative projects, initiatives and actions the MWMO undertakes to implement its Comprehensive Watershed Management Plan.

Keywords: Water Planning, Watershed Management, Water Assessment, Water Monitoring and Project Collaboration.

Effect of Seed Source on Reproductive Traits of *Parkia timoriana*

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Abstract

Parkia timoriana (Tree bean) is an important agroforestry tree species widely distributed across North East India and other South East Asian countries. A survey was conducted in twelve sites under four states of North East India which happen to be the important source of seeds of the tree. The states were Mizoram, Manipur, Nagaland and Meghalaya, having altitude range from 60 metre to 1425 metre above mean sea level and area range from 23°11′26″N to 25°45′30″N and 91°54′99″E to 93°56′25″E. The purpose of the study was to determine if there was any significant relationship between the source of seed of *P. timoriana* and the tree's reproductive traits. These include the study of geographic, edaphic and the tree's morphological characteristics. The study revealed highest value of tree morphological traits in trees from Sumer (Meghalaya) and Serchhip (Mizoram), while least was observed in case of Langol (Manipur) and Lunglei (Mizoram). Pod and seeds characteristics of the trees from these regions showed mix result. Relationship between tree morphological traits and seed characteristics showed little significance while among the traits, both parameters gave good correlation. Fair and significant relationship was also found when correlation was checked between geographic variables and seed characteristics.

Keywords: Seed source, geographic, edaphic, morphologicaltraits

Climate Change and its Impact on Food Security

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Abstract

Global climate change influences all aspects of our daily lives, and it will for many years to come. Climate change has added to the enormity of food security

challenges. During the last two decades, 200 million have been lifted out of hunger and the prevalence of chronic malnutrition in children has decreased from 40 to 26 percent. In spite of this progress, according to the World Bank, 702 million people still live in extreme poverty and, according to this year's report on the State of Food Insecurity in the World (SOFI), 793 million people are undernourished. To assess all aspects of climate change and its impact and formulate realistic strategies to mitigate these effects, the Intergovernmental Panel on Climate Change (IPCC) was founded in 1988. So, climate change will have an impact on human health, livelihood assets, food production and distribution channels, as well as changing purchasing power and market flows. Food systems will also be affected through possible internal and international migration, resource- based conflicts and civil unrest triggered by climate change and its impacts. So, this paper provides background information on the interrelationship between climate change and food security, and ways to deal with the new threat. While the relationship between climate change and food security is complex, most studies focus on one dimension of food security, i.e., food availability. This paper discusses the impact of climate change on food security, keeping in mind three dimensions — availability, access, and absorption. Methodology of this paper based on secondary data. It finds that ensuring food security in the face of climate change will be a formidable challenge and recommends, among others, the adoption of sustainable agricultural practices, greater emphasis on urban food security and public health, provision of livelihood security, and long-term relief measures in the event of natural disasters.

Keywords: SOFI, climate change, Food security, IPCC, Food availability, Accessibility and Absorption, Sustainable development.

Comparison of Rainfall Records of Mizoram, India by Means of Isohyetal Maps Generated Using GIS Techique

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Abstract

Climate is one of the most important factors which controls human's activities like agriculture, forestry, supply of water, industries, etc. The elements of climate that control the economic development of a region are mainly rainfall and temperature. Mizoram is blessed with abundant rainfall and the amount of annual rainfall varies from place to place due to variation in elevation and topography. Rainfall data of Mizoram has been recorded by different agencies. Since, rainfall data is highly crucial for planning different kinds of developmental schemes, well-organized rainfall record and reliable isohyetal map is highly essential. The

objective of the study is to compare rainfall data recorded by different agencies using a GIS technology in order to establish trustworthy isohyetal map of the state. All the rain gauge stations were plotted in a GIS environment with the amount of average annual rainfall as their attribute. Then, Isohyetal maps were prepared for the entire state from each of the records separately. Spatial interpolation technique through Inverse Distance Weighted (IDW) approach has been used in the present study for generating spatial distribution of rainfall. The resulting maps prepared based on different records show different isohyetal maps for the state. These diverse maps indicate the dissimilarity of records of different agencies for the same environmental factor. However, these maps may be fine-tuned to composed dependable maps showing the average amount of rainfall in order to carry out different developmental activities for the entire state.

Keywords: GIS; Interpolation; Isohyetal map; Mizoram; Rain gauge.

Isolation of Bornesitol from *Helicia nilagirica* Bedd

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Abstract

Helicia nilagirica Bedd.is a medium sized tree belonging to the family Proteaceae. It is commonly known as 'Pasaltakaza' in Mizoram, Northeast India. Traditionally, a decoction prepared by boiling the leaves or bark is used for various stomach ailments including peptic ulcer and indigestion by the people of Mizoram. It is also used in scabies and other skin diseases. The bark of the plant was air dried and extracted successively with petroleum ether, chloroform and methanol. Phytochemical screening was carried out according to standard procedures on the methanolic bark extract of the plant. The presence of flavonoids, glycosides, steroids and carbohydrates was indicated by the tests conducted. Two compounds, beta-sitosterol and daucosterol were isolated using column chromatography and structure elucidation was done using NMR and Mass Spectroscopy. A white crystalline compound was isolated from the concentrated methanolic extract, structure elucidation was done using NMR and Mass Spectroscopy and the compound was identified as Bornesitol, a cyclitol.

Keywords: *Helicia nilagirica* Bedd., Phytochemical, Isolation, Spectroscopy, Bonesitol.

Past and Present of the Sewage and Drainage of Kolkata, a Brief Overview

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Abstract

Kolkata,the city of Joy, established by the British to enhance their business but today it is suffering from poor drainage system. Kolkata had its natural drainage through Khals joining salt lakes ith Hooghly River but the Great cyclone made this useless,then many schemes came up like Clarkes scheme, Suburban Improvement Committee and finally Dr. Birendranth Dey planned a scheme for the betterment of the sewage and drainage of kolkata. Maps and data are collected from KMC and some Primary data are collected from House hold survey through questionnaire. Then data are analysed and complied and then represented in graphical method. This present paper Will analyse the detoriation and development of sewage and drainage in Kolkata and steps may be taken to improve the khals.

Keywords: Sewage, East kolkata wetlands, Bidyadhari River, kolkata drainage, khals.

Quality Assessment of Groundwater Resources of the Water samples collected from Villages along the Kali River

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Abstract

Groundwater plays a significant role in the maintenance of India's economy, environment and standard of living. Groundwater is one of the most important sources of freshwater, but with time groundwater level is receding day by day with its depletion it is also getting polluted. The same condition is prevalent in Meerut district too. Its groundwater level is receding besides as the Kali River is getting polluted it is polluting the groundwater of the nearby villages too. Thus in the present study an effort has been made to find out the depth of the groundwater and to make a quality assessment of the groundwater of the villages lying along the Kali river. The work is based on both primary and secondary data, water sample were collected from the villages lying along the Kali River and their quality was tested and the groundwater depth was analyzed from the groundwater data collected from the groundwater cell.

Keywords: Groundwater, Receding, Quality assessment, Polluted, Groundwater depth

Climate Trends in the Indian Sunderban Region and Problems of Adaptation

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Abstract

Climate, comprising the changing weathers of a region, is one of the most important factors for the life and living of people concerned. On a long term basis climate of any region is expected to change, but the significance of such change should draw more attention when people are in a difficult position to adapt with the changed situation. At present climate change, although has many scientific and political-economic dimensions, is mainly trying to focus on the various issues of climate risks, vulnerabilities and problems of adaptation. Since the concentration of population is more within a relatively small geographic area of the humid tropics, e.g. in the Sunderban area, climate trends of the region should get due importance in research and policy of our society. Coastal location of the Sunderban, the southernmost and active part of the Ganga delta, is naturally very sensitive. The region is frequented by a number of cyclonic storms for about six months of a year. Besides, the threat of sea level rise due to the current global warming scenario, ingression of saline water from storm surge on breaching of the embankments, are some of the most pressing problems of the region. However, many of the studies on climate change and its implications in the Sunderban region needs critical scientific review, as these are often found to be more hypothetical than reality. This is because the reliability of climatic data in terms of their length, density and accuracy is inadequate for arriving to a concrete scientific conclusion. Moreover, the region's geological and hydro-geomorphic complexity often dominates the effects, which appears to be very similar to climate-induced outcomes.However, some of the important climate trends observed by the India Meteorological Department (IMD), Government of India and other research institutes show that: (1) Winter temperature has a slight increasing trend; (2) Rainfall is being delayed with the late in arrival Monsoon; (3) Frequency of the cyclones are decreasing but their intensities are increasing; (4) High intensity rainfall with thunderstorms are also increasing. All of these, particularly the rainfall pattern, have definite adverse consequences in the ecology and livelihood of the 4.5 million plus people of the Sunderban region.

Keywords: The Sundarban region, Climate trends, extreme weathers, vulnerability and adaptation

Landscape Changes and Geomorphic Evolution of Tut Drainage Basin

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Abstract

Mizoram is tectonically active as evidenced by many geomorphic signatures. The development of landscape is influenced by various external processes and also by active tectonics in the Tut drainage basin which spreads in an area of about 846 km^2 in the north western part of Mizoram. An attempt has been made in this study to evaluate the landscape changes with the help of various geomorphic indices. The geomorphic indices were computed by standard formulae in order to correlate the active tectonics with erosional processes in the watershed. The values of some significant geomorphic indices such as valley floor width to height ratio index (0.4-0.67), elongation ratio (0.34), hypsometric integral (0.47-0.70) and topographic symmetry factor (0.24- 0.97) indicate the active incision and ground tilting in the drainage basin. It is evident from the geomorphic signatures that the area is prone to severe erosion and subsequent landscape changes in the geomorphologic evolution of Tut drainage basin.

Keywords: Geomorphic indices, active tectonics, landscape changes, active incision, hypsometric integral.

Studies on Aquatic Macrophyte Distribution of Khumanpat Lake, Manipur, Northeast India

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Abstract

The present study was carried out in Khumanpat Lake situated in Imphal East District, Manipur. The study has been undertaken to assess the distribution of aquatic macropytes in the study area. Altogether, a total of 43 (forty-three) aquatic macrophytic plant species were found distributed in the lake during

the study period. Some of the dominant species like *Alternanthera philoxeroides, Azolla pinnata, Brachiaria mutica, Ceratophyllum demersum, Echinochloa stagnina, Eichhornia crassipes, Enhydra fluctuans, Hygroryza aristata, Ludwigia adscendens, Pistia stratiotes, Salvinia cucullata* and *Zizania latifolia* were found to occur in all the study sites during the entire study period. The percentage compositions of the different macrophytic species were found maximum in the emergent group (67.44%), which was then followed by the free-floating species (13.95%) and rooted with floating leaved species (11.62%). The lowest percentage (6.98%) was contributed by submerged species. The maximum number of 29 species were recorded under the emergent group viz., *Echinochloa stagnina, Enhydra fluctuans, Ludwigia adscendens, Hygroryza aristata, Ipomoea aquatica, Zizania latifolia, Phragmites karka, Pseudoraphis minuta* etc. Minimum of 3 species were recorded under submerged group viz., *Ceratophyllum demersum, Hydrilla verticillata,* and *Utricularia flexuosa* etc.

Keywords: Distribution, Aquatic, Macrophyte, Khumanpat Lake, Manipur.

Shifting Land Surface Temperature (LST) due to Change in Urban Land Use: A Case Study of Bidhannagar Township, West Bengal

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Abstract

Remote sensing is useful for understanding spatio-temporal land cover change in relation to the basic physical properties of the surface radiance and emissivity data. Land Surface Temperature (LST) is used to determine the temperature distribution and change in local or global scale. In this paper, the LST in spatial and temporal dimensions has been analysed for Bidhannagar, a planned satellite township of Kolkata. The township is spread over 33 sq. km. area. Landsat TM and ETM+ images (thermal bands) have been used to estimate LST for the years 1990, 2000, and 2010 and ward-wise variations have been identified. It is revealed that changing pattern of LST is closely correlated with the changing vegetation, water body and built up pattern (NDVI, NDWI and NDBI) in the study area. In addition to the increasing impervious built-up surface the vertical extension of buildings due to urban densification within the town contributes to increase of LST in the recent years.

Keywords: LST, Bidhannagar, NDVI, NDWI and NDBI

Changes in Soil Properties under Different Land Use Covers in Parts of Kolasib District, Mizoram

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Abstract

Adoptions of economically high valued tree crop plantations to this area where agriculture is the mainstay for about 60% of the population has set an initiation for farmers who typically practiced shifting cultivation as an opportunity to enhance and diversity their livelihood. But a concern about longer term sustainability of these plantations system in such non-traditional growing area often arises. The study was conducted to evaluate the dynamics in soil physical and chemicals properties under different land use covers: arecanut plantation soil, rubber plantation soil and a secondary forest soil. Soil samples were collected from two subsequent depths (0-20 cm and 20-40 cm) of three slope gradients viz. gentle (0-15%), moderate (15-30%), and steep (>30%) in three replications. The textural class of the soils varied between sandy loam to loam. The pHs of the soil are found to be acidic in nature. The result further revealed that the contents of organic carbon, total nitrogen, available phosphorus, calcium, magnesium and potassium varied from the steep slope to gentle slope and were higher in secondary forest soil than in other land cover soils. Thus, the conversion of tropical secondary forests to arecanut and rubber plantations can have a profound effect on soil quality. Therefore, the information generated from this study will assist in developing sustainable land use strategies.

Keywords: Land use cover, Slope gradients, Soil properties, Nutrient status, Mizoram.

Mapping the Vegetation Change in Lakshadweep Using Remote Sensing

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Abstract

The Lakshadweep Islands are known as the Coral Paradise of India with a fragile ecosystem including a large association of corals, marine animals and all the

natural resources are vulnerable to climate change. The present scenario tells the impacts of climate change in vegetation, water resources and land resources which are highly effected during the past two decades. The remote sensing and GIS are the most efficient technology and toolset for assessing the status for integrated resource management, environmental conservation and sustainable rural development. The present study is focused to assess the changes in vegetation for a period of 15 years. The study has progressed by processing the satellite data, GPS based lad survey has made for verifying vegetation land, then all data is integrated for GIS analysis. ArcGIS, ERDAS Imagine and ENVI are the important software used for the present study. The datasets finally integrated and the vegetation change is derived for the past 15 years and the result is visualized in GIS layout.

Keywords: Natural Resource Mapping, Environmental Monitoring, Remote Sensing, GIS, Change Detection

Socio-Economic Impacts of Gorkha Earthquake 2015: Lessons Learnt

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Abstract

Nepal is highly prone to various types of disasters such as: earthquakes, floods, landslides, fires, epidemics, avalanches, windstorms, hailstorms, lightning, glacier lake outburst floods, droughts and extreme weather events. Among all these disasters – earthquake is the most scary and damaging. The effects of a disaster, whether natural or human induced, are often far reaching. In addition to the natural factors, the losses from disasters are increasing due to the human activities and absence of proactive legislations. Fundamentally, the weak structures have been found as the major cause of infrastructure collapse in earthquakes. This emphasizes the need for strict compliance of town planning bye-laws and earthquake resistant building codes. Thus, proactive disaster management legislation focusing on disaster preparedness is necessary. This paper analyses the critical gaps responsible for emphasizing the seismic risk and of factors that would contribute towards seismic risk reduction to enable various stakeholders to address the critical areas for improving seismic safety in Nepal and other earthquake prone countries. Additionally, this paper aims to pinpoint the deficiencies in disaster management system in Nepal with reference to the devastating earthquake of 25 April 2015 and suggest appropriate policy and advanced technical measures.

Keywords: Earthquake, Proactive, Impact, Legislation, System

Socio-Economic Status of Women Population in Dhule District (M.S.)

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Abstract

Women are a significant demographic and cultural index. In the population status of women and men are an important issue for the development of the society. It reflect the socio- economic development prevailing is an area and useful tools for geographic analysis. Society development is governed by various aspects i.e. - demographic, socio-economic, infrastructure and amenities of the areas. Development process is depends on the level of socio-economic interaction between rural and urban areas. The present paper attempts to analyze the decadal variation of woman population status in Dhule district. The main objective of study is to measure the women status of the 2001 and 2011 in Dhule district. On the basis of availability of data socio-economic indicators like general sex ratio, population density, women child sex ratio, women literacy rate, women working population rate and women working population in non-agricultural sector are taken for consideration separately to assess the status of women. Overall women status at tahsils level for the year 2001 and 2011 is uneven. The various indicators data is processed and comparison tahsil wise 'Z' value and composite index then presented through tables, maps and graphs. In Dhule tahsil female population increased by 5.4% in 2011, Sakri tasils female population has been decreased by 2 to 3 %. Whereas, lowest fall of female population is observe in Shirpur tahsil which was 0.77 % only. It is found to be Composite index highest level in Dhule (9.7), and Sakri (4.7). While remaining two tahsil like Shirpur (3.6) and Shindkheda (1.9) are moderate and low level status of women in 2011. Regional pattern of study area is closely related with the socio-economic of region. The study region recording low women status suffer from poor agricultural and show emigration, while the region recording high status women have undergone industrial development attracting in migration. The high status women have increased up to 63.8% in 2001 and 80.9 in 2011. According to total population in Dhule district population of female child was higher than male child population in 2001, which declined by the year 2011.

Keyword*:* Population, Density of Population, Female Literacy, Workers Population

Impact of the Sprawling Brick Kilns along Ichhamati's Bank in North 24 Parganas on the River's Channel Evolution

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Abstract

Ichhamati is a trans-boundary river which originates from river Mathabhanga in Nadia and joins river Kalindi near Hasnabad, North 24 Parganas of West Bengal. The riverbed is 4.3 meter higher than Mathabhanga, resulting in shortage of water during dry season and consequently massive siltation of the bed. Huge sediment source and regular demand of bricks is an impetus for the development of brick industry on both the banks of the river between Baduria to Hasnabad. Developments of the kilns are strongly regulated by the Pollution Control Act of 1986, which mandates the establishment of any Kilns at a range of 200 meters away from a major river and habitable area. However, the present study depicts the failure of effective implementation of the law and reveals the illegal nature of the mushrooming construction sites. Among the inherent consequences, interruption in the channel flow and channel configuration is the core theme of the present research. Field observations and satellite image analysis is hence the basic methodological gear. Thus, development with environmental sustainability is attempted to be accomplished through this research.

Keywords: *Brick kilns, encroaching settlers, Channel flow, Channel evolution, Environmental sustainability*

A Preliminary Checklist of Moth Species of West Tripura District, Tripura

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Abstract

There is a lack of study on the species richness and diversity of moths from north-east India which includes parts of ranges of two biodiversity hot spots, Eastern

Himalayan in the north of Brahmaputra valley and 'Indo- Myanmar' range in the east. The present study was undertaken to analyse the moth species richness in the West Tripura district of Tripura. In the present study, 1174 specimen of moths were collected belonging to eight different moth families. The highest diversity index of 2.85 was recorded for Noctuiidae family. Tripura state has a favourable habitat and climate for the occurrence of these insects. There may be many more species of moths in the state and there is a vast scope for works for the exploration of species richness and diversity of this group of insects.

Keywords: Biodiversity, Hawk moth, Noctuiidae, Tripura, Northeast India

Evaluation of Landuse/Landcover Changes in Uttarkashi District Using RS and GIS Techniques

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Abstract

Landuse/Landcover study is very important for many planning and developmental works. Earlier LULC mapping was done through manual surveying the area and mapping the area on its basis, thus it was very tiresome and costly but after the coming of RS and GIS techniques LULC study has become very easy. Remote sensing methods can be employed to classify types of landuse in a precise, practical and repetitive manner. GIS provides the image classification techniques which helps in differentiating the different landuse classes. The present study aims in finding out the Landuse and landcover change of Uttarkashi district between a time gap of 2000 and 2015 using RS and GIS techniques. The work has been done with the help of Remote Sensing and GIS techniques. Remote sensing data gives the facility to check the inaccessible places and GIS gives the facility to analyse these remotely sensed images as per our requirements. The study starts with downloading images layestacking and mosaicing them in Erdas imagine 9.1 then applying the Maximum Likelihood (MLH) supervised classification algorithm to classify the study area. A Post Classification Comparison (PCC) approach was then adopted to analyze the LULC changes.

Keywords: Landuse/Landcover, Geospatial techniques, Layerstack, Mosaicking, Supervised classification.

Morphometric Analysis of Kanhar River Basin by Using GIS and Remote Sensing Techniques

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Abstract

Morphometry is the measurement and mathematical analysis of the configuration of the earth's surface shape and dimension of its landforms. The morphometric analysis is done successfully through measurement of linear, aerial, relief gradient of channel network and contributing ground slope of the basin. The Kanhar River is an important tributary of the River Son the total area of the basin is approximately 5000 km^2. It is flows through the Indian starts of Chhattisgarh, Jharkhand, and Uttar Pradesh. Present study aims of using the remote sensing and GIS to find out the various parameters of morphometric is stream order, stream length, bifurcation ratio, drainage density, drainage texture, stream frequency, elongation ratio, circulatory ratio, length of overland flow etc. In my study using ASTER DEM of resolution 30 meter and ArcGIS 10.5, ERDAS Imagery 2014 software is used.

Keywords: Morphometry, Kanhar basin, DEM, GIS

Role of Kanyashree Project on Empowerment of Women in West Bengal

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Abstract

Women are one of the most important focus groups in the study of development and marginalization. A section of women in West Bengal are commonly portrayed as among the most oppressed, and majority of them are grounded in both poverty and patriarchy. The objective of this paper is to analyze the life of women who are affected in the process of marginalization and how the *Kanyashree*- a social development project of the Government of West Bengal, has been acting as a helping tool for women, and also its impact on reducing child marriage, improving maternal health, school dropouts and girl child

trafficking. The work is based on various reports of the Government of India and State Government of West Bengal, and interaction with the selected local people. It is found the that Murshidabad, Malda, Birbhum, Purulia, Bankura, Dakshin Dinajpur, South 24 Parganas, Nadia and Coochbehar districts are the more vulnerable districts in terms of child marriage and school drop out in the state. According to the DLHS-3 published in 2007-08 the percentage of child brides were 54.7, which has reduced to 32.1 in the year 2012-13 mainly due to the implementation of the *Kanyashree* Project. The school dropout rate has also reduced significantly in these districts.

Keywords: Development and marginalization, Kanyashree Project, child marriage, girl child trafficking

Socio- Economic Profile of Traditional Tribal Weavers' in Tripura : A Study on Chakma Community

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Abstract

Tripura, a small state in the North-Eastern region of India is homeland to 19 tribal communities with an area of 10,491km^2.They have their own fine cultural and proud heritage. The Chakma is one such rich cultured tribe among the nineteen scheduled tribes of Tripura. According to the Census Report of 2011 Chakma population in Tripura is 79,813 which is the fourth largest tribal community of the State after Tripuri, Reang and Jamatia. They are mainly concentrated in Belonia, Sabroom and Amarpur in South Tripura, Dhalai and North Tripura District at Chamanu, Gandacherra, Kanchanpur, Machmara etc. places of Tripura. Weaving is the primitive economic activity as well as cultural symbol of this tribal community. Now a day the Chakma men have given up their traditional clothes for western-style shirts and trousers. The Chakma Women who maintain the traditional Chakma style of dress, which consists of two pieces of cloth. One is worn as a skirt, wrapped around the lower part of the body and extending from waist to ankle. The traditional colour is generally black or blue, with a red border at top and bottom. Due to globalised market, impact of westernisation, mechanised product and others social economic factors cumulatively make impact on traditional handloom weaving among the Chakma community of the State negatively. This research work genuine attempt had been made to gain insight and understanding

into the socio- economic profile of traditional tribal weavers' in Tripura. About 200 samples have been collected from Chakma concentrated clusters of Tripura through Stratified Random Sampling technique by Systematic Schedule Survey. Secondary data has been collected from the Census of India, different Panchayats and Rural Development Blocks of different districts of Tripura. The finding reveals that the traditional handloom weaving culture is annihilate from the state due to social upliftment of Chakma Community both in terms of educational as well as economical.

Keyword: Tribal, Chakma, Handloom, Weaving

Multi-Temporal Standardized Precipitation Index and Regional Drought Monitoring in the Western Part of West Bengal

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Abstract

Drought is considered as one of the most important natural hazards in the world, and it rank the first in case of total number of affected people are concerned. Drought may occur due to scarcity of moisture. Therefore, precipitation is the most important factor of drought, but other climatic factors like temperature, relative humidity and wind too influence drought. There are a number of many methodologies available to study drought that varies from one region to the other. In general, droughts are classified into four types- meteorological, hydrological, agricultural and socio-economic. There are various drought indices developed, e.g. the simplest index like Percentage of Normal, to complex one like Palmar Drought Severity Index. McKee, Doesken and Kleist (1993) developed Standardized Precipitation Index (SPI), which is accepted by the World Meteorological Organization (WMO) and other important meteorological institutes worldwide. In this study, multi-temporal SPI has been calculated to quantify the characteristics of the drought in the western part of the state of West Bengal. Application of SPI does not only monitor regional drought phenomena, it also gives long-term climatic characteristics of a region in terms of dry and wet period, which is the prime objective of this paper. It has been found that both the duration and intensity have changed from one district to the other.

Keywords: Meteorological Drought Indices, Regional Drought, SPI, Western West Bengal

Sand Mining and Its Impact on the Physical Health of the River and the Livelihood of the People, a Case Study of Umtyngar River, Meghalaya

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Abstract

The removal of sand from its natural occurrence is described as sand mining. Focusing on sand mining and its environmental and socio-economic impacts, this paper seeks to explore the current state of sand mining and extraction mechanism and to assess its impact on the river health of Umtyngar river, Meghalaya with reference to the river channel and also on the livelihood of the local community. Using primary data in the form of in-depth interviews, questionnaires and PRA tools, the study found that primarily unemployment influenced people into sand mining. Also, very high profits and regular income from the sales of sand were found to be some of the positive effects of sand mining on livelihoods. With the aid of GIS tools using temporal data for analysing the river health, the study revealed that rampant instream and inland riparian zone sand mining causes an increase in bank erosion and channel shifting of Umtyngar River. In addition, it was found that improper sand mining activities along the river which forms a tributary of the Umiam River on which the Mawphlang Dam, a major source of drinking water supply to the city, is situated has resulted in serious environmental implications to the dam especially during the rainy season when all the sand and pebbles flow from the excavation site.

Keywords: sand mining, livelihood, river health, bank erosion, Umtyngar River

Socio-Economic Condition of Indian Sundarban, an Issue on Food Scarcity

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Abstract

Indian Sundarban located in the southern part of West Bengal, it experiencing a critical vulnerable coastal location. Different extreme climatic hazards have been

occurring every year in that particular coastal area. So that the people of that region experiencing food scarcity, property loss at the time of extreme event. Extreme climatic events also hamper the economic condition as well as the structure of economy of the region. This study tries to analyse about the peoples social and economic condition and food security of Indian Sundarban region. To analyse all the aspects occupational structure, monthly income of those people, government's involvement during the extreme events are analyzed. Frequencies of extreme events of 10 years are discussed here. A perception study about food availability, cropping pattern, involvement in different economic sector are also been discussed here. This study tries to suggest some strategies and options to get rid from those extreme weather conditions and ensure the food availability.

Keywords: Indian Sundarban, food availability, extreme weather condition, mitigating strategies.

Socio-Economic and Livelihood Condition of Rural Women, a Study of Imphal Valley

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Abstract

The contribution of Manipuri women is significant in socio-economic upliftment of the society. Especially in rural areas, women have actively participated in socio-economic activities same as their male counterpart. The objective of the present study is to examine the socio-economic activities and livelihood conditions of the rural women and to analyze their role in sustainable livelihood as well as their various problems and prospects in future generation. The study will be based on both primary and secondary data. The Primary data will be collected through questionnaires from different parts of the central Imphal valley inhabited by different communities of Manipur. The data thus collected will be analyzed with the help of simple statistical tools. The study will attempt to show that the economic activities of the rural women are totally based on primary activities and it practiced in un-sustainable ways. The study will try to highlight the low educational level, un-employment, low per capita income, low standard of living and lack of government's policy and programs of rural women.

Keywords: Imphal Valley, rural women, un-employment, sustainable and livelihood.

Histological Changes and Immunolocalization Effects of Tuibur (Tobacco Smoke Infused Water) on Ovary and Uterus in Female Mice

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Abstract

Smokeless Tobacco Products have been collectively designated as Group 1 carcinogens i.e. carcinogenic to humans. It is estimated that the use of tobacco kills about three million people globally every year. A number of smoking and smokeless tobacco products are in use all over the world. Unlike other smokeless tobacco products, a unique water (liquid preparation) containing the extracts of tobacco smoke is used in Mizoram and Manipur, is locally known as *tuibur (tobacco smoke infused water)*.This product is made locally by passing smoke, generated by burning tobacco, through water till the preparation turns cognac in colour and has a pungent smell. The present study was carried out to determine the effects of oral administration of Tuibur (Tobacco Smoke Infused Water) on female mice. Tuibur (130 mg/kg), Tuibur (260 mg/kg), one positive control and Nicotine (0.6mg/kg) as negative control were administered orally for 21 days. The results showed significant changes in histology and immunolocalization of ovary and uterus in female mice. Serum biochemical analyses were also significantly increases (AST, ALT, urea and creatinine) in liver and kidney. Moreover there was significant changes in Tuibur treated groups when compared with those of control. The study demonstrated the adverse effects of Tuibur in female swiss albino mice.

Keywords: Tuibur, Histology, Immunolocalization, Mice

Socio-Economic Transformation in the Backdrop of Climate Variability, a Case Study of a Santal Village in Bankura District of West Bengal, India

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Abstract

In search of the livelihoods burden among the scheduled tribe under unfamiliar climatic events, the present study aims to investigate the impact of climate variation

on the present socio-economic condition of the Santal tribe living in a village (*Gidhuria*) located at the drought prone district (Bankura) of West Bengal, India. Structured schedule, focus group discussion and key informant interviews were used to collect data from 58 families. The results revealed that about 90% of the villagers engaged in rainfed agriculture. The declining monsoon rainfall, rise of temperatures, shifting season and dryness of top soil in the agricultural land for the last 15 years may heavily impact on agricultural production, socio-cultural life and livelihoods of the Santal villagers in a negative way. The perception regarding climate variability among villagers was also supported by the meteorological data of that region. Though they tried to cultivate high yielding varieties of paddy but failed to get sufficient yield due to water scarcity, economic barrier to use modern technology and frequently occurring dry seasons. The development programmes (like Grain Bank) were often failed to meet their challenges. These erratic conditions have forced the villagers to migrate in other districts or urban areas in search of their secondary earning as daily wage labour which form a new socio-economic dimension for their survival.

Keywords: Climate variability, Santal tribe, socio-economic status, paddy production, Bankura district

Sediment Yield Estimation Using Remote Sensing and GIS, a Case Study on the Gumti River Basin of Tripura, India

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Abstract

Soil conservation planning often requires estimates of the spatial distribution of soil erosion at a catchment or regional scale. Modelling can provide a quantitative and consistent approach to estimate soil erosion and sediment yield under a wide range of conditions. Gumti basin is the largest river basin of Tripura with an area of 2250 km^2. Recently the basin is facing large scale soil erosion. Consequently huge sediment is yielding from the basin every year. It not only increases the sediment load of the river but also arising sedimentation problem especially in the lower course of the river. Thus the present study is an attempt to estimate sediment yield from the Gumti River basin using USLE model with the help of Remote Sensing and GIS techniques. For that all the five parameters of USLE model were processed and computed under GIS environment. The result shows that potential sediment yield from the Gumti basin ranges between 0.03 to 114.08 t ha^{-1} $year^{-1}$. Around 11.47% areas of the basin fall under severe sediment yield category. The results can certainly

aid in implementation of soil management and conservation practices to reduce the soil erosion in the Gumti River basin.

Keywords: Gumti River bas in, Sediment yield, Remote Sensing, GIS, Soil management.

Population Status and Distribution across Altitudinal Gradient of Assamese Macaque (Macacaassamensis) in Dampa Tiger Reserve, Mizoram, India

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Abstract

Many species of mammals including primates are increasingly threatened due to changes in their habitats. Primates play an important role in seed dispersal, forest regeneration and ecosystem functioning. The state of Mizoram shares Indo-Myanmar bio-diversity hotspot and thereby harbors rich flora and fauna. Natural vegetation is tropical evergreen forest in lower reaches, and semi-evergreen on the upper slopes.The status and distribution of primates has not been properly evaluated in Mizoram. We conducted a study on Population status and distribution of Assamese macaque (*Macaca assamensis*) across altitudinal gradient of in Dampa Tiger Reserve, Mizoram, India. Survey was carried out for three years (2012–2015) and surveyed along 34 trails covering 293.5km in two ranges namely Teirei and Phuldungsei. The survey was undertaken by line transact method sampling technique. We gathered data on group locations, demography and site covariates including trail length, duration of walk, proportion of vegetation forest, height of activity.Total count method was adopted, for population status 9 groups and a total of 123 individuals were observed..They occupied from 386m to 856m msl and also different habitats: tropical semi-evergreen forest and moist deciduous forests. The smallest group consisted of 7 individuals, and the largest was of 18 individuals with an average group size of 13.6(±0.9).Composition of the population was : 24% were adult male, 38% adult female, 12% sub-adult male, 16% sub-adult female, 5% young-male and 5% young-female. The population encounter rate is 0.13 and group encounter rate is 0.04. The male-female ratio was 1:0.65. Their distributional area is 26.3km². This census data will help for management and conservation of Assamese macaque in rainforest habitat.

Keywords: Assamese macaque, Population status, Distribution,Elevation, Dampa Tiger Reserve

Impact of Serlui-B Hydel Project on the Water Quality of Serlui River in Kolasib District, Mizoram, North-East India

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Abstract

The Serlui river is one of the most important natural resource system in Kolasib district, Mizoram, India. The present study was conducted for a period of one year (March 2015 to February 2016) to assess the impact of Serlui-B Hydel Project construction on the water quality of Serlui river as it is used for drinking and various other domestic purposes by the local people in and around the surroundings without any treatment. Altogether, three sampling sites were selected for detailed investigation along the river from upstream to downstream in vicinity of the hydel project. The water samples were collected monthly for analysis of various parameters such as Temperature (22.2°C-34.3°C), pH (6.1-7.7), Electrical Conductivity (81µS-154µS), Dissolved Oxygen (5.7-8.1mg/L), Biological Oxygen Demand (0.6-2.2mg/L), Acidity (31-68 mg/L), Total Alkalinity (18-70mg/L), Chloride (21-145.67mg/L), Nitrate-N (0.14-0.60mg/L), Sulphate-S (0.21-7.70mg/L) and Phosphate-P (0.017-0.210mg/L). The findings reveal that intensity of pollutants increased from Site 1 (Upstream-Control Site) to Site 3 (Downstream) of the river which may be due to the direct discharge of treated water into the river system after power generation, and sewage containing more organic matter. Even though all the parameters except Phosphate-P are within the permissible limit of standard, but long term use of such water may lead to adverse effects on human beings as well as aquatic life.

Keywords: Serlui-B hydel project, Serlui River, Water Quality, DO, BOD.

Voting Behaviour Pattern in Varanasi District: Spatio- Temporal Analysis in Assembly Elections

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Abstract

This study focuses on voting behaviour pattern of the electorate in two consecutive of assembly elections of Varanasi district, which is the challenging

task and interesting issue in a democratic country like India. The pattern of voting may changeor remain unchanged over the period of time (one election to another election) or space (one constituency to another constituency). Mapping the voting behaviour pattern of anarea is one of the great significance for an electoral geographer as it depicts the level of political consciousness and development of that area. Voting gives the choice and voice to the voters in a democratic country like India where right to vote is a constitutional right of the citizen. Voting behaviour is not confined to the examination of voting statistics, records and computation of electoral shifts and swings. It also involves an analysis of individual psychological processes (perception, emotion and motivation) and their relation to political action as well as of institutional patterns, such as the communication process and their impact. Voting behaviour of the electorate is largely influenced by their perception during the entire process of electionsstarting from declaration of the poll up to the final polling date.

Varanasi district is divided into two parliamentary and eight assembly constituencies in which three constituencies (out of eight) are covered the Varanasi city. The study is based on secondary data (2012 and 2017 assembly election) which is collected from the Election Commission of India and other sources wheredata is available. In this paper the main objective is to examine the voting behaviour pattern and to study the factors responsible for the spatial changes in voting pattern as well as voting behaviour from one constituency to another.

Keywords: Electoral geography, voting behaviour, Pattern, Constituency, Voters.

Rapid Out-Migration and its Impact on Socio Economic Profile of Natives in Lachigad Watershed, Pauri Garhwal, Uttarakhand, INDIA.

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Abstract

Outmigration from rural area of Himalayan region to the other nearby urban area or to other states has now become so rampant that its impact is felt in every aspect of life. After India's Independence, out migration became a way of life for many educated youths in the region. Almost every family in Lachi Gad Watershed is

affected by out migration. And this is affecting every facet of life specially economic, demographic, social, political and even religious. With such a massive impact, the question arises what is the socio-economic status of the region left behind. It is mainly the youth male who have migrated in search of better job opportunities.

The objective of the study is to analyse the impact of rapid outmigration on Socio Economic profile of Natives in Lachi Gad watershed, Pauri Garhwal District, Uttrakhand, using GPS and GIS as tools. It also examines its impact on the women of the region. In spite of the abundant resources in Lachi Gad Watershed, people are compelled to move out to urban areas due to various physical, social and economic problems. Therefore, outmigration is a common phenomenon in this region. This rapid young male outmigration to the urban areas for better economic prospects has had a severe impact on both the land use and the socio-economic status of families back home.

It was found that, the major destinations of out migrants are Defense and Para Military. Apart from this they also migrate to Dehradun, Rishikesh, Delhi, Punjab, Haryana, and other states in NCR. Mostly it was the young adults migrated due to lack of jobs, attraction towards city life, poor economic condition of the native place etc. Many youth also migrated as part of the family or distant relative was already settled and leading a very comfortable life. Lachi Gad is also vulnerable to landslides, poor Infrastructure, lack of coordination between authorities, poor road network and many more such push factors playing a very significant role in the high rate of OUT MIGRATION. The families which are left behind have to bear the brunt, be it natural calamity, loss of crop to floods, sudden landslides etc. The loss of those with the skills and entrepreneurial talents, which may slow down the process of economic development. The area may suffer from the cumulative problems and there growth would be retarded. The women's burden has increased manifold when the social obligations of meeting extended family, attending functions, taking old parents for health checkups, children's needs etc is also on them that too in such a rugged terrain.

Keywords: Out-migration, socio-economy, vulnerable and watershed

ABOUT THE ABSTRACT BOOK

Natural resources management for sustainable development and rural livelihoods is the comprehensive and emerging issue at global, regional and local levels mainly in the wake of depleting natural resources and increasing food insecurity in the rural areas of developing countries. Keeping these issues in mind, the Department of Geography and Resource Management, Mizoram University hosted an international conference on the given theme. This book is an output of the international conference where a number of scholars, scientists and academicians from India and Abroad have submitted their research findings as abstracts. We received over 400 abstracts and divided them into four sections – natural resources management, rural livelihoods, biodiversity, and papers from multi-disciplinary studies. Further, we divided this book into two sections: the first is souvenir and the second is abstracts. This book will be useful for all the stakeholders who are involved in research and development activities.

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