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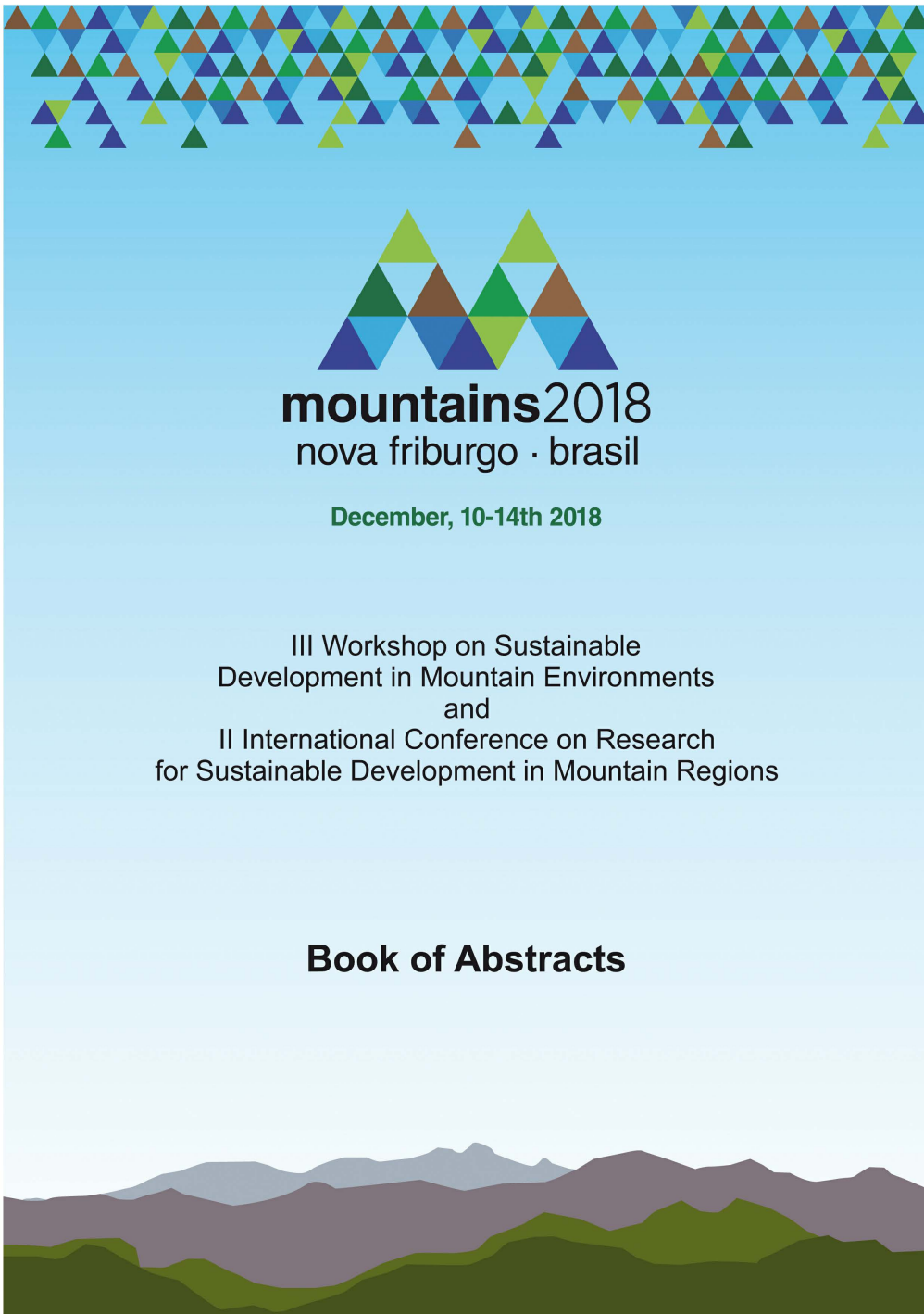
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December, 10-14th 2018

III Workshop on Sustainable
Development in Mountain Environments
and
II International Conference on Research
for Sustainable Development in Mountain Regions

Book of Abstracts





**III Workshop on Sustainable
Development in Mountain
Environments
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Development in Mountain Regions**

Book of Abstracts

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*Nova Friburgo, Rio de Janeiro
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III Workshop on Sustainable Development in Mountain Environments and II International Conference on Research for Sustainable Development in Mountain Regions

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*Instituto Politécnico de Bragança
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Preface

I am very pleased to have been asked to write this Preface, to introduce the first major international mountain science meeting to take place in Brazil, contributing to our growing knowledge and understanding of mountain issues.

In October 2016, I participated in 'Mountains 2016' in Bragança, Portugal (<http://cimo.esa.ipb.pt/mountains2016/>). This attracted 182 delegates from 32 countries and was addressed by the Minister of Science, Technology and Higher Education of Portugal. He showed particular interest in one of the key outcomes: the launching of the Lusophony Mountain Research Network – Lumont (<http://cimo.esa.ipb.pt/LuMont/index.php/pt/>) to encourage exchange among Portuguese-speaking scientists working in the mountain areas of their countries. The establishment of this network provided additional support for Brazil to organize 'Mountains 2018'.

'Mountains 2018' is taking place from 11 to 15 December 2018 in the mountain town of Nova Friburgo, in the state of Rio de Janeiro, close to Pico Maior (2,366 m), the highest point of the 1,500 kilometre-long Serra do Mar. As you will see from the abstracts in this book, the participants in 'Mountains 2018' will include scholars, professionals, policy makers and others involved with multiple aspects of the mountain world: at least 200 people from about 30 countries. Over a hundred of the people will be from Brazil; on one hand, this will allow all the visitors to learn about the mountains of Brazil and interact with people working in them; on the other hand, it will enable the Brazilian participants to place their challenges and experiences in an international context.

The aim of 'Mountains 2018' is to stimulate and disseminate knowledge based on lessons learned from scientific research and practical experiences related to the use and challenges of promoting sustainable development in mountain areas, including how mountains can contribute to the Sustainable Development Goals. The event includes two parts: the III Workshop on

Sustainable Development in Mountain Regions; and the II International Conference on Research for Sustainable Development in Mountain Regions. The Workshop will focus on practical experiences related to sustainable development in mountain regions, gathering professionals and other stakeholders actively working towards this urgent goal. The Conference will discuss issues related to scientific research and perspectives to enhance and disseminate knowledge about mountains.

Whether or not you are attending 'Mountains 2018', I hope that this book will provide you with new knowledge and insights about the mountains of the world, and that you will be able to apply these in your own mountains.

Professor Martin Price FRSE

Chair, Scientific Committee, 'Mountains 2018'

Director, Centre for Mountain Studies, Perth College, University of
the Highlands and Islands, UK

Chairholder, UNESCO Chair in Sustainable Mountain Development

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together through organic (biological) agriculture

Agroecological practices in the Serrana Region of the state of Rio de Janeiro: participatory knowledge building for sustainability

25 - Open Session

Mountains of India: constructing and reinforcing the peripheral

Silvicultural interventions on natural regeneration of tropical mountain forest in southern Ecuador

Role of proximity and trust relations in the process of territorial governance in traditional mountain cheese value chains. Example of the artisanal serrano cheese value chain in the Campos de Cima da Serra region, Brazil

Quantitative energy assessment of active fault influence on mountain hazards

Volunteerism for community resilience in the highlands of Guatemala

Environmental functionalities of upper montane ecosystems of the Serra do Mar of Southern Brazil

Inselbergs – a global system of underexplored mountains

Program

III Workshop on Sustainable Development in Mountain Environments Public Policies for Mountain Environment Experiences and New Challenges

With simultaneous translation

Goal: Promote debate and analysis of the strategic importance of mountain ambiances and priorities for public policies aiming at improving integrated management of mountain territories in a context of climate change, including public policies, food and water security, with a special focus on Portuguese and Spanish speaking countries.

Monday - December 10th

08:00 - 08:30 - Registration.

8:30 - 09:00 - Reception and Coffee.

09:00 - 09:30 - Opening ceremony.

09:30 - 10:15 - Opening address: The importance of mountains for sustainable development - **Martin Price** - University of the Highlands and Islands/UNESCO. Escócia.

10:15 - 10:30 - Dialogue - Moderator: Monica Amorim . Federal University of Ceará, Brazil, Representative of the World Famous Mountains Association in Latin America.

10:30 - 12:00 - Round table 1: Challenges for sustainable action and management of mountain environments.

1. Participatory Guarantee Systems - Celso Merola Junger.
Ministry of Agriculture, Livestock and and Food Supply /SFA-RJ,
Brazil.

2. . Mountain Partnership in action - Rosalaura Romeo . Mountain
Partnership/FAO, Italy.

**3. Alto Camaquã: a regional development concept with a territorial
approach - Marcos Flavio Silva Borba.** Embrapa Pecuária Sul,
Brasil.

12:00 - 12:30 - Dialogue - moderador: Helga Hissa-
Superintendência de Desenvolvimento Sustentável - SEAPPA,
Brazil.

12:30 - 14:00 - Lunch.

**14:00 - 15:30 - Round Table 2: Experiences of payment for
environmental services in mountain areas.**

**1. Public policies and payment for environmental services and
Atlantic Forest Project Connection. - Gilberto Pereira.** Instituto
Terra de Preservação Ambiental, Brazil.

**2. Payment for Environmental Service with focus on water
resources of the Paraíba do Sul river basin. - Flavio Monteiro dos
Santos.** AGEVAP – Agência de Bacia Brasil.

**3. Payment for ecosystem services in European mountain fores -
João Azevedo.** Mountain Research Centre, Polytechnic Institute of
Bragança, Portugal.

**15:30 - 16:00 - Dialogue - Moderator: Rachel Bardy Prado -
Embrapa Solos.**

16:00 - 16:30 - Coffee break.

16:30 - 17:00 – Experience Report: Poster Session.

17:00 - 18:30 - Round table 3: Experiences in visitation and

conservation in mountain landscapes.

1. Sustainable products and services generated in high biodiversity areas - **Sebastián Malizia**. ProYungas, Tucumán, Argentina.

2. Diversity of visitation opportunities in mountains: aspects of public policies - **Renata Bradford**. CBME, Brazil.

3. Long course routes as visiting and conservation instruments - **Pedro Menezes**. ICMBio, Brazil.

18:30 - 19:00 - Dialogue - Moderator: Luis Felipe Cesar - Crescente Fértil. Brazil.

Tuesday - December 11th

08:00 - 09:30 - Round Table 4: National policy for mountain environments.

1. Policy initiatives in research and development in Portugal - **Isabel Ferreira**. Mountain Research Centre, Polytechnic Institute of Bragança, Portugal.

2. The National Research and Conservation Program in mountain environments - **Gustavo Martinelli**. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Brasil.

3. The Agriculture Census as a tool for planning in mountain areas: profile of the Brazilian agriculture at different altitudes - **Antônio Carlos Simões Florido**. IBGE. Brasil.

09:30 - 10:00 - Dialogue - Moderator: Marcos Sá. Universidad Nacional Autónoma de México, Mexico.

10:00 - 10:30 - Coffee break.

10:30 - 12:30 – Spontaneous presentations of experiences.

12:30 - 14:00 - Lunch.

14:00 - 16:00 - Round table 5: Impacts of climate change and experiences of action related to natural disasters: an interdisciplinary approach.

1. The megadisaster of the Rio de Janeiro mountain region and collective action for facing natural threats and reduce environmental disasters - **Ana Luiza Coelho Netto**. Federal University of Rio de Janeiro, Brazil.

2. Transdisciplinary research for climate change adaptation in the Andes: Generating systems, target, and transformation knowledge - **Sarah-Lan Mathez-Stiefel**. Centre for Development and Environment (CDE) and World Agroforestry Centre (ICRAF), Peru.

16:00 - 16:30 - Dialogue - Moderator: Irasema Alcántara Ayala - Universidad Nacional Autónoma de México, Mexico.

16:30 - 17:00 - Coffee break.

17:00 - 18:00 - Experience Report: Oral Session.

18:00 - 18:30 - Information about field trips and the II International Conference on Research for Sustainable Development in Mountains Regions. Context for the technical visits to the Rio de Janeiro mountain region based on the 2017 Agriculture Census - - **Antônio Carlos Simões Florido**. IBGE, Brasil.

18:30 - 19:00 - Conclusions of the Workshop and presentation of the “Nova Friburgo Charter”.

19:00 - 19:30 - Closing ceremony.

21:00 - International Mountain Day Celebration Dinner.

Wednesday - December 12th

II International Conference on Research for Sustainable Development in Mountains Regions: Connecting Science to Practice

English – Official language

Goal: To share innovative experiences of mountain scientific knowledge, and promote debate on new directions and on how research can contribute to practice.

Thursday - December 13th

08:00 - 09:00 - Registration.

09:00 - 09:30 - Opening ceremony.

09:30 - 10:30 - Keynote Address 1: Mapping Mountains: lessons from global and European experiences. - Martin Price - University and Highlands and Islands/UNESCO. Scotland, UK.

10:30 - 10:45 - Dialogue - Moderator: Isabel Ferreira, Mountain Research Centre, Polytechnic Institute of Bragança, Portugal.

10:45 - 11:15 - Coffee with Letters.

11:15 - 12:15 - Keynote Address 2: Reduction and management of disaster risk: the challenge of connecting science to practice. - Irasema Alcántara Ayala - Universidad Nacional Autónoma de México, Mexico.

12:15 - 12:30 - Dialogue - Moderator: Qui Dunlian - Institute of Mountain Hazards and Environment (IMHE), Chinese Academy of Sciences (CAS), China.

12:30 - 14:15 - Lunch.

14:15 - 16:15 - Symposia.

16:15 - 16:45 - Coffee with Letters.

16:45 - 18:30 - Symposia.

19:00 -

Friday - December 14th

08:00 - 09:30 - Symposia.

09:30 - 10:00 - Coffee with letters.

10:00 - 11:00 - Presentation of scientific journals focusing on mountain issues.

11:30 - 12:30 - Symposia.

12:30 - 14:15 - Lunch.

14:15 - 15:15 - **Keynote address 3: Making connections for our changing mountains: The role of the Mountain Research Initiative in connecting people and knowledge for sustainable mountain development.** - **Ricardo Grau** - MRI-Mountains Research Initiative, Universidad Nacional de Tucumán. Argentina.

15:15 - 15:30 - **Dialogue - Moderator: Fausto O. Sarmiento.** University of Georgia, USA.

15:30 - 16:15 - Poster session.

16:15 - 16:45 - Coffee with letters.

16:45 - 17:00 - **Lumont** - The Lusophony Mountain Research Network. - **João Azevedo.** Mountain Research Centre, Polytechnic Institute of Bragança, Portugal.

17:00 - 18:00 - Establishment of the Latin America and the Caribbean Mountain Research Network.

18:00 - 18:15 - Closing ceremony.

Experience Reports

Experience report 1 - Transmantiqueira Trail: instrument for conservation and social development

Experience report 2 - Association between fusarium wilt of tomato and management practices adopted by farmers of the mountain region of Rio de Janeiro state

Experience report 3 - Patagonia Waste Management: managing human waste in a backcountry site in Los Glaciares National Park, Argentina

Experience report 4 - Rede sabor e saúde da serra: fair, agroecological and solidary commerce in Serra do Brigadeiro, Minas Gerais

Experience report 5 - Agroecology in mountain coffee: the natural and organic coffee production site Pedra Redonda, in the area of the forest of Minas Gerais

Experience report 6 - Fertmovel as a process of innovation and knowledge of soils

Experience report 7

Experience report 8 - Cushion plants of the Andes an inspiration for the implementation of micro biodiversity hotspots

Experience report 9 - Projeto Conexão Mata Atlântica

Experience report 10 - Academic experience in organic agriculture in the Serrana Region of Rio de Janeiro

Experience report 11 - Supporting family farmers agro-ecological transition in Cunha, São Paulo, Brazil

Experience report 12 - Slope recovery that suffered a landslide in Teresópolis, RJ

Experience report 13 - Use of soil and water conservation practices in orchard implantation in a mountain region

Experience report 14 - Agricultural demands, activities and problems in two mountain regions: Nova Friburgo/RJ and Lima Duarte/MG, Brazil

Experience report 15 - Birds and shutterbugs: how nature photography is driving local conservation efforts in the Eastern Himalaya

Experience report 16 - How we made Mata Atlântica's plants a sustainable and vegan business

Experience report 17 - Sesmaria River Project – Hydric PES (Payment for Environmental Services)

Experience report 18

Experience report 19

Experience report 20

Experience report 21 - Responsible tourism a key to sustain livelihoods and minimize migration in mountains

Experience report 22 - Transition from conventional agriculture to organic: the case of Jacó micro basin in Petropolis, Serrana Region of Rio de Janeiro

Experience report 23 - High altitude water conservation technologies to combat climate change in northwestern Himalayas

Experience report 24 - Cuyún, Protected Natural Areas and Mountains: educational didactic articles

Experience report 25 - The natural environment and the

apprentice - in the construction of knowledge “there is only conservation with awareness, but through education”

Experience report 26 - Hops plantation in the district of Amparo in Nova Friburgo, Rio de Janeiro, Brazil

Experience report 27 - Potentialities and challenges in the use of poultry manure in the production of vegetables at the mountain region of Rio de Janeiro state

Experience report 28 - Use of forage peanuts as live soil cover in persimmon orchard

Experience report 29 - The agricultural local report importance at soil environmental characterization in mountain area

Experience report 30 - Clubroot of brassica spp. in tropical mountainous region of the Rio de Janeiro: situation, difficulties and alternatives

Experience report 31 - The mountains of Togo: biodiversity, geodiversity, issues and safeguard

Experience report 32 - Changing farming systems and its implications on livelihood: an observational findings from rural area of Garhwal Himalaya

Experience report 1

Transmantequeira Trail: instrument for conservation and social development

Institution: Associação Trilha Transmantequeira, Brazil

Presenter: Hugo de Castro

Introduction:

The Transmantequeira Trail (TMTQ) is an interconnected trails that together approximately 1000 km in the Serra da Mantiqueira. It crosses 34 municipalities of the states of São Paulo, Rio de Janeiro and Minas Gerais, 30 protected areas privileging the passage through tracks already consolidated and visiting the greatest number of attractions along its course. It comes with the intention of integrating the ICMBio's Brazilian Long Course System, adding like national and international experiences of systems like this one.

Experience description:

This movement began in late 2017 and has already gained many enthusiasts and volunteers. It has been participatory and horizontalized, having as a principle a collective construction in a bottom-up process, in which social participation is essential for gain the goals, since all individuals and entities are the true stakeholders. Participatory processes are based on the inclusion and pluralism of people, communities, groups and institutions, to boost and broaden the scope of results in the face of convergence of experiences and diversity. The mobilization actions, such as seminars, they seek to map and aggregate stakeholders in this construction, identifying the individuals and entities involved in the movement, how are these local governance protagonists of the 19 trails that make up TMTQ and which are making decisions and are guardians of each trail kilometer. The trail's implementation is the moment to enable volunteers to handling and signaling, and finally, to plan and to implement these actions.

Results:

Until today the project has already held 5 seminars to disseminate the movement and the concept of LCT (Long Course Trail), 5 signaling *mutirões*, the APA Serra da Mantiqueira's program volunteer, that resulted the signaling in the trail about 120 km. This is a model for the conservation and planning of mountain tourism in Mantiqueira and for the development of individuals and traditional communities, avoiding emptying them for lack of opportunity and employment and income. The trail has a mandatory role in privileging an environmental education in the search for a natural environment, as well as a quest for alternatives in its relations with nature and in the discovery of new types of lives, gastronomy, beliefs and values, architecture and so on.

Conclusion:

The TMTQ will contribute to the environment conservation, the integration of man and nature in a living relationship with the ecosystem, with the customs and local history through the communities' socioeconomic development and their surroundings, as well as the orderly and sustainable tourism in Mantiqueira.

Experience report 2

Association between fusarium wilt of tomato and management practices adopted by farmers of the mountain region of Rio de Janeiro state

Authors: *Mayara dos Santos Rocha, Cristiana Maia de Oliveira, Cíntia Luíza Xavier Batalha, Jéssica de Oliveira Lima, Rita de Cássia Silva, Laura Carine Cândido Diniz Cruz, Caio Soares Diniz, Carlos Antônio dos Santos, Margarida Goréte Ferreira do Carmo*
Institution: *Federal Rural University of Rio de Janeiro (UFRRJ), Brazil*

Presenter: *Mayara dos Santos Rocha*

Introduction:

The Mountain Region of Rio de Janeiro State (RJ), Brazil, is considered a pole of horticultural production, and it is responsible for a huge supply of this segment in the State. Among the crops produced in this area, tomato stands out due to its economic and social importance. The tomato production is carried out by small farmers and sharecroppers who face daily production challenges, such as diseases caused by soil plant pathogens. One of the main diseases is caused by *Fusarium oxysporum* f. sp. *lycopersici*, a pathogen that has three races, 1, 2 and 3 that colonizes the xylem vessels of the plant causing symptoms such as wilt, yellowing, leaf necrosis, and some cases fruit drop resulting in high yield losses.

Experience description:

Students from the Federal Rural University of Rio de Janeiro have been developing researches in the cities of the Mountain Region of Rio de Janeiro State in order to reduce the problems faced by small farmers, and thus reduce the social and economic impacts caused mainly by soil plant pathogens. Surveys on farms in

the city of Nova Friburgo were carried out in order to identify the management practices adopted by the farmers and its relation to the occurrence of Fusarium wilt. The surveys were conducted through forms, soil and tomato plants samples.

Results:

From the results it was possible to identify the presence of the pathogen in the region and also to highlight some practices used by the farmers that are related to the spread of the disease: 1) The high specialization of the farmers in tomato production and the uninterrupted cultivation of tomatoes contribute to the increase of the inoculum density of the pathogen in the soil. 2) The soil management adopted in the region, especially in steep areas, favors erosion, where soil particles and spores of the pathogen are carried away, increasing the spread of the disease. 3) A common use of machinery and implements by the farmers without previous cleaning. 4) Another practice commonly adopted in the region is the incorporation of plant residues from the crop to the soil. The fungus has saprophytic activity and can survive in plant debris, thus increasing the survival and spread of the pathogen. 5) Fertilization and liming in general are not carried out in adequate quantities to meet the need of the crop, also favoring losses due to the disease.

Conclusion:

A group at UFRRJ has been developing researches aiming strategies to reduce the losses caused by the disease, such as a screening of resistant materials to the races of the pathogen in this region. In addition, lectures are being planned to promote orientation to the farmers about the management practices adopted.

Experience report 3

Patagonia Waste Management: managing human waste in a backcountry site in Los Glaciares National Park, Argentina

Authors: Steffan Gregory, Kika Bradford, Geoff Hill, Alan Thorne

Institution: Acceso PanAm and Toilet Tech Solutions, Argentina

Presenter: Kika Bradford

Experience description:

High numbers of visitors has brought challenges to Los Glaciares National Park (LGNP), El Chaltén, Argentina. A big challenge is human waste management in backcountry campgrounds. Patagonia Waste Management, a volunteer-based project, has sought to propose long-term solutions for human waste in backcountry areas, including the case study of the test toilet built in Laguna Capri, a day use destination in the park. The majority of human waste is urine. If urine mixes with fecal matter, ammonia levels rise, decomposition stops, and strong foul odors are produced. When urine is diverted at the source, it can be treated by native soil, and fecal matter can be consumed by invertebrates. By researching the range of urine diversion technologies, we used a urine-diverting design that was not patented and had been proven in Europe and North America, a TTS unit with the Behind the Wall technology. The system was proposed as an alternative to the high ground water pollution of pit toilets, high cost and intensive labor demand of barrel collection, and decrease decomposition capacity of composting toilets that mix urine and fecal matter. During the first field season (Dec 2015-Feb 2016), we built this urine diverting vermicomposting test toilet at Capri. After research conducted by the Argentinean National Park Administration, worms found locally were approved to go in the unit. The second season (Jan-Feb 2017) monitored and maintained the test toilet, while the third season (Feb-Mar 2018) researched and proposed adaptive management solutions to structuring issues in the unit. Over the years, aspects of

the project included negotiating with various land managers, engaging the local community, public education and understanding importation bureaucracy in Argentina. Regardless of challenges, the results of the test piece have proven its functionality and cost effectiveness. Visitors have reported a better experience and reduced odor at the Capri toilet over the pit toilets previously used. Trash has been seen in the toilet system and educational signs were reinforced at the local site. Maintenance processes were taught to park staff. Worms promoted a faster decomposition of the fecal matter. Construction presented a few areas for improvement, which have been addressed. Flooding noticed in 2018 requires monitoring and an adaptive management approach to research the proposed solutions. The most difficult challenge, which is at a standstill currently, is the logistics of import, which prevents the possibility of using other similar toilets in Patagonia because of cost and bureaucracy. There is also need for further negotiations for using urine diverting conveyor belt type units, research for context-specific solutions to provide a long-term, simple, inexpensive option to manage human waste in different backcountry sites in Patagonia.

Experience report 4

Rede sabor e saúde da serra: fair, agroecological and solidary commerce in Serra do Brigadeiro, Minas Gerais

Institution: Núcleo de Estudos em Agroecologia Puris, Federal Institute of Sudeste – Muriaé, Minas Gerais, Brazil

Presenter: Juliana Sena Calixto

Introduction:

Family-based agroecological agriculture faces several challenges in draining its production. Thus, the combination of short circuits with agroecological production favors the creation of alternative marketing networks and the strengthening of the local economy, as well as promoting the sustainability of agriculture in mountain regions, since agroecological production preserves the soil, water and biodiversity.

Experience description:

With the purpose of strengthening the commercialization processes of the agroecological family agriculture in the region of the Serra do Brigadeiro and enabling the access of consumers to food products produced without pesticides, a partnership between the Cooperative of Producers of Solidary Family Agriculture of the Region of Muriaé (COOPAF) and the Puris Agroecology Studies Center (NEAP) fostered the creation of the *Rede Sabor e Saúde da Serra*, which links consumers and agroecological producers. The experience began with the mobilization of producers in order to form a cohesive group. After some meetings, the NEAP team visited the producers to learn about the properties and challenges of production. To present the proposal, a meeting was held with potential consumers, who were able to get to know farmers and their products on display at a fair.

Results and conclusion:

The marketing process starts with the producers sending a fortnightly list of available products. This list is available on a website, where registered consumers make purchases. The products ordered are delivered to the Southeast IF and NEAP grantees set up the basket of each consumer, who withdraws it the next day and makes the payment. The Network currently has 32 families of agroecological producers from the municipalities of Muriaé, Miradouro, Rosário da Limeira and Barão do Monte Alto, and 72 registered users. At the moment the group is also involved in the inauguration of a permanent fair of agroecological products and goes towards certification without pesticides (SAT), results of the maturing of the experience and strengthening of the group provided by the Network. This experience signals the existence of a strong local market demand for agroecological products in the region, as well as being an initiative able to re-signify the relationship between consumers and producers through the links of production and consumption of healthy foods.

Experience report 5

Agroecology in mountain coffee: the natural and organic coffee production site Pedra Redonda, in the area of the forest of Minas Gerais

Authors: Elaine Jamires Freitas, Maria Alice Fernandes C. Mendonça

Institution: University of Vale do Rio Verde, Três Corações, Minas Gerais, Brazil

Introduction:

Agroecology in recent years progress towards understanding and structuring of sustainable agrifood systems (GLIESSMAN, 2011, 2012). Until the first decade of the 2000s, understood to agroecology as a science, social movement and practice (WEZEL et al., 2011) for the design of sustainable agro-ecosystems, emphasizing the ecological dimensions in the production units. Today, conceptually, agroecology is a set of actions, scientific, social and practical, for the restructuring of agrifood systems in the territories, from the ecological dimension. Access, justice and food and environmental equity, are central pillars of its construction. The challenge of agriculture is to find forms of land use that are economically viable and ecologically sustainable. Agroforestry systems (AFS) can be a good alternative to increase productivity, with higher levels of sustainability in the production system (Lamonica, 2008). In this sense, the account of experiments that elucidate the understanding of agroecology, focused on the sustainability of agroforestry systems in Mountain coffee, it is necessary. So much for the recognition and apprehension of these experiences, and for the encouragement and strengthening springs experiences toward the multiplication somewhat more autonomous mode. Then, later, the record and theoretical and methodological organization of new knowledge produced can support the creation

of tools to the mass of experiences in producing natural and organic coffees in mountainous regions.

Experience description:

The visit to Pedra Redonda site occurred in September 2018 during a technical visit organized by the XII Congress of the Brazilian Society of Production System (SBSP). The visit had a very heterogeneous group, with the presence of professors from the Federal University of Viçosa (UFV), Federal University of Pará (UFPA), agronomy students, biologists, ecologists and two Dutch sailors seeking sustainable solutions to humanity and the planet. During the visit, we follow the experiences of Edmar with the production of organic and natural coffee, where there was the exchange of knowledge between the farmer and the group.

Results:

The site Pedra Redonda is located in Araponga municipality in Zona da Mata of Minas Gerais, where Edmar produces organic and natural coffee. In the production of natural coffee Edmar uses of the available resources on the property, preferably the litter of the forests, forests that these are around the coffee plantations. The transport of litter occurs through the bullock cart, due to topography and altitude, but the shipping relationship goes beyond the difficulties of access to the area of agriculture and forests, is a cultural relationship that the father of Edmar went for it and it still holds today. In the coffee area houses several other species such as native trees, banana, avocado and fruit can be characterized as an agroforestry system (AFS), the complexity of the system contribute to increase the resilience thereof, for the management of ground cover and the large amount of litter transported from forests to coffee plantations, especially for natural coffee plantation favors the biological activity and nutrient cycling allowing maintaining soil moisture and nutrition of the coffee. Agriculture practiced in *Sítio Pedra Redonda* is highly productive and is already at an advanced stage in terms of ecological conversion (Altieri, 2012): high diversity and complexity of agro-ecosystems, high fertility and vitality of the soil, the benefit of ecological interactions for control of pests and

diseases, low use of external inputs (only for coffee, some organic fertilizer, bone meal and bio-fertilizers, among others). Edmar explains that intends to expand forest area to increase the litter production and thus to increase its production of natural coffee. The withdrawal of the forest litter is delineated by Edmar, respecting the time and the process of decomposition of matter (leaves, twigs, straw, etc.), which explains their desire to increase the forest area as well. The complexity of the site system Round stone It relies on agro-ecological techniques and resources available on the property that are used and enhanced by the experiences and lessons of Edmar. The interaction of Edmar with the system allows autonomy from the production of the coffee market consolidating the importance of having market strategies in the territorial scope.

Conclusion:

The understanding of the productive site Pedra Redonda system for its Edmar has allowed the expansion of sustainable coffee systems in mountain regions and the production of natural and organic coffees, which are intended in part to the market, the trade door to door and subsistence of the family. Promoting income, quality of life and possibilities of a more sustainable agriculture and reproductive self.

Experience report 6

Fertmovel as a process of innovation and knowledge of soils

Authors: Barros, G. T.; Schuenck, P.R.V.; Gravino, G.B.; Melo, A.S.; Macedo, J.R.

Institution: Embrapa Soils, Brazil

Introduction:

The use of fertilizers and correctives, without considering the current fertility of the soil, can lead to the application of subdoses, not reaching the potential of production of the crop, as well as the application of superdoses increases the costs with inputs besides polluting the environment. Soil analysis is a simple and accessible tool for evaluating the soil fertility of a property and aims to diagnose the stock of nutrients available to the plants and should precede the cultivation of any crop. Based on the results of the soil fertility analysis, liming and fertilization recommendations are made. The objective of the work is to report the experience and the importance of Fertmovel in the mountainous region.

Experience description:

Given the scenario of scarcity of laboratories in the state and innovation of a mobile soil fertility laboratory - Fertmovel - operating in a van, a partnership was signed between Embrapa Soils, Syngenta and the Ibelga agricultural college to facilitate the access of rural producers to this service and supply the demand of the state. The location of Fertmovel in Nova Friburgo is strategic in the mountain region of Rio de Janeiro, which is a hub of agricultural production and the main producer of vegetables.

Results and conclusion:

Fertmovel brought to the city an innovation, operating close to

producers, facilitating access to information and generating a relationship of trust in information, confirmed by the growing demand for analysis. Another experience is Fertmovel to make available to the students of the Ibelga College the opportunity of internship and learning about the functioning of a laboratory, consolidating the theoretical knowledge of the discipline of soil fertility. With this integration to the pedagogical activities, one believes in a paradigm change as far as the valuation of the soil analysis and the agricultural technician in the region. Some of the results of the fertility analyzes presented high levels of phosphorus and potassium according to the Rio de Janeiro Fertilizer Manual (2013). In this manual are classified as very high values of $P > 30 \text{ mg dm}^{-3}$ and values of $K > 135 \text{ mg dm}^{-3}$, indicating that the fertilization is done incorrectly, increasing the cost of production and the risk of environmental contamination by the leaching of these nutrients to the water bodies. Some acidity results showed high levels of Ca + Mg and pH, indicating that they were corrected in relation to the natural conditions. Several pH results exceed 7.0, indicating that the producers are applying correctives without the technical basis. In the future, the opportunity to map the fertility of the soils of the municipalities of the mountainous region is based on the results generated by Fertmovel.

Experience report 7

Authors: *Nina Celli Ramos, Yan Gabriel Celli Ramos e Guilherme Stutz Erthal*

Institution: *Fazenda Monte Cristo Agroflorestal, Brazil*

Presenter: *Nina Celli Ramos*

Experience description:

One of the greatest challenges nowadays is to reconcile food production with conservation of the environment and biodiversity. In this context, agroecology reveals itself as a science and movement in search of sustainable agriculture. Successional agroforests are highly diverse and productive systems resulting from the management of trees together with agricultural crops. Working as a natural environment, agroforestry supports food security while contributes significantly to biodiversity conservation. Located on the slopes of Serra do Mar (Rio de Janeiro state, Brazil), the Fazenda Monte Cristo was a coffee farm in the 18th century and is in the family for four generations. Recently, it is undergoing agricultural transformations: after study Agronomy and Ecology at the Federal University of Viçosa, we moved to the farm seeking to apply the agroecological knowledge on the practice of dealing with the land and restore the valley landscape with agroforestry. Firstly, we put effort on improving the existing constructions, such as houses and sheds. Then, we began to convert old areas of pasture into areas of agroforestry. In order to complete this task, we adopt the ecological principles of syntropic agriculture and organic management of the soil, experimenting multi-stratified and biodiverse consortia and using techniques adapted to the mountain environment. To close the energy cycle of the property, we integrated the animal element, which consumes the leftovers from the harvest and produces manure for the agroforestry. After 5 years, the changes are already visible. We are expanding these plantations, occupying previously degraded areas that are gradually becoming forests of food production. Currently, we harvest more than 54 agroforestry products, including fruits, vegetables, roots and grains. From the diverse harvests, we elaborate other products like dry fruits, pickles,

bread and desserts. These results evidence the productivity and diversity of the agroforestry, making possible to reach the food sovereignty and to generate income for our family. We sell the production in public markets and also deliver them directly at people's homes, strengthening the bond between producers and consumers and making the economic sustainability of the agroforestry truly effective. In addition, we believe that agroforestry is making the way for the restoration of the landscape, since it works as a habitat for pollinators and seed dispersers, functioning as a matrix of quality and allowing greater connectivity between fragments of native forest. Moreover, the farm has showed itself as a great environment to the diffusion of techniques and knowledge regarding agroforestry and agroecology. We have the opportunity not only to raise our children in permanent contact with nature, but also to share our experiences with other adults and children who come to the farm to participate in courses, *mutirões* and school visits. Finally, we see our experience with agroecology and agroforestry not only as a way to obtain healthy food, but also as an ecological and social movement, expanding the bond between people and theirs with the land, allowing community development, food sovereignty and the restoration of environments in a sustainable and economically feasible way.

Experience report 8

Cushion plants of the Andes an inspiration for the implementation of micro biodiversity hotspots

Authors: Carvajal, F.; Palape, M.; Moreira-Muñoz, A.

Institution: Plantasia, Biomimicry Chile, Pontificia Universidad Católica de Valparaíso, Chile

Presenter: Francisca Carvajal

Experience description:

This presentation shares the experience of what has been to transform the idea of creating micro biodiversity hotspots in degraded territories into a social innovation that addresses at least seven of the 17 SDGs, proposing a decentralized model that regenerate life in the soil collectively. I would like to share three main concepts, which synthesize and transmit the lessons learned through the biomimetic process that lead to Life patch project. 1) Micro Biodiversity Hotspots, a local proposal to a global problem – The dynamics of human development and growth require more resources (land, water, energy, food, fuel) to sustain it, which reshapes urban and agricultural landscapes that are threatening natural ecosystems that provide ecological services and are rich in biodiversity. Until now, the increase in food production has been based on the intensification of agricultural practices and the expansion to new territories. As there are not many fertile areas available, there is the need to access dry lands and regenerate degraded land. Life patch is a proposal to create multiple micro biodiversity hotspots fostered by communities working collectively in a networked and decentralized effort to regenerate degraded land. 2) Inspired by nature – Current environmental challenges require a systemic approach, to accept and understand the complexity of the web of life, especially including plants and humans. In this Project, we have learned from nature and have abstracted the biological principles of the nurse plants of the Andes Mountains to gain

insights of how they shelter life in hostile conditions. These principles have been applied in the creation of both, the product that biologically regenerates degraded soils, and the social intervention model, which stimulates the economic activity of local nurseries, directly benefiting rural women. 3) A transdisciplinary path – The path to develop these, product and model, has been a constant research, including diverse disciplines such as Biology, Engineering, Ecology, Design, Economics, Geography and Sociology. The path of entrepreneurship is uncertain and requires a transdisciplinarity approach, which is why we have relied on a network of collective knowledge crystallized in a group of collaborators who, from their experiences, have contributed to the knowledge base of the project executing team. Knowing that agriculture is be a key activity to achieve the sustainable development goals, our proposal is to approach the local nurseries trade market with a systemic perspective and the principles of sheltering abstracted from nursery plants, allowing the knowledge of rural women to emerge and create value from it. Our purpose is to invite people to look at nature, while implementing micro biodiversity hotspots that regenerate degraded land that can even provide food and other ecosystem services.

Experience report 9

Atlantic Forest Connection Project

Institution: Fundação Florestal, Secretaria de Meio Ambiente de São Paulo, Brazil

Presenter: Claudette M. Hahn

Experience description:

The objective of the Atlantic Forest Connection Project is to recover and protect biodiversity and climate-related ecosystem services in the Brazilian Atlantic Forest Southeastern Corridor priority areas.

The Project uses a sustainable forest management approach to produce multiple benefits, especially land use and land use change carbon maintenance and removal by promoting and encouraging native species silviculture and biodiversity enhancement.

In addition, it complements state governments' efforts for protected areas management and fosters private land owners' engagement in landscape sustainable management by promoting ecological restoration activities, favoring ecosystem natural regeneration and the adoption of good agricultural / forestry practices.

The Project activities are aimed at increasing carbon stocks, enhancing ecosystem resilience, promoting habitat restoration for biodiversity conservation through the reconnection of forest fragments, and strengthening public and private institutional capacities of those entities participating in the Project.

To achieve the expected results, the Project combines different economic instruments: Payment for Ecosystem Services (PES), support to sustainable value chains, and certification of agricultural, livestock and forestry rural producers at the São Francisco Xavier Environmental Protection Area (APA) and the buffer zones of Bananal Ecological Station and Itariru and Santa Virgínia sectors of

Serra do Mar State Park.

The Atlantic Forest Connection Project started in 2017 and will extend through 2020. Therefore, the outcomes are still in progress.

Experience report 10

Academic experience in organic agriculture in the Serrana Region of Rio de Janeiro

Authors: Almeida, L. H. M.; Dias, A.; Araújo, E. S.; Guerra, J. G. M.

Introduction:

The experience, organized by the Graduate Program in Organic Agriculture - PPGAO (Federal Rural University of Rio de Janeiro and Embrapa Agrobiology), aims to provide students of their master's degree course with the opportunity to know successful experiences in agroecology and organic production. It is an important opportunity to favor dialogues and exchanges of knowledge among these students, mostly professionals working in the most diverse regions of Brazil, and organic farmers.

Experience description:

In the period between 2015 and 2018, there were five class trips from the course to the mountain region of Rio de Janeiro. Organic production units were visited in the cities of Petrópolis, Teresópolis, Nova Friburgo, Sumidouro and Duas Barras. In these units it was possible to observe aspects related to the organic management of vegetables, temperate fruit trees, agroforestry systems, laying birds, production of edible shoots, minimum processing of vegetables and family agroindustry, considering the different strategies used for fertilization, for phytosanitary management and for commercialization.

Results:

After the visits, the students in their reports made the following observations: All units visited were linked to the Participatory Organic Conformity Assessment Body of ABIO - Association of Organic Farmers of the State of Rio de Janeiro. It was possible to

observe that the System is safe in terms of guaranteeing organic compliance and, in addition, it provides dynamic relations between farmers with exchanges of knowledge and experience. Farmers visited most of their products directly in the cities where they live, as well as in the fairs of the *Circuito Carioca de Feiras Orgânicas*, which has about fifteen fairs in the city of Rio de Janeiro and the metropolitan region. The Circuit was cited as a major driver for disseminating the importance of organic food consumption and as responsible for improving the income and quality of life of the families involved. The family agroindustry is an important way both for the aggregation of value to production, and for the generation of employment and income in the rural area.

Conclusion:

The experience is presented as a valuable tool for the postgraduate program mentioned above with respect to the expansion of students' knowledge, with possibilities of applying what was seen, generating new perspectives in their daily professional life.

Experience report 11

Supporting family farmers agro-ecological transition in Cunha, São Paulo, Brazil

Authors: Marina Valadão, Alketa Bestaku

Institution: Serra Acima Associação de Cultura e Educação Ambiental (SerrAcima), Brazil

Presenter: Alketa Bestaku

Introduction:

SerrAcima, an OSCIP created in 1999, has built together with family farmers a long trajectory to stimulate the agro-ecological transition in the municipality of Cunha, located in the Paraíba Valley, state of São Paulo. The productive structure established historically in the region relies on conventional agriculture and livestock. This strategy has proved to be unsustainable for small landowners, especially family farmers. Their negative impacts are visible in the environmental (genetic erosion, loss of soil fertility and biodiversity), cultural (ripping of relationships and traditional knowledge) and socioeconomic levels (rural exodus and low human development indexes). Aiming to promote participatory construction of environmentally sustainable and socially just knowledge and practices, SerrAcima has implemented several projects focused on environmental conservation (protection of springs, recovery of the Atlantic Forest and elimination of dependence on chemical inputs), with emphasis on agroecology and in the generation of work and income.

Experience description:

Encouraging the agro-ecological conversion of rural properties - particularly in traditional communities, has been the central focus of our work in the last ten years. As a mobilization strategy, the organization promoted theoretical-practical courses in "Agroecology and Marketing", using the principles of Popular Education and

prioritizing field action in the production units themselves. In the seven classes formed, the courses attended 190 students and 150 units of family production of 30 rural districts. This work continues to the present day, with periodic workshops, technical visits, support to cooperative action, agro-ecological food marketing and the participation of families in regional, national and international events. The support of entities such as Petrobras Socioambiental, Interamerican Foundation and Banco do Brasil Foundation has been essential for the continuity of actions.

Results:

In this walk, the knowledge and practices related to the agro-ecological production of vegetables and ecological livestock have been disseminated and gained credibility. In addition to production for consumption, which affects family income and food security in rural communities, organic production is today the main source of income for more than 30 families who sell their products by means of direct sales, in street fairs and for the National School Feeding Program. The establishment of partnerships among producers begin to design a new perspective for sustainable rural development. The *Association of Agro-ecological Producers - APAC - Friends of the Earth* has been recently constituted and other collective initiatives are emerging in the region, including the House of the Family Farmer and the Group of Women of Paiol, which is investing in the production of ecological cleaning and hygiene products.

Conclusion:

Working with agroecology is still very challenging, given the need to maintain the continuity of the actions in the long term, even at the end of the projects that subsidize the technical activities in the field. In dealing with a hegemonic vision of the present and the future, the greatest challenge is to articulate the experiences to the broader political debate and the construction of a more just, solidary and sustainable world.

Experience report 12

Slope recovery that suffered a landslide in Teresópolis, RJ

Institution: Embrapa Soils, Brazil

Presenter: Claudio Lucas Capeche

Introduction:

On January 11th, 2011, the mountainous region of Rio de Janeiro was affected by floods and landslides caused by torrential rains and was considered the greatest climatic disaster in the country's history. The *Fazenda dos Caboclos* was one of the rural properties hit by the rains and had several areas with landslide occurrence. At this site, an area of approximately 1ha of forest has slid leaving the subsoil vulnerable to new landslides.

Experience description:

The owners decided to look for Embrapa Soils, due to its institutional tradition in the recovery of degraded areas. Three researchers visited the Fazenda dos Caboclos in January 2012 to check the affected sites. Considering the environmental characteristics of the site and the risks inherent to the situation of the main house, the owner was informed that the agronomic technologies would not be sufficient to contain the risk to the property. Civil engineering (concrete wall designed with containment rods, gutters, concrete stairs and drainage basins, among others) would be required. In February 2013, the Embrapa Soils team had returned to the farm to visit the progress of the containment works. After a meeting with the civil engineer responsible for the work, Embrapa researchers observed the need for some adjustments in the engineering design in order to increase the safety and efficiency of the work. The agronomic recommendations suggested by Embrapa aimed not only to increase the safety of the work, but also, whenever possible, to

reduce economic costs through more sustainable technical alternatives.

Results:

The first and most important recommendation was the reallocation of the dissipation stairs and deployment of two more surface drainage channels. So, it was recommended to change the dissipation stairs to the central part of the slope to share the water flow carried by the channels to the dissipation stairs. Other actions taken: Regularization of the surface with the implantation of bags with “Soil more cement”; the edges of one of the channels were to improve safety of the flow; installation of bags with “soil plus cement” the base and side of some channels to occupy the empty space; planting of pork bean (*Canavalia ensiformis*) inoculated with Rhizobium, fertilization with superphosphate simple and ground cover with straw; planting vetiver grass only at the edges of the channels and the dissipation ladder.

Using the low-cost techniques recommended by Embrapa Soils for the slope vegetation, the spontaneous vegetation could be established on the slope, offering an efficient vegetation cover to protect against rainfall

Conclusion:

The association of agronomic practices with civil engineering was fundamental for the reduction of costs and completion time of the work aiming at the stabilization of the slope

Experience report 13

Use of soil and water conservation practices in orchard implantation in a mountain region

Institution: Embrapa Soils, Brazil

Presenter: Claudio Lucas Capeche

Introduction:

The Fazenda dos Caboclos had about 5h planted with Ponkan mandarin in the early 2000s. Unfortunately, over time, the plants lost their productivity and were abandoned. Recently the owner decided to reform an area of approximately 1.2 ha, for make it productive again.

Soil preparation left the exposed surface at risk of erosion. The owner contacted the Embrapa Soils team asking for alternatives to minimize the problem. On September 13th, 2017, the team had visited the site and orientated the terraces and retention basins implementation. This service was accompanied by the team weekly and executed until at the end of September, when it was concluded.

Experience description:

Five uneven terraces were implanted, with a retention basin of approximately 2m². They collect the water from the dirt road that access the top of the orchard, and these facilities drains the water from the flood safely into the forest at the opposite side. At the lowering area, two main retention basins (one with a storage capacity of 135m³ and another of 180m³) were constructed. Another four facilities, located close to the forest, complete the storage set with approximately 91m³. In October, soil samples were collected for fertility analysis to guide orchard fertilization. In May 2018, the cropping process began, with the definition of the pits according the contour level. The soil received limestone to correct the acidity and, inside the pits, an organic fertilizer was applied. It was chosen to

plant a citrus orchard, diversified with orange, mandarin and lemon in a total of 260 fruit trees, with an approximate area of 8600 m². For the planting of the fruit trees, dolomitic limestone and bovine manure were used at the time of opening of the pits. In the planting, mineral fertilizers were applied. The orchard soil was classified as Yellow Red Latosol Humic Dystrophic.

Results:

The terraces and retention basins have functioned perfectly by ordering the surface flow and storing rainwater; the plants are well developed; Curve planting has promoted better soil conservation.

Conclusion:

Conservation practices are fundamental to the success of sustainable farming. The citrus orchard at the Fazenda dos Caboclos is an excellent example of sustainable cultivation in mountain agriculture.

Experience report 14

Agricultural demands, activities and problems in two mountain regions: Nova Friburgo/RJ and Lima Duarte/MG, Brazil

Institution: Embrapa and Company of technical assistance and rural extension of the state of Rio de Janeiro (Emater-Rio), Brazil

Presenters: Sergio R. Teixeira, Renato Linhares de Assis, Ocimar Teixeira, Ana Helena Camilotto

Introduction:

The objective is to present the experiences in demands identification obtained using Focus Group Meeting (FGM) in Nova Friburgo and Lima Duarte, the developed activities and observed problems.

Experience description:

Lima Duarte – Minas Gerais State county 860 meters high at the city. Dairy is one of the main industries. Local stakeholders participate in FGM. They were chosen because of their knowledge of regional farming. Nova Friburgo, RJ - Rio de Janeiro county 985 meters high at the city. Vegetables and legumes are the main activities. The same methodology was applied.

Results:

The FGM surprised because of fast Results: *“For years the Union has been trying to identify farming demands that have been identified in less than three hours.”* Lima Duarte – The FGM provided a re-elaborated experience on mountain agriculture (Table 1). Nova Friburgo – The highlight was for environmental demands and associativism (Table 2).

Table 1. Demands, activities and problems observed

Main demands	Implemented activities	Observed problems
Set Demonstration Units (DU) of soil conservation	Livestock Agriculture Integration	Farmer refuse to dry the pasture for the 2nd turn forage planting: <i>"I will not dry the pasture because I never had such pasture."</i>
Farmers orientation on production costs	Production data collection	Farmer resistance to organize and provide data about costs and livestock information
School education with agriculture disciplines	Prepare and present a kid's theater about farming and video production	Change tradition school disciplines

Table 2. Demands, activities and problems observed

Main demands	Implemented activities	Observed problems
Environmental legislation training in monitoring showing financial return of the standing forest	- Lectures on environmental legislation and Rural Environmental Registration (RER) - Rural Rio: Projects funds to help farmers	Convince farmers to adopt environmentally sound practices
Set DU in Agroforestry Systems (ASs)	Meetings to organize ASs	Fit the vegetables and legumes intensive dynamics to ASs
Associativism	Activities to strengthen social organizations	Politicization in associations and low participation of members

Additional comment: The demand "training in minimum processing of vegetables and legumes" would help mothers that work in housekeeping at Nova Friburgo. Moving to rural activities would improve the relations between mothers and children, thus helping to avoid social deviations of young rural kids.

Conclusion:

The diversity of actors helped a fast identification of demands of agricultural practice and more. However, it is necessary to improve the integration of the identified demands with organizations that work in rural areas, with rural stakeholders and with their associations.

Experience report 15

Birds and shutterbugs: how nature photography is driving local conservation efforts in the Eastern Himalaya

Authors: Deepa Basnet, Yang Jianmei, Yi Shaoliang

Institution: International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal / Southwest Forestry University (SWFU), Yunnan, China

Presenter: Deepa Basnet

Introduction:

The Eastern Himalaya encompasses several Important Bird Areas (IBA), with high species diversity and endemism. Avifaunal diversity is not only ecologically important but also provides cultural and recreational services. Due to rich bird diversity, the area has gained popularity among birdwatchers/ photographers, researchers, and nature lovers. The villagers of Hanlong, southeast of Gaoligongshan National Nature Reserve (GNNR) are engaged in bird photography tourism by developing hides, establishing feeding and watering spots, and providing infrastructure to cater to the needs of photographers who seek convenient and less strenuous ways to photograph birds. As tourist numbers increased, the number of ponds grew from six in 2013 to over 100 in 2018.

Experience description:

GNNR was established in 1983 in Yunnan, China. It is spread over 4,055km² and is home to many rare, endangered, endemic and migratory birds. Hanlong village is located at the entrance to GNNR and the community is deeply involved in bird photography tourism. In 2017, we conducted a case study in Hanlong to assess bird photography tourism from economic, ecological, social, gender, environmental education and public awareness perspectives. The

study also aimed to identify areas for improvement and explore the potential for such a tourism model being replicated across the Hindu Kush Himalaya (HKH). It was carried out using a combination of semi-structured household interviews (50), focus group discussions (3), internet survey of visitors (90), and expert opinions of ornithologists and conservation experts (7). It also included a review of documents from local government and protected area management departments.

Results:

Bird photography tourism is a major source of income for Hanlong engaging about 84% of local people. Fifty percent of households earned about 2,900 USD, 16% earned 2,900-5,800 USD, and 10% earned 5,800-8,700 USD from homestays, ponds and hides, transportation services, and as guides. Bird watching and photography tourism has benefited women by improving their knowledge of birds, enhancing their visitor management and hospitality skills, and exposure to new viewpoints gained from interactions with tourists. The growth of tourism has encouraged biodiversity conservation. Local dependence on forest resources has decreased exponentially and local perceptions of forest use and ecosystem services has changed. In terms of perceived benefits, 54% of respondents valued the regulating and maintaining services, 16% provisioning services, 14% cultural services, and 16% economic benefits. Sixty four percent of visitors to Hanlong are attracted through online and social media marketing, and referrals on social media.

Conclusion:

Bird photography tourism offers a niche area for development of mountain communities in biodiversity rich areas. In the case of Hanlong it has led to spontaneous protective actions and change in local perceptions of ecosystem services. It is also an effective way to enhance public awareness and knowledge of biodiversity. Social media has played a crucial role in promoting bird photography tourism in Hanlong village.

Experience report 16

How we made Mata Atlântica's plants a sustainable and vegan business

Authors: Flavio Jandr  and Clarissa Taguchi

Experience description:

Here at S tio Bonfim we work with organic certified produces and also *PANC (Plantas Aliment cias N o Convencionais)* – or *PENC (Plants that are Edible but Not Common used)*, specially from *Mata Atl ntica's* environment. We started resourcing in 2015 and since then we developed several artisanal and vegan products that are now found at few stores in Rio de Janeiro and Nova Friburgo cities. Our initial goal was to develop a better way to sustain organic farm for small farmers. After we found all the possibilities and new flavors that *Mata Atl ntica* has to offer, we felt in love for the project and started new recipes and ways to preserve our findings. Flavors from the woods are very popular around gastronomy markets and *PANC* is now very popular too. However, in order to work with *PANC* flavors we also had to rescue traditional techniques for preserving and fermenting plant based food.

More about organic agro forest at Nova Friburgo's mountains:

Nova Friburgo has plenty intact biomes, all filled in by *Mata Atl ntica* high altitude forests. Our location lays on a reserve of 40.000 m². We have our own spring that irrigate all the produce. We practice adaptations and mixed techniques for organic farming, such as biodynamic methods and natural agricultural from (MOA – Mokiiti Okada Association). After we started working with *PANC* our produces were driven into seasonal and rustic varieties, they are easier and cheaper to crop.

More about PENC:

We found endemic species such as *Ocimum selloi*, *Nothoscordum gracile*, *Monstera deliciosa*, *Jacaratia spinosa* and *Tagenta minuta*, just here at site. The variety we use for crops and within our artisanal products vary and increase every year. We are actually working with more than 20 species by now. Our final products follow a vegan and high nutritional path. We do not use artificial preservatives or coloring. Most of the ingredients '*in natura*' came from *Sítio Bonfim*, so our business is very self-sustainable. To deliver *PANC* towards consumers, even for Nova Friburgo market were the biggest and difficult task. *PANC* varieties may be easier to crop but harder to sustain at shelf market stores. So we had to deal with three big questions: 1 - How to deliver a product that last at our consumer's house and at shelf stores? 2 - How to sell a new flavor for our consumers if they have no idea of how it taste? 3 - How we can add value into it because *PANC* is seasonal and most rare to find? So, we started to research. Our kitchen became a laboratory. We needed a final product that fitted into all those questions and we did it. It took three years and now we use traditional Japanese techniques for fermenting, vegan procedures such as rejuvelac - a former way to also ferment plant based food - and local traditional cooking. After all, *PANC* were a nice shot we have bet. They are now being pretty studied as its nutritional values are found higher than conventional produces. It helps our products to sell as the vegan market increases every year.

Visits and tours:

Besides our artisan business, we are also open for cooking classes and organic agricultural techniques. Groups of four up to 20 are especially welcome, we can enjoy a nice walking detecting and searching for *PANC* species while learning about agroforests practices. By the end, enjoy a nice colorful and tasteful vegan coffee break or lunch, all prepared with our *PANC*.

Experience report 17

Sesmaria River Project – Hydric PES (Payment for Environmental Services)

Authors: Luis Felipe Cesar, Matheus Ambrósio

Institution: Crescente Fértil - Projetos Ambientais, Culturais e de Comunicação, Brazil

Presenter: Luis Felipe Cesar, Matheus Ambrósio

Introduction:

The Sesmaria River Project – Hydric PES (Payment for Environmental Services) started in 2015, it aims the restoration of 20 hectares of forest and the conservation of 40 hectares of remnants of the Atlantic Forest, being an unfolding of the “Environmental Diagnosis of the Sesmaria River Basin Project” (2012-2015). The objective of the first stage was to establish guidelines and priority actions for the recovery and environmental adequacy of the sub-basin of the Sesmaria River in the municipalities of Resende and São José do Barreiro, located in the states of Rio de Janeiro and São Paulo. From June 2018, the project is being replicated in the *Sacra Família* river basin, in the municipalities of Paulo de Frontin, Mendes and Vassouras, state of Rio de Janeiro.

Experience description:

The Project” began in July 2015 with the signing of a contract between Crescente Fértil, Agevap and the Municipality of Resende. The main goals are constituted by the restoration of 20 hectares of forest and the conservation of 40 hectares of remnants of Atlantic Forest. The areas worked were chosen from a public selection process of the interested rural owners of properties, who receive a financial incentive for the provision of the environmental services during the two years of the project. In addition to planting and forest conservation activities, soil conservation actions were implemented

with the construction of four mudlines associated with forest restoration areas and four catchment area on the access road. The Sesmaria River Project- Hydric PES is carried out by Crescente Fértil, in partnership with the Municipality of Resende, with water collection resources from the *Paraíba do Sul* river basin operated by Ceivap, Agevap and CBH - Middle Paraíba do Sul. The initiative also has the partnership of IEAR / Federal University Fluminense (UFF), Rural Union of Resende, Inea-State Institute of Environment, Cedae and TNC - The Nature Conservancy.

Results:

41.39 hectares of forests fenced for conservation; 24.43 hectares of fenced areas for forest restoration; Approximately 32,000 seedlings planted; Payment of R\$ 11.277,60 to 5 beneficiary rural owners of properties; Creation of municipal law in Resende establishing municipal policy of payment for environmental services; Technical support to the Municipality of Resende for the preparation of the project approved under the Water Producer Program of the National Water Agency; Approval and initiation of the Water and Forest Producers Project - Sacra Família river sub-basin, in the municipalities of Paulo de Frontin, Mendes and Vassouras, in the state of Rio de Janeiro, with the objective of implanting 1.000 hectares of forest conservation and 50 hectares of forest restoration, including payment for services to selected rural owners of properties. (July 2018 to June 2021).

Conclusion:

Forest protection and recovery projects that include payment for environmental services still have a high cost per hectare planted, and it is necessary to develop methodologies to increase the cost / benefit ratio. The usual practice of involving Municipalities as obligatory intermediaries of the PSA's (ESP's) financial transfer to the participating owners of properties needs to be re-evaluated, since problems of a bureaucratic or political nature may jeopardize the good progress of the projects or even render them impracticable. Mountainous or areas with contrasting relief should be considered as priorities for forest recovery and conservation.

Experience report 18

***Institution:** Company of technical assistance and rural extension of the state of Rio de Janeiro (Emater-Rio), Brazil*

***Presenter:** Gustavo Pereira Polido*

Experience description:

Varre-Sai, in Rio de Janeiro, is a municipality focused on agribusiness that has coffee growing as the largest income generator, possessing, approximately five thousand hectares and located in steep hill slopes, typical of mountain regions of coffee. In these areas, the soil must be very well managed to avoid erosion processes. The Emater-Rio of Varre-Sai - RJ, has been encouraging conservation practices in soil, as main examples: 1) micro terraces (MT): built between the lines of coffee planting; 2) rainwater catchment boxes (CB): built on the banks of coffee-growing roads. The construction of (MT) is a new practice, therefore, the adoption by the coffee growers is small, but has been increasing. In Varre-Sai we have experience with two ways of building (MT): 1) narrow base, 20 a 50 cm wide made with hand tools and / or animal traction, it's serves to improve the passage of the worker within the crop; 2) long base, de 1,3 a 1,5 m, made with motorized traction (micro trailer, small excavator, 4x4 narrow gauge tractor). The (MT), made with motorized traction is more effective, because it forms paths, where small tractors, tricycles, micro tractors and equipment can be transported, able to: pulverize, fertilizer, transport, besides allowing the worker to perform the harvest and other cultural practices with more convenience. Mechanization in mountain coffee growing is essential to reduce the cost of production. In addition of this benefits (MT), both narrow base or long base, show another important characteristic, which is to prevent erosion, avoiding the superficial runoff of the water and increases the accumulation of water in the soil. The (CB) is a practice stimulated by the Rio Rural Program and stands out for the widespread adoption of coffee growers. When the farmer shows interest in adopting this practice, the technician makes a technical on-site visit to evaluate and size the project. After the

implementation of the (CB) it was remarkable the improvement of the soil of the plantations, where the erosion process was already beginning. Besides the benefits caused in the agricultural sector, it was possible to note the improvement of the roads, because the rainwater that flowed from crops to roads, now run less causing less damage. The practices (MT) and (CB) has been were efficient in Varre-Sai - RJ, but deserves better publicity for the target audience. It would be interesting to adopt the (CB) by the municipal government, in the vicinal roads that would greatly reduce the maintenance of the roads. The practice of (MT) lacks technical support at the time of construction. The (CB) must always first pass a technical evaluation so that the ideal (CB) number for a particular construction area.

Experience report 19

Institutional Markets - marketing support in Nova Friburgo

Institution: EMATER-RIO

Presenter: Ocimar Alves Teixeira

Introduction:

The incentive to trade on a fair basis is inherent to the rural extension activity. It is fundamental the direct sale in fairs, local and regional markets for the independence of farmers.

This work has been developed with greater emphasis on access to the Institutional Markets, through federal public policy to commercialize the production of family agriculture, especially in the 3rd district of Nova Friburgo, due to the location of the settlements and the strong presence of agriculture. Rural extension work, carried out by EMATER-RIO, added other areas of the municipality and today the sales projects include farmers from eight micro-basins, as well as farmers from neighboring municipalities, increasing the variety of products available. They are direct and indirect benefits, in the countryside and in the city, generating work and income, causing resources to circulate, moving the economy of the municipality and region.

Experience Development

The main entity involved is the Technical Assistance and Rural Extension service - TARE public, through EMATER-RIO, which sought to aggregate the partners in order to make feasible, through various programs, the full implementation of existing Public Policies. Thus, they were worked: federal programs for land credit - Banco da Terra, National Program for Strengthening Family Agriculture - PRONAF, Food Acquisition Program - PAA and National School Feeding Program - PNAE (which serves philanthropic and social

interest institutions), as well as state programs for rural roads – Estradas da Produção and organizational support, in infrastructure and sustainable practices - RIO RURAL. Throughout these 15 years, EMATER-RIO applied several methodologies, such as meeting, visit, excursion, field day, and in the beginning functioned as an incubator, generating all social technology for registration and control of bookkeeping and accounting organization, relating to collective sales, starting to be developed by the organizations after 2011.

Results

In 2002, a settlement in Fazenda Rio Grande, 3rd district of Nova Friburgo, through the federal program Banco da Terra, benefited 48 families from two associations, Serra Nova and Serra Velha. In 2005, the PAA's resources were considered as a form of discharge the annual financing. It started with 14 farmers of the Serra Nova association and in 2006 there was adhesion of other farmers of the Serra Velha association, and in the third year each association presented its own sale project, being followed by other institutions. From 2014, the Central of Supply of the State of Rio de Janeiro - CEASA created the food bank (Banco de Alimentos) and started to operationalize the PAA Simultaneous Donation (PAA Doação Simultânea), acquiring directly from the farmers. In that year, 110 suppliers were registered. Already in 2017, 256 farmers provided food through this modality.

In 2011, the year of the climatic tragedy that hit Nova Friburgo, the City Hall launched its first public call aimed at meeting the School Feeding Law (Law n ° 11.947 / 2009), which established the PNAE. The association Serra Nova was authorized and signed a contract, which has been taking place uninterruptedly, along with other associations and cooperatives, until nowadays. It is also worth mentioning the beginning of the commercialization of individual farmers, informal groups and the Legal Rural Woman Cooperative (Cooperativa da Mulher Rural Legal), attending state schools in Nova Friburgo and neighboring municipalities.

Conclusion

The effects are noticeable in several segments: Economic - significant increase of volumes and values traded with Institutional Markets, higher remuneration of farmers and increase of municipal collection with the issuance of invoices; Environmental - awareness of the importance of the product quality offered, leading to the adoption of sustainable technologies in mountain farming. As an example, the work of the Research and Training Center for Farmers (Núcleo de Pesquisa e Treinamento para Agricultores – NPTA) / Brazilian company of agricultural research (Empresa Brasileira de Pesquisa Agropecuária – EMBRAPA) and EMATER-RIO / RIO RURAL, with the incentive of green manuring; Social - strengthening of the agricultural sector of the municipality, strengthening associativism, generation of work and income in the communities, social control of the collective purchase process and the quality of the food offered.

Experience report 20

Institution: *Company of technical assistance and rural extension of the state of Rio de Janeiro (Emater-Rio), Brazil*

Presenter: *Flávio Gonçalves de Souza*

Experience description:

Through research, articles, meetings held in rural communities, and work developed by Emater-Rio, in the development of the Rio Rural Program, we seek alternatives and solutions that would enable better conservation of flora and fauna species together with anthropic occupation in watershed. The interest of the environmental sector of the municipality and the wish of the community, presented in the public hearings developed in the communities and in the municipalities' headquarters, provided an alternative guaranteed by law, guaranteeing the creation of conservation units for sustainable use, approved by federal law 9.985 of July 18, 2000 - SNUC - National System of Conservation Unit. The Rio Rural Program operational manual, available at http://www.microbacias.rj.gov.br/area_arquivo/area_22/capitulo_0 served as a basis for the creation of sustainable use conservation units that have already been implemented in three Hydrographic Watersheds to date. The micro-basins present in the regions delimited as important for the conservation of the local flora and fauna are: Created in 2012, in the municipality of Natividade, in Rio de Janeiro, the Environmental Protection Area APA MBH Capanema / Marambaia has a total area of 4,301.70 hectares and with 44 remnants of forests totals 637.24 ha, sanctioned by Municipal Law 606/2012 and later changing its name to APA Collar Sloth by Municipal Law 621/2013. The second belongs to the Municipality of Porciúncula in the Hydrographic Basin of Perdition, with a total area of 6,241.0 ha, 1,593 ha in native forests (25.94%), sanctioned by Decree 1360 of June 5, 2013. The Third , in the municipality of Itaperuna, in the district of Raposo, part of the micro basin, known as the Environmental Protection Area - APA Raposo, sanctioned by Decree 3362 of January 29, 2014, totaling

6,170.06 hectares, with approximately 1,789 hectares in forests (28.93%). For the Northwest Region, the creation of the Sustainable Use Conservation Units guarantees the sustainable use of a total area of 16,712.76 hectares, in addition to making feasible the increase of Municipal Revenue with the Green ICMS and collaborate in raising funds through projects, as for example, those presented by the Municipalities of Natividade and Porciúncula in the Technical Chamber of Environmental Compensation of the State of Rio de Janeiro. The co-investment in the environmental sector of the mentioned micro-basins is R\$ 368,446.00 for Natividade and R\$ 360,806.00 for the municipality of Porciúncula. The APAs are an excellent way of preserving, as well as providing resources for municipalities through the green ICMS.

Experience report 21

Responsible tourism a key to sustain livelihoods and minimize migration in mountains

***Authors:** Pradeep Mehta, Ghanshyam Pande and Ram Singh Koranga*

***Institution:** CHINAR (Central Himalayan Institute for Nature & Applied Research), India*

***Presenter:** Pradeep Mehta*

Introduction:

Mountain ecosystems are one of the most fragile ecosystems. The occurrence and the magnitude of extreme climatic events are traditionally higher in mountain than in lowlands, a situation that is increasing due to climate change. This has affected the livelihoods of the mountain communities. Despite being ecologically rich and sustainable, more than 1/3 of the rural population in the mountain areas suffer from hunger and malnutrition. As a result of this, migration from the rural areas to the towns and city has been increasing. According to the latest Intergovernmental Panel on Climate Change (IPCC) report, temperatures are predicted to increase further in most mountain areas, making it very likely that in the near future, disasters and extreme events will affect mountains even more. At this rate, climate change could increase the vulnerability of mountain peoples in the long run and may push them to continue to out-migrate to bigger cities or to deplete mountain natural resources at a faster rate for survival. All this poses a threat to the livelihoods of the communities in the Himalaya. Considering the above, there is an urgent need to diversify the livelihoods option for the mountain communities to adapt to climate change. One biggest advantage is capitalizing on the scenic beauty, the charismatic landscape and the exotic and endemic floral and faunal species of the Himalaya. Tourism has its positives as well as negatives. It contributes to the local economy

and improves the livelihoods of the communities. On the hand, unregulated and irresponsible tourism has a negative impact on the mountain ecosystem. However, tourism if planned properly in the mountains can be a game changer and can be the best option for climate change adaptation for the communities.

Experience description:

CHINAR as part of its livelihoods program has initiated responsible tourism in Indian Himalaya in cluster of villages. As part of this program, homestays have been developed in remote villages of Uttarakhand, India and farmers have been trained in rural tourism. So far, 21 homestays have been developed through community participation without any external funding. CHINAR is promoting tourism which is more responsible like farm-based tourism, nature based (bird watching, hiking, trekking, educational tours, etc.), and cultural tourism. The above is being promoted mainly through social media i.e., Facebook, Twitter and website (www.chinarindia.com). Tie-ups with other expeditions companies are being done. Partnership with top management institutions and universities like Xavier School of Sustainability, Bhubaneswar and Symbiosis School of Liberal Arts, Pune, has been done from where students are coming to learn about mountain sustainability and stay in the developed homestays and also volunteering to make them more sustainable. CHINAR has a vision to make this cluster of villages as a model of responsible and sustainable tourism, which can be replicated in other mountain areas.

Results:

The start of responsible tourism in the remote area of Himalaya has raised new hope among the communities. It has helped the rural families to earn additional income by subletting their houses. There are families who have earned approximately INR 25,000 annually. Additionally, it has sensitized the communities to care for ecosystem services and conserve biodiversity (agro-biodiversity and flora-fauna) of the region.

Conclusion:

Conservation linked with tourism can help the mountain communities to improve their livelihoods, which in turn will help in inward migration and minimize malnutrition. It addressed SDG'S 1, 2, 3, 8, 13 and 15. Responsible tourism is therefore, the solution for the sustainable development of the mountains and mountain communities.

Experience report 22

Transition from conventional agriculture to organic: the case of Jacó micro basin in Petropolis, Serrana Region of Rio de Janeiro

Authors: André Luís C. Azevedo, Nelson Buarque C. Junior

Institution: Company of technical assistance and rural extension of the state of Rio de Janeiro (Emater-Rio), Brazil

Experience description:

Petropolis stands out in the agricultural sector, with a much-diversified production with honey, horticulture and floriculture, mushrooms, shoots, among others. The problem of (in) sustainability, associated with the findings that the environment is reaching its limit, has been presented as the great crisis of recent years. The indiscriminate use of pesticides and various other harmful human actions to the environment have contributed to the reduction of the quality of life on the planet. The conventional agriculture model has led to serious social, environmental and economic problems, such as very high production costs, successive increases in inputs, low product remuneration, trading system with the participation of middlemen, besides physical wear and Jacó, a region with a rugged topography to look for solutions to minimize this situation. Through Emater-Rio, the family farmers of this micro basin had their first contacts with organic agriculture. Using the participatory methodology coupled with the classic methods of rural extension such as the presentation of videos, technical excursions and exchange of information and knowledge, farmers began the transition that culminated in the certification of these farmers in 2006. In this transition process, some technologies such as analysis of soil with limestone and bone meal, planting in strips and level curves, reducing the use of micro-tractors, no-till and elimination of burnings to clean the land have become everyday practices. More recently, the Rio Rural Program provided incentives to improve the productive structure of the organic production chain in the

municipality, ranging from environmental recovery practices, acquisition and production of agroecological inputs, machinery and equipment that optimize working time and foster productivity, an identification and qualification of the actors involved in community development and management and the prioritization of common problems affecting these areas.

This support has helped to minimize the problem of organic and conventional farming, marketing. During the transition process farmers reported that the greatest difficulties in the process were the lack of initial capital, crop failures averaging 50%, the initial fall in productivity, the lack of conditions and time for technical improvement, lack of sites to acquire alternative inputs and marketing. With much perseverance and a proactive attitude, farmers emphasize the importance of organic agriculture in providing personal and family health, as well as adding value to the products, thus contributing to the socioeconomic improvement of their families.

Experience report 23

High altitude water conservation technologies to combat climate change in northwestern Himalayas

Author: Farhet A. Shaheen

Institution: Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, India

Experience description:

Clod-arid desert of North-Western Himalayas (Ladakh Region) traditional farming system has been included in the FAO list of “Globally Important Agriculture Heritage Systems (GIAHS)”, worthy of being preserved and conserved. In order to adapt and mitigate impacts of global and climatic changes, region is experimenting with new techniques based on traditional knowledge blended with modern science centering around water management to sustain livelihoods in harsh environs. Artificial glacier is an intricate network of water channels and check dams along upper slopes of the village valley. Construction work is undertaken between May and October. Water collection at glacier site begins in mid-November at a slow pace. Stabilization of ice occurs within 24 hours and gradually is converted into a glacier or ice block. Glacier remains in place until end of March when melting begins with rise in temperature. Compared to natural glaciers, artificial glaciers start melting earlier as they are located at lower altitudes and are exposed to rising temperature sooner. There is almost 1200–1700 m altitudinal difference between locations of natural and artificial glaciers across all the sites. Up scaling of technology has recently resulted in terms of conical formations of glaciers, which lasts for more time due to their less exposure to sunlight as compared to horizontal longer formations. Impact of technology has been in terms of shift from traditionally grown crops to more remunerative crops as well as increase in yield of crops. Both these changes have resulted in three to four fold increase in income of beneficiary farmers.

Moreover, they are also generating additional income from livestock rearing through milk and other products due to increased acreage and greater cuttings from fodder. Artificial glaciers have also contributed to development of pastures for cattle rearing. Apart from economic gains to beneficiary farmers, their impact on social cohesiveness for undertaking works of these structures in villages on cooperative basis with reduced water disputes among neighbors and families due to improved water availability. Expansion of agriculture and increase in local cattle population attributed significantly to check out-migration due to increase in employment generation. As these remote mountain communities come under pressure from population growth and climate change, researchers and development agencies need to take a serious look at restoring and developing art of glacier grafting to address water problems of these regions. Technique of creating artificial glaciers or ice stupas needs to be replicated in similar geo-climatic regions across Hindu-Kush Himalayan region. Climate impacts on water are so widespread, much climate change adaptation translates into water adaptation. Arid and semi-arid regions are predicted to experience significant temperature increases and reduced precipitation, and becomes very important to capture and store water so that it can be used for food production. Taking right steps now can increase resilience of both communities and economies. Sound science together with credible, salient and legitimate local knowledge is important to support development and implementation of such innovative policies.

Experience report 24

Cuyún, Protected Natural Areas and Mountains: educational didactic articles

Authors: Leticia Vega, Tania Bilbao, Natalia Imazio, Fernando Carmona, Miguel Alanoca, Peter Thomas, Gabriela Lúquez, Silvia Musso

Institution: Environmental Sciences Institute, UNCuyo / Education Faculty UNCuyo, Argentina

Presenters: Leticia Vega, Tania Bilbao

Introduction:

Protected Natural Areas are key areas of conservation, protection and environmental education. In the current context of climate change their management, evaluation and protection is fundamental. In the Province of Mendoza the presence of mountainous ecosystems, protected by these areas transforms them into valuable spaces of environmental education. It is necessary to assume individual and collective responsibilities with commitment from different sectors, institutions and organizations to spread their cultural, environmental and ecological value. The Project “Cuyún, change your habits not the Climate” elaborates since 2012 didactic articles destined to children, families and educators. These are distributed as part of a children’s magazine of a local newspaper, referring to topics related to the Climate Change. Among them the Protected Natural Areas are mentioned during the 2018 cycle and worked out by the coordination of the Direction of Natural Resources, an institution that manages some Natural Areas of the Province, but also by the Faculty of Education, foundations, Municipalities and the Institute of Environmental Sciences. The didactic articles are related to Natural Areas of the Province. They are emphasizing the mountain ecosystems represented in them.

Experience description:

The process of preparation and design of the articles (Figure 1) is carried out by a working team belonging to the Institute of Environmental Sciences of the National University of Cuyo (Mendoza – Argentina) and is reviewed by the Faculty of Education. The content of each article is built collaboratively with park rangers from the Direction of Natural Resources, the Villavicencio Private Natural Area and Municipal Protected Areas, addressing the theme of the Natural Areas of Mendoza from different approaches, generating an intersectional network of knowledge and reflection with the aim of creating a material, that reflects inter- and multidisciplinary views of this conservation spaces, their values and their relationship with Climate Change.

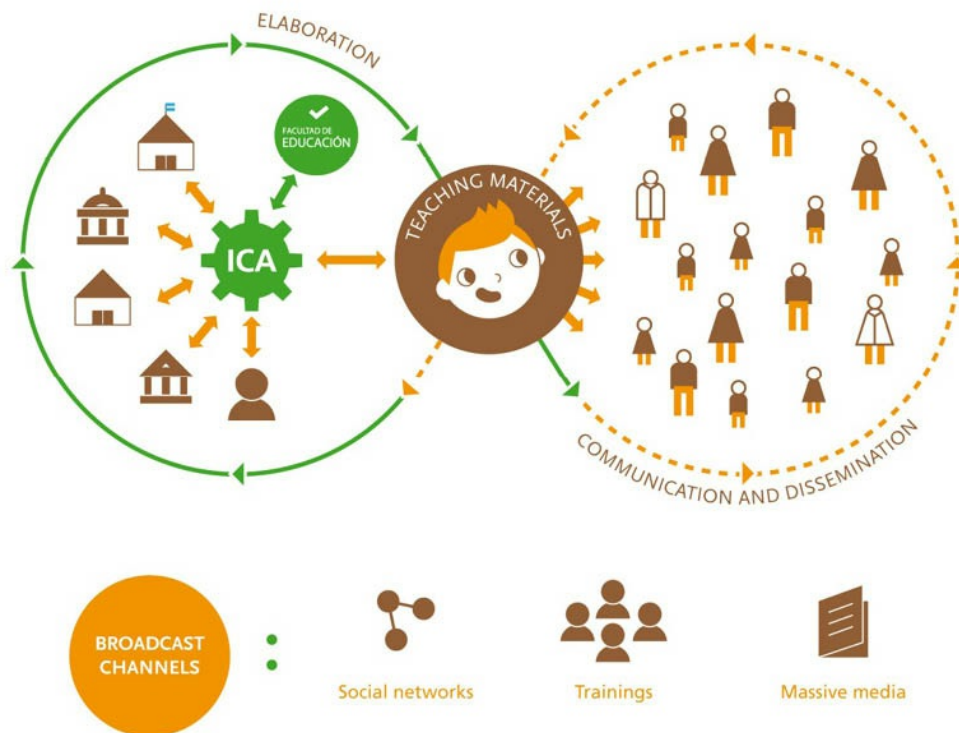


Figure 1: Process of preparation and design of the didactic articles

The didactic articles are published every Sunday in the children’s magazine “Tintero”, belonging to the local newspaper Los Andes. It has a circulation of 70,000 copies that reach up to the entire provinces of Mendoza and La Rioja. The objective of the 2018 article cycle is to make protected natural areas visible as protection,

conservation and environmental education spaces, highlighting the role of mountain ecosystems as a source of water and biodiversity, rescuing the cultural values of the communities that inhabit them and promote sustainable tourism. To make known these spaces and their situation from a systemic and multidisciplinary approach, facing Climate Change; with a proactive and optimistic point of view, avoiding a catastrophic approach to Climate Change, encouraging teamwork, collaborative, proposing healthy attitudes and habits, values of equity and equality and critical spirit.

Results:

During 2018 there were carried out within the framework of five chapters of the Cuyún cycle, 20 didactic articles referring to Protected Natural Areas sited in the mountains of Mendoza (Figure 2). The chapters, under the titles of “Mysterious Mountains”, “Cordilleran Stories”, “Mountains and their stories”, “The strength of communities” and “Memories of the Earth” address issues such as mountains and their importance as a source of water for the oases of Mendoza, as niches for biodiversity and as cradles of cultural stories; but also the importance of citizen participation for the creation, care and management of these areas. Using the Story Telling technique, the constructed story tells the character’s journey through the province of Mendoza, discovering the different protected ecosystems in the Natural Areas. The articles highlight the presence of glaciers in mountain ecosystems, their vulnerability to Climate Change and the richness of biodiversity in the ecosystems of the province of Mendoza. The cultural value represented for its inhabitants and for ancestral people, such as the Incas and their Andean system of road circulation, or by the liberating campaigns of Argentine national heroes like San Martín.



Figure 2: Educational articles of Cuyún cycle 2018

Conclusion:

In the context of environmental changes, the incorporation of these issues in teaching and learning processes in family and school settings is essential. The material uses an encouraging, proactive, informative, simple and clear, narrative message through a story-adventure character that interacts with the territory, and illustrates with realistic styles. It is created by multidisciplinary approaches, cooperative works and uses didactic languages that are empowered by an adult. In this way, it is possible to approach and articulate the knowledge generated by different relevant sectors in the management of the Protected Natural Areas and the mountain ecosystems form where they pretend to achieve their massive and continuous diffusion in the community.

Experience report 25

The natural environment and the apprentice - in the construction of knowledge “there is only conservation with awareness, but through education”

***Institution:** Fishing place Pesque Truta, a family business located in the Environmental Protection Area of Mantiqueira, in Pindamonhangaba, São Paulo, Brazil*

***Presenter:** Mirian Aparecida Gomes Coutinho*

Introduction:

The educational ideal, nowadays, is increasingly approaching the ideal of integrity, that is, to educate in today's world is to offer a global formation that allows each individual to participate in the reality in which it is inserted. For this education takes place, one of the essential elements for the training of those who participate in the educational process is the knowledge of different environments, including the situation of natural areas that are preserved and the influence of humans on these areas.

Experience description:

The Environmental Education work carried out at Fazenda Vera Cruz, part of the Federal Environmental Protection Area of Serra da Mantiqueira, in Pindamonhangaba, aims to awake the interest of people from different areas of society for the natural environment, recognizing the historical moment lived by humanity, where technological, economic, social and environmental development necessarily requires an awareness that environmental preservation is important for the existence of civilization. Through the experience, concepts about nature and sense for a holistic view of the natural environment are built, because nothing is fragmented, everything is interconnected. The attitude will concretize the concepts and

consciousness in actions, bringing to their way of living a look the importance of preserving nature, such as: the biodiversity of flora and fauna, springs and water courses, know the dynamics of forests and observe how the environmental impact will bring damage never seen to all kinds of life in these environments, often irreversible. Reflection on the importance of the preservation of forests and the protection of water springs, relating to problems such as the reduction of water in dams, changes in the cycle of rains, reduction of water in water courses, extinction of springs and other environmental issues that may lead to society to a crisis in water supply and energy rationing, damaging the quality of life of this society. Through a monitored trail, observe the balance between flora and fauna, the characteristics and soil formation of Serra da Mantiqueira, the relationship between forest and water quantity and quality, traces of human occupation in wild areas and the impacts of this occupation. Knowing a source, noting the importance of its preservation, planting a tree in this area in order to contribute to its preservation. At the end of the trail, within the pedagogical purpose, a handbook will be answered to effect the knowledge acquired, for the participant group that is of the first or second grade and technical education. If the participants are formed by groups that want to know more about the natural environments, a dynamic of integration, internalization and reflection with music and relaxation on the holistic connection between the human and Planet Earth will be proposed. After lunch, there will be a presentation of the movie "AQUA", showing how a spring emerges, the formation of the watercourse, the emergence of life and the death of this watercourse by pollution. After the presentation of the film, a debate will be opened on the principle of environmental ethics and political strategies for conservation of environmental heritage, such as water and forests. Visit to Isabel Power Plant, a historical patrimony that was relevant in the production and distribution of energy in the region of the city of Pindamonhangaba in past decades. Visit the Chapel of Stone of São Francisco, integrated in the middle of the forest of the farm, revealing the mystique of the region. Visit trout breeding, watching for fingerlings, their development stages up to adult fish, when they are placed in a fishing tank, implementing tourism in place, bringing the sustainability of a strictly family business on the Vera Cruz Farm as an alternative development with low environmental impact. Closing the work with the dynamic Bat

and Mariposa from Joseph Cornell's book "Playing and Learning with Nature", sensitizing the understanding of the interrelation of some animals in the forest, understanding that predation is beneficial, when it is natural in form to bring balance in the population of these animals.

Results:

Works with environmental education is relevant in the sense of individuals attitude transformations in preserving all environments, whether natural or urban environment, because nature responds to human interference. When there is knowledge by the individual about their role in the living environment, the consequences of their attitudes become minimized, as this individual can optimize the actions in benefits for this environment. Environmental Education has this role and when it is worked in the natural environment, it is clear that if the preservation of forests does not occur, life on Earth in the long term will be unsustainable due to the lack of natural resources essential to life, especially water. This work has been carried out for twenty-three years and it is great to observe the results with the nature response in the place that is being carried out, such as the trees that were previously planted by children and adolescents participating in the project, such as areas of pasture taken by forests, action of the owners, reducing intervention in the areas of the farm in an unsustainable way. There is care in passing to the locals regarding the dimension that each one has to take responsibility with their actions when they visit a natural environment. Most importantly in the long term, many young people taking part in the project have opted for professions such as Environmental Engineering, Biology, Geography, Ecology, among others or specializing in their professions in areas related to the environment or have brought the flag care for the environment in which they live, doing the recycling, not wasting water, electricity, not wasting food and using products from companies that care about the impacts caused to the environment.

Conclusion:

Observing these results, it is possible to conclude that care with

the environments is not a duty of one or another segment of society, political or not, but a duty of each one, a responsibility that the more time passes or new technologies are brought to our experience, it will still depend on each of us human beings the awareness that the attitudes of our day to day life can have consequences for our survival. The Environmental Education experienced and systematized is the way that will not guarantee the change of attitude of all, but will be the seed planted and it will be able to sprout in the consciousness of those who participate and experience this project, improving their actions in the environment in which they live, bringing benefit for everyone, making a difference and making the world better.

Experience report 26

Hops plantation in the district of Amparo in Nova Friburgo, Rio de Janeiro, Brazil

Institution: Rural producer in Nova Friburgo, Rio de Janeiro, Brazil

Presenter: Paulo Roberto Celles Cordeiro

Introduction:

The rural property is located 682 meters above sea level with a geographical location 22°15'31'S and 42° 27'31"W, where 76 hops (*Humulus lupulus*) seedlings of 12 different varieties were planted in 2016, test handling, production, harvesting and drying of flowers for use in beers. In collaboration with the Federal University of Espírito Santo and the Federal University of Viçosa, laboratory tests are being performed (by Headspace Solid-Phase Micro extraction / Gas Chromatography with Mass Spectrometry detection (HS-SPME-GC-MS) with procedures performed in triplicate) for comparing the levels of the chemical components and compare with the international parameters of each variety of hops. First work already published in the sixth Capixaba Meeting of Chemistry in October 2017.

Experience description:

Between September and December 2016, rhizomes and seedlings of several species of hops already cultivated in Brazil were acquired in the southern region of the country. The purpose was to test the production and its use in local beers of several varieties of hops, in the hope of obtaining beers with more aroma and flavor from the use of fresh flowers of hops. Varieties were planted, Cascade, Halertau Mittelfruh, Saaz, Columbus, Victoria, Bullion, Tehuelche, Canastra, Spalt, Tettninger, Brazyljiski, and Yakima Gold. Some of these varieties showed good development and production of flowers. Other varieties that were planted later in the summer (December 2016 and January 2017) did not show good

development and production of flowers.

Results:

The harvest was done manually, when the cones of the plant were ripe, leaving the smaller ones still green. In this way, we get the spoon 3-4 times in the same plant until the beginning of the winter period (May and June), when they began to dry and preparing to hibernate.

We had trees of the Cascade variety with five flower collections from December to May with a volume of 2,540 grams. Other varieties such as Saaz, Brazyljiski, Canastra and Victoria showed good yields of flowers at around 1,360 grams per plant. It was dried in shade nets at room temperature and with dehydrator for homemade vegetable use until reaching 10% humidity, being packed in a vacuum and stored in a freezer at a temperature of -10° C. At the Hop Flower Festival held on March 31 and April 1, 2018, the use was tested in the beers developed by several brewers who used the hop flowers as an aroma and flavor ingredient, according to the relation below. During the Festival of the Flower of Hops that will be on the 31st of March and April 1st we will have for tasting, several types of SPECIAL BEER that used Flowers of Hops of Nova Friburgo in their productions.

The following beers are:

Type Beer	Hops	Company/Producer	Point Sale
Black APA	Cascade	Brewery Alpendorf	Space Assamam
Cream Hop ALE	Cascade	Willian Zebendo	Space Assamam
BR'APA (Brazilian Pale Ale)	Canastra	André Gripp GRIEBier E.A.	Restaurant Wood Stove
Strong Bitter	SAAZ	Gleidson Arouca	Space Assamam

Witbier citrus	Canastra	Paulo Cordeiro	Space Assamam
ALE Morena do Amparo	Cascade	Paulo Cordeiro	Space Assamam
Hesse bier	Cascade		
Red IPA	Canastra	Tomaz Santos	Art & Bistro Café
Blond of the Hops Flower Festival	Cascade and Saaz collaborative beer	Beer Alliance	Space Assamam

The evaluation of the participants was very positive. Also for the 200 years of founding of the city of Nova Friburgo, in MAY 2018, a collaborative beer was made Nova Friburgo Helles, with the AcervA Nova Friburgo where they used the hops in flower for aroma.

Conclusion:

The initial production data, crop management, pest control, fertilization, post-harvest treatment and storage were satisfactory in these first two years of cultivation, but still need to be better studied with the climate conditions in our region and the real needs to improve the performance of the Hops culture.

Experience report 27

Potentialities and challenges in the use of poultry manure in the production of vegetables at the mountain region of Rio de Janeiro state

Authors: *Jessica de Oliveira Lima, Camila da Costa Barros de Souza, Carlos Antônio dos Santos, Cíntia Luíza Xavier Batalha, Mayara dos Santos Rocha, Rita de Cássia da Silva, Margarida Goréte Ferreira do Carmo, Nelson Moura Brasil do Amaral Sobrinho*

Institution: *Federal Rural University of Rio de Janeiro (UFRRJ), Brazil*

Presenter: *Jessica de Oliveira Lima*

Introduction:

The Mountain Region of Rio de Janeiro (RJ), Brazil, is a large producer of vegetables. In these crops, high amounts of poultry manure are used as organic fertilizer, often without previous composting. The widespread use of this manure is due to its good characteristics as fertilizer, since it is rich in macro and micronutrients, and the facility of acquisition as a result of the farms proximity. However, the extensive use of these residues in crops without prior treatment can result in a number of environmental problems such as eutrophication of rivers, due to the large amount of nitrogen in the material, and contamination of the soil with heavy metals. Therefore, initiatives that promote reflection on the use of this practice and its consequences in mountainous areas are necessary.

Experience description:

A group at the Federal Rural University of Rio de Janeiro (UFRRJ) has carried out several scientific studies on the production

of vegetables in the Mountain region of the State of Rio de Janeiro. These studies includes surveys on practices related to the use of poultry manure and the adopted management in the cultures of cauliflower, tomato, broccoli and leafy greens. Samples of soil and poultry manure were collected in different properties of the region for chemical analysis. Complementing experiments were conducted at greenhouse and at field.

Results:

Based on previous and consolidated results it is possible to point some aspects that need profound discussion and behavior change, such as: 1) the poultry manure is rich in nutrients, however it also has high levels of contaminants in its composition (heavy metals and undesirable microorganisms) - so it has to be managed correctly and used with technical recommendation; 2) use of a great amount of fresh poultry manure could cause damage to the plants and to the environment since it has the potential to acidify the soil because of organic matter transformations; 3) use of fresh poultry manure might be one of the factors that leads to great losses caused by diseases and pathogens in the region soil, such as clubroot (*Plasmodiophora brassicae*) in cauliflower and fusarium wilt (*Fusarium oxysporum* f. sp. *lycopersici*) in tomato, as a result of soil acidification. As alternatives in research and rural extension, we propose methodologies for composting the material, dose calibration and time of application. The management and proper use of agricultural waste should be encouraged. Their correct use can contribute to reduce the demand for chemical fertilizers and economy of small producers.

Conclusion:

The composting and rational use of fertilizer in vegetables is a great alternative to reuse of poultry manure, an abundant residue that is frequently used in rural areas at the Mountain Region of Rio de Janeiro. The sustainable management of this organic residue is important for the maintenance of agriculture without damage the environment, especially in mountainous areas.

Experience report 28

Use of forage peanuts as live soil cover in persimmon orchard

Authors: Priscila Brandão Barbosa, José Antônio Azevedo Espíndola

Institution: Company of technical assistance and rural extension of the state of Rio de Janeiro (Emater-Rio), in Sumidouro, and Embrapa Agrobiology, Brazil

Presenter: Ricardo Belo Costa Ferreira

Introduction:

The culture of the persimmon (*Diospyros kaki L. F.*) stands out in the Serrana region of the State of Rio de Janeiro, being exploited mainly by family farmers. Its cultivation is generally carried out with reduced use of technologies, fertilization without soil analysis, indiscriminate use of herbicide and without irrigation system.

Experience description:

The objective of this work was to verify the behavior of forage peanuts as a live cover of the soil in a persimmon orchard, through cuts at different times of the year, evaluating the seasonal production of phytomass and the nitrogen content of forage peanut and spontaneous herbs. An experiment was carried out in the São Pedro da Lage site, Sumidouro municipality, Serrana region of Rio de Janeiro. The experimental design was a randomized block design and was composed of four treatments. During one year, samples of aerial part of forage peanut and spontaneous herbs were collected, in four different seasons, namely, March, August, October and December 2016.

Results and conclusion:

The highest values of biomass production and nitrogen

accumulation were associated with four cuts per year of forage peanuts. The accumulated amount of nitrogen in the leaves of the forage peanut with four cuts per year ($123.50 \text{ kg}\cdot\text{ha}^{-1}$), showed that this production would be enough to supply 2.5 times the nitrogen requirement demanded by the maintenance fertilization of the recommended persimmon for the State of Rio de Janeiro, which is $48 \text{ kg ha}^{-1} \text{ year}^{-1}$ of N, considering the spacing of $5 \times 5 \text{ m}$, with the Fuyu variety (FREIRE et al., 2013). This result suggests that although not all of this nitrogen is readily used by plants, since losses occur due to immobilization by soil microorganisms and volatilization to atmospheric air, it is inferred that a significant part of the nitrogen requirement for maintenance fertilization of this crop or its entirety can be supplied by the use of forage peanuts. Regarding the behavior on spontaneous herbal infestation, it was verified that in the period between the first cut and the last one, there was an increase of dry matter of forage peanut in detriment of the reduction of dry matter of the spontaneous herbs. It follows that throughout all the cuts of forage peanut and spontaneous herbs, there is a tendency of the first to stand out over the spontaneous herbs. Thus, forage peanuts is a viable alternative in the reduction or even elimination of herbicide use, which can significantly reduce competition with spontaneous weeds and considerably improve soil fertility, providing a more balanced nutrition for plants.

Experience report 29

The agricultural local report importance at soil environmental characterization in mountain area

***Authors:** Daniele Rodrigues Barbosa, Leonardo Guimarães, Camila Souza de Pinho, Fábio Freire de Souza, Diogo Muniz Alexandre, Talita de Santana Matos, Irene da Silva Coelho, Erica Souto Abreu de Lima, Nelson Moura Brasil do Amaral Sobrinho*

***Institution:** Federal Rural University of Rio de Janeiro (UFRRJ), Brazil*

***Presenter:** Daniele Rodrigues Barbosa*

Introduction:

Agricultural activity in mountain areas is commonly observed in Nova Friburgo City, in Rio de Janeiro State (Brazil). Nova Friburgo is a major horticulture products supplier to Rio de Janeiro, there was concern about agricultural inputs uses and agricultural practices as also relations with regional soil and relief characterization, which approach at protected area Three Picos State Park. Therefore, the soil management survey was answered with local producers and was implemented during soil samples collection period using a questionnaire. The project aim was to compare environmental characteristics of agriculture soil and forest soil in *Barracão dos Mendes* hydrographic micro basin area, analyzing chemical, physical and microbiological characteristics related to soil pollution.

Experience description:

The soil attributes fertility, slope, heavy metals and herbicide detection were evaluated in laboratory and compared to agriculturists' reports and researchers' preliminary observations about agricultural practices. The soil samples were collected in

georeferenced points. Physical, chemical and microbiological soil analysis was realized. The survey questionnaire answered with agriculturists in interview format during soil samples collect contained relevant information to data interpretation, such as regional characteristics, agricultural practices and agricultural inputs (herbicide and fertilizers) applied by local agriculturists. This survey was important to data analysis and results interpretations in laboratory afterwards.

Results:

The survey-using questionnaire during sample collection, in interview format including local agriculturists, contributed to better description of agricultural management practices and approaches to legal environmental reserve maintenance, containing forest, adopted in Barracão dos Mendes region. The herbicide was detected in agricultural area where its application was not reported. The producer whose reported proximity that it stopped using herbicide because it affected the neighbor area being mainly due to slope, information confirmed in laboratory analysis. The heavy metals shown greater bioavailability in the agricultural area where there was the report of mineral fertilizer use.

Conclusion:

The results confirmed that agriculturists' reports contributed to agricultural practices comprehension and laboratory data interpretation. Thereby it was concluded that the informations reported contributed to a better agricultural practices knowledge adopted in Barracão dos Mendes region and laboratory data analysis comprehension. Concerning on Agricola practices it is suggested that adequate techniques be applied in high declivity areas to minimize soil negative impact and pollution distribution.

Experience report 30

Clubroot of *brassica spp.* in tropical mountainous region of the Rio de Janeiro: situation, difficulties and alternatives

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Institution: Federal Rural University of Rio de Janeiro (UFRRJ), Brazil

Presenter: Carlos Antônio dos Santos

Introduction:

The mountainous region of the Rio de Janeiro State, Brazil, is a large producer of *Brassica spp.* vegetables. Its cultivation is predominantly done by family farmers under intensive management in steep areas. Among the main problems in the production of these vegetables is the clubroot, disease caused by *Plasmodiophora brassicae* Wor., which has led to immeasurable losses and limited its production.

Experience description:

A team formed by UFRRJ, with support from Embrapa-Agrobiology and producers, started, in the year of 2013, a series of studies in the mountainous region of the state of Rio de Janeiro, Brazil. The objectives of the studies are: a) to identify factors responsible for the occurrence and losses caused by root diseases; b) propose and test sustainable and contextualized strategies to the local reality to mitigate these losses. Information was recorded on the history of use of the areas and management practices adopted. Samples of soil and plants were then collected; diagnosis and quantification of diseases and chemical analyzes of soil and plants

were carried out. Field trials in the region have also been carried out.

Results:

The results obtained in these five years of study allow us to identify some main and critical factors for the management of clubroot in the region: 1) predominance of acidic soils; 2) little diversification of cultivated species and systematic cultivation of species of the same family; 3) conventional soil preparation, often without observation of conservation practices, and sharing of machines and implements; 4) application, without technical criteria, of large quantities of mineral fertilizers and fresh poultry litter (not composted) in cover; 5) diffusion of the use of a pesticide, recently registered in the Brazilian Ministry of Agriculture (MAPA), to control of clubroot. These characteristics of the soils and of the management result, respectively in: conducive environment to the development of clubroot and limiting to the full development of the plants; survival of *P. brassicae*; and dispersion of pathogen resting spores. As actions is proposed: correction of soil acidity and adoption of conservation practices such as increased species diversification and reduction of soil disturbance. The liming, even applied in planting pits provided a 30 to 75% reduction in clubroot severity and a 50% increase in cauliflower productivity. Physical and chemical soil conditions favorable to the root development of cauliflower plants can, by themselves, compensate for root losses due to the disease. The diffusion of chemical control deserves attention because its effect and long-term efficiency are still unknown; the generalization of its use may lead to negligence in adopting basic measures.

Conclusion:

In order to change the current scenario and reduce losses due to the disease, it will be necessary to disseminate this information, with incentives for its adoption. This requires investments, continued participation of public institutions and involvement of farmers.

Experience report 31

The mountains of Togo: biodiversity, geodiversity, issues and safeguard

Authors: Awesso Balakyem, Djiwa Oyetoundé, Bleza Mangola, Olanlo Tini Kodzo, Moussa Samarou, Ouro-Bossi Bouwessodjo, Ouro Agbandao

Institution: Ministry of Environment and Forest Resources of Togo in collaboration with FAO Togo, Togo

Presenter: Awesso Balakyem

Introduction:

Togo is a country in West Africa that opens on the Gulf of Guinea, between 6° and 11° north latitude and 0° and 2° east longitude, on a 56 km coastal strip. Bordering with its neighbors from Burkina Faso to the north, Benin to the east and Ghana to the west, the Togolese territory is subdivided into five administrative regions (maritime, plateaus, central, Kara, and savannahs). The mountain landscapes in general and those of West Africa in particular, among which include the Fouta Djallon and Mount Nimba in Guinea, the Adamawa plateau in Nigeria and Cameroon, and the modest chain of the Atakora in Ghana, Togo and Benin, have enormous natural potentialities (Mutke et al., 2002). In Togo, these topographic units are marked mainly by the Togo Mountains and the basic and ultra-basic massifs, oriented SSW-NNE, which take the whole country in sling. They are characterized by a rich geodiversity and biodiversity that provide the bulk of resources for the well-being of local communities. However, in recent decades, these geosystems are marked by strong human pressure (population growth), which threatens the survival of both animal and plant species with high rates of endemism and causes a sharp erosion of mountains slopes and filling dams. These environmental crises reflect a weak anchoring of mountain management measures defined by the 1992 Convention on Biological Diversity in Rio. Numerous studies such as Akpagana (1989), Guelly (1994), Woegan (2007), Dourma

(2008), Adjossou (2010), Banassim (2012) Olanlo (2018) report the poor health of mountain ecosystems. In view of its challenges, Togo recently joined the mountains partnership on November 30, 2017 in a vision of achieving Goal 15 of Sustainable Development. This document provides a general overview of mountain ecosystems while defining sustainable proposals for their conservation.

Experience description:

Togo has joined the mountains partnership to better manage its mountain ecosystems and contribute at the global level to the achievement of SDG 15. But faced with this initiative, several questions arise: Where are the mountains in Togo? How much area do they occupy? What is the human environment of it? What are the conservation issues of their ecosystems? Etc. Before being able to initiate any action in the direction of sustainable mountain management in Togo, these are all questions that needed to be answered. This led the Ministry of Environment and Forest Resources to conduct this study with the support of FAO-Togo. The experience to be shared under this call for proposals concerns the challenges that Togo faced and the results obtained by raising them. The working approach adopted is based on the collection of written data on the subject and the naturalistic approach involving fieldwork. Inventories of biological diversity within plots and geodiversity, qualitative surveys using the interview guide and observation grid tools, and results comparison workshops were favored as methods. Then, the STRM 90 m image processing (February 2000) obtained on the GLCF website and Rapid Eye 5 m (2013/2014) enabled the emergence of the Digital Elevation Model (DEM) and the forest layers of the country respectively. The extraction of altitude classes above 300 m from a binary threshold has made it possible to highlight mountain areas.

Results:

Mountains areas in Togo – The definition of mountain used in this document concerns the mountains of the world, including those of Togo, in the low altitude category with altitudes between 300 and 1000 meters. This approach was based on the World Conservation

Monitoring Center (WCMC) and Global Mountain Biodiversity Assessment (GMBA) GIS works that serve as “conventions” or standardized protocols (Körner et al., 2016). Thus, mountainous areas in Togo are defined as areas with elevations greater than 300 m above sea level (Plate 1).

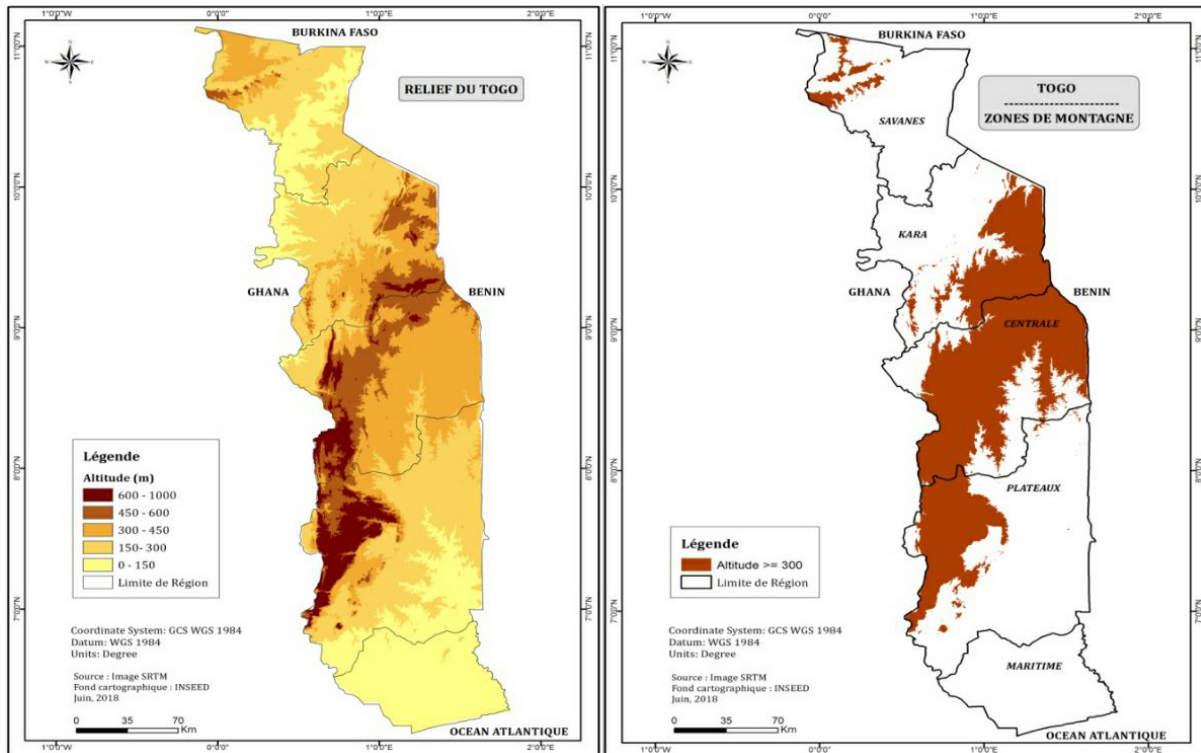


Plate 1: Altimetry and mountain landscapes of Togo

Biological diversity of mountain areas in Togo – Occupying 17831.6 km² or 31.5% of the national territory, the mountains of Togo, despite the human pressure, constitute a potential reservoir for biodiversity and act as ecological refuges for many plant and animal species, sometimes rare and often-threatened extinction. For the moment, the forest layers of mountain ecosystems are characterized by dense semi-deciduous forests, riparian forests, Guinean and Sudanian savannahs, very rich in non-timber forest products, medicinal species and commercial timber species. Land use in mountain areas reveals a sharp decline in forest areas in favor of savannah formations and human enterprises (Figure 1). The layers of semi-deciduous moist dense forests are almost absent or only assimilate to the relics dominating the very uneven slopes and to the gallery forests (photo 1). This situation is a proof

of the strong human influence on the environment.



Photo 1: Relic of semi-deciduous dense forest on the Akposso plateau

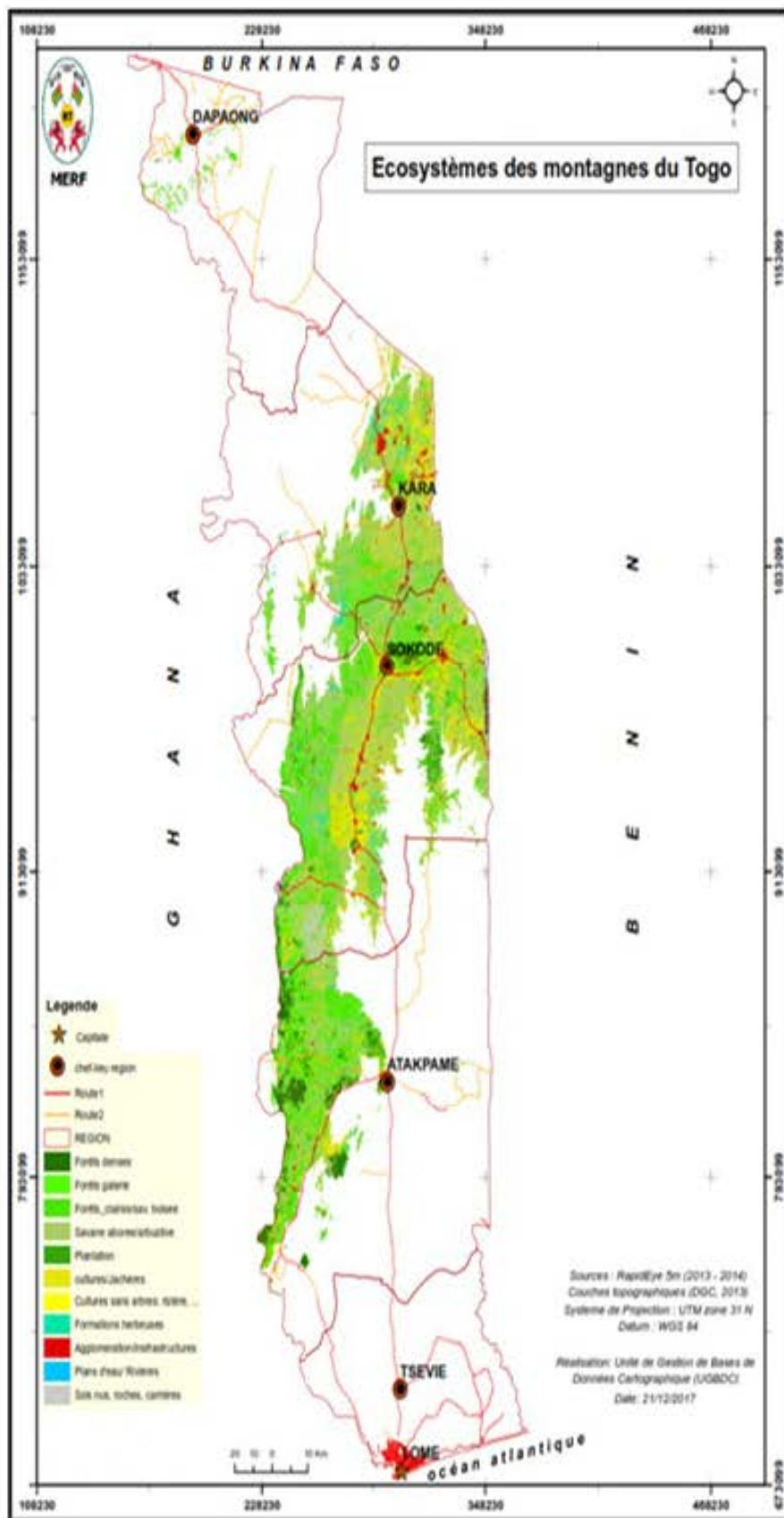


Figure 1: Land cover map of Togo

At the present state of knowledge, the plant diversity of Togo's ecosystems is estimated at 3,600 plant species and around 30% are from mountain ecosystems. Table 1 below shows the top 10 high-density species in the different forest strata of the mountains.

Table 1: Phytodiversity of mountain ecosystems

Forest strata	Area (ha)	Top 10 dominant species
Dense forests	84249	<i>Theobroma cacao</i> ; <i>Anogeissus leiocarpus</i> ; <i>Manilkara multinervis</i> ; <i>Sterculia tragacantha</i> ; <i>Persea americana</i> ; <i>Albizia adianthifolia</i> ; <i>Vitellaria paradoxa</i> ; <i>Crossopteryx febrifuga</i> ; <i>Diospyros mespiliformis</i> ; <i>Pterocarpus erinaceus</i>
Clear Forests / Woodland	363064	<i>Isoberlinia doka</i> ; <i>Uapaca togoensis</i> ; <i>Pterocarpus erinaceus</i> ; <i>Vitellaria paradoxa</i> ; <i>Parinari curatellifolia</i> ; <i>Monotes kerstingii</i> ; <i>Burkea africana</i> ; <i>Lanea acida</i> ; <i>Daniellia oliveri</i> ; <i>Crossopteryx febrifuga</i>
Riparian / swamp forest	142311	<i>Manilkara multinervis</i> ; <i>Uapaca togoensis</i> ; <i>Elaeis guineensis</i> ; <i>Diospyros mespiliformis</i> ; <i>Anogeissus leiocarpus</i> ; <i>Vitex doniana</i> ; <i>Ficus sur</i> ; <i>Isoberlinia doka</i> ; <i>Terminalia glaucescens</i> ; <i>Dialium guineense</i>
Tree savanna / shrubby savannah	711996	<i>Vitellaria paradoxa</i> ; <i>Daniellia oliveri</i> (Rolfe); <i>Parinari curatellifolia</i> ; <i>Crossopteryx febrifuga</i> ; <i>Detarium microcarpum</i> ; <i>Burkea africana</i> ; <i>Pericopsis laxiflora</i> ; <i>Terminalia avicennioides</i> ; <i>Terminalia laxiflora</i> ; <i>Lophira lanceolata</i>
Crops / fallow / stuffed	332295	<i>Persea americana</i> ; <i>Bridelia atroviridis</i> ; <i>Peddiea fischeri</i> ; <i>Rothmannia longiflora</i> ; <i>Cola gigantea</i> ; <i>Milicia excelsa</i> ; <i>Ficus sur</i> ; <i>Manilkara multinervis</i> ; <i>Theobroma cacao</i> ; <i>Xylopiya aethiopica</i>

Forest plantations	10292	<i>Albizia adianthifolia</i> ; <i>Albizia zygia</i> ; <i>Anacardium occidentale</i> ; <i>Anthocleista djalensis</i> ; <i>Aubrevillea kerstingii</i> ; <i>Blighia sapida</i> ; <i>Cola nitida</i> ; <i>Daniellia oliveri</i> ; <i>Dracaena arborea</i> ; <i>Elaeis guineensis</i>
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Source: MERF/IFN, 2016

This rich phytodiversity is a potential habitat for a specific zoo diversity (Plate 2). In the absence of exhaustive work on the recent inventory of Togolese fauna in general and that of mountains in particular, research efforts on zoo diversity estimate the number of species at 4019 among which two species of endemic amphibians are mountainous – *Conraua derooi* in the semi-deciduous forests of southwestern Togo and *Bufo togoensis* on the Adélé-Défalé plateau in the Central Region. In addition, there is an animal stand of monkeys, snakes, squirrels, birds, buffalo, chameleon, warthog, etc. More localized research will allow us to update databases on mountain faunal diversity.



Plate 2: Zoo diversity of the plateaus of South-West Togo: *Conraua derooi* (A); butterfly of Kouma-Konda (B); *Cercopithecus patas* (C)

All of this biological diversity described above is based on an abiotic diversity (geodiversity) that also deserves to be highlighted.

Geodiversity of the mountains in Togo – The natural landscape of the mountains of the country is characterized geomorphologically and geologically by a variety of landforms that offer beautiful landscapes of ridges, plateaus, escarpments, gorges and troughs.

These topographic forms constitute panoramic views that enliven the curiosity of any visitor. For the example of the South-West plateau, which benefited from the research work relating to the inventory of geodiversity, some forty (40) geotopes have been listed; resulting from fluvial, structural, pedogenic, gravitational, differential erosion and anthropogenic processes (Plate 3). Among this abiotic diversity, waterfalls (fluvial models) are the most representative (50%) and are full of multiple values that underpin the strong geotourism potential.

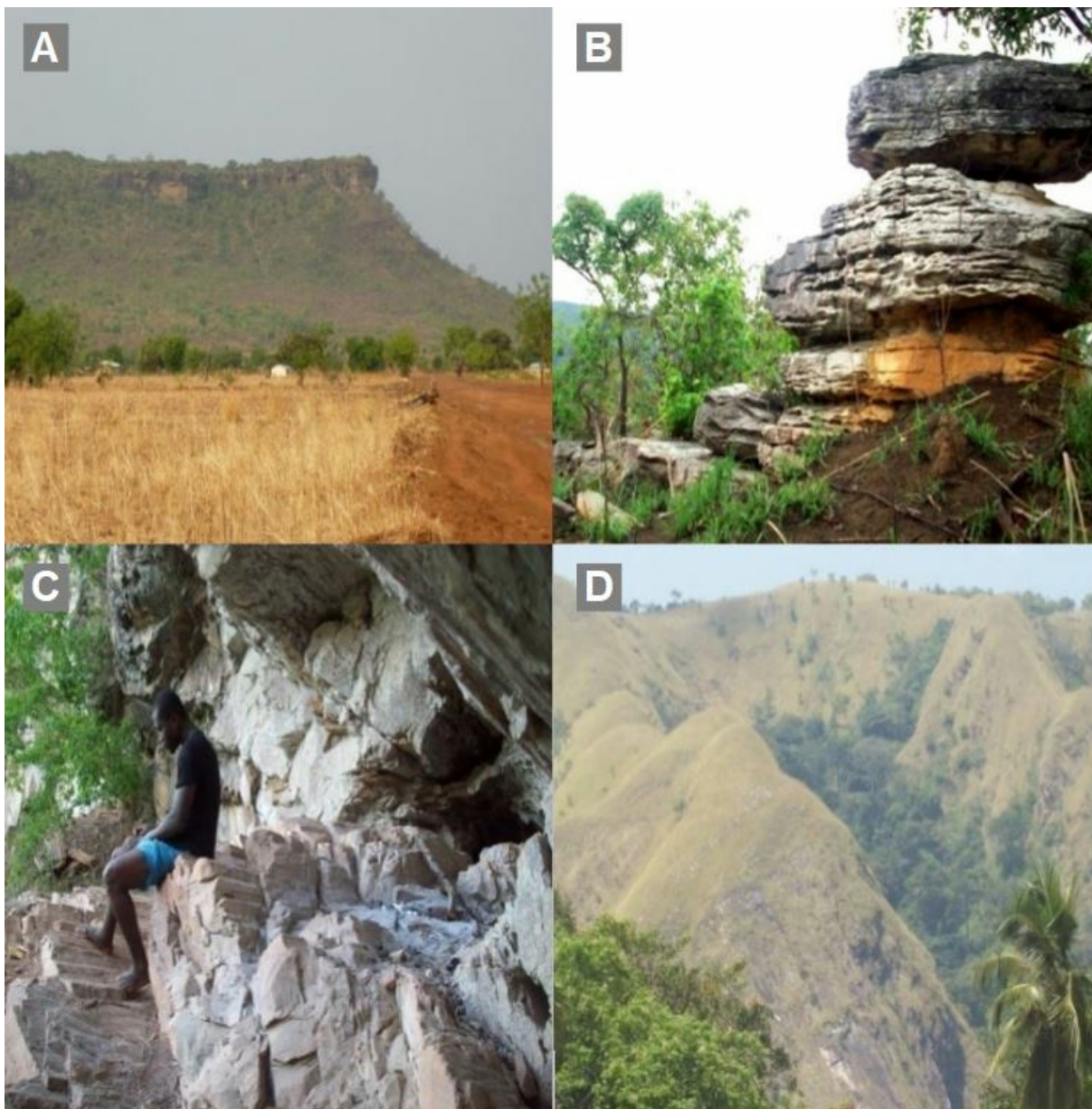


Plate 3: Geodiversity of Togo: cuesta of Bombouaka (A), quartz slabs on the Akposso plateau (B), Cave of the Kpélé-Tsavié waterfall (C), peak depression at Yikpa (Danyi) (D)

These biophysical characteristics of the mountains constitute the potentialities that the mountaineers in their installation have exploited, either rationally or anarchically, by bringing alterations to the primitive landscapes.

Human environment – In Togo, the mountains are home to 978 localities, ranging from towns to hamlets, with an estimated population of 1,291,284 (INSEED, 2010) (Figure 2 and Table 2). A regional analysis reveals a high concentration of people in the Central region.

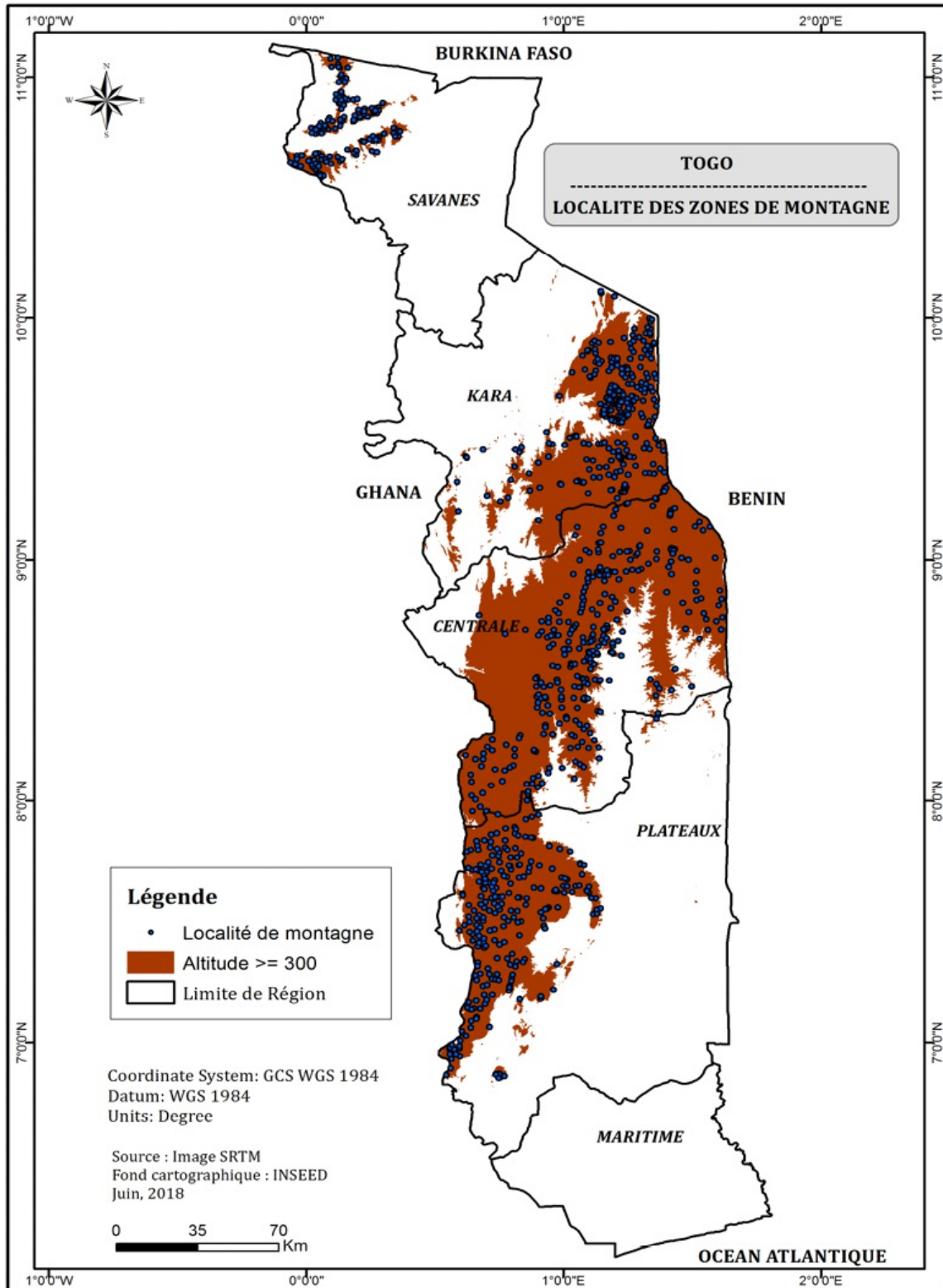


Figure 2: Map of the localities of the mountainous areas of Togo

Source: INSEED, 2010

This fact denotes the important role played by mountains in the

lives of people. In the same way, they are charged with intrinsic values, in the eyes of the mountaineers, often unknown in the planning and management of the territory. These include cultural, aesthetic, ecological, scientific and economic values.

Table 2: Regional distributions of mountain populations in Togo

Regions	Number of localities	Populations size
Savanes	131	135675
Kara	281	347918
Centrale	315	497530
Plateau	251	310161
Total	978	1.291.284

Source: INSEED, 2010

Value of mountains in Togo

- **Socio-cultural value**

The mountains have always been places of refuges according to the exactions of the kings in the history of the kingdoms of Togo. This is the example of the Agou massif and the plateaus of southwestern Togo who fled the persecutions of King Agokoli in Notsè. Also, they are considered as sacred sites for ceremonies, rituals and pilgrimage sites (case of Ayomé and Alédjo). Today, the artistic dimension of mountains is increasingly perceived: The sites of the waterfalls are painted by the artists and are solicited for video clips (Mount Kloto for example) and picnics during the festivities of August 15 in the Danyi, Akébou and Wawa. These foundations give mountains a socio-cultural value (Plate 3).



Plate 4: Cascade of Ayomé, site of the Marian pilgrimage (A), perched villages of Dzigbé (foreground) and Dogbadji (background) on Agou massif (B)

- **Ecological value**

The ecosystem services of mountain areas are well established. Mountain forests are a source of supply for pharmacopoeia, timber and energy products, a climate regulator, a carbon sink and a role in mitigating morph dynamic hazards such as land movements and flooding. Then, the geo-heritage (soils) assures the functions of reserve of biodiversity, food (support of the agricultural activities), of filter through the natural purification of surface water or subsurface, building materials and cosmetic (clays, sands) and mineral extraction.

- **Economic value**

The economic life of mountain dwellers, who are mainly rural, is based on agriculture, to which are added livestock, crafts and trade (Plate 4). In fact, the richness of the soil and the availability of cultivable land have been favorable for the development of agricultural activity, which occupies more than 90% of the working population. The farms are almost all family-

owned and rely on cash crops (coffee, cocoa, banana, etc.) and food crops (maize, cassava, beans, sorghum, etc.).

Moreover, the economic importance of these reliefs is revealed through tourism (the aesthetics of the sites), the photographic shots for the postcards and the exploitation of the mineral resources or the quarries (iron of Bandjéli, quartzites of the Atacora, marble at Pagala). The geomorphological landscape, as a land surface, acquires an economic value. This economic value can be increased or speculated according to human interventions.



Plate 5: Economic importance of mountains: coffee field on the Kloto plateau (A), cocoa field on the Akposso Plateau (B), polyculture of banana, orange and avocado on the massif Agou (C)

- **Hydro-climatic value**

The mountains attract many people because of the leniency of their microclimate marked by a permanent freshness favorable to the hike. The high altimetry of these reliefs (800 m altitude on average) leads to a rise of hot humid air generating rains. In the same way, these reliefs are the reservoir or the source of several streams, the torrents and the brooks.



Photo 2: Avégamé Waterfall in Akébou

- **Communicational value**

The high altimetry of mountainous areas has attracted many telecommunication companies in the last decades, including Togo Telecom, Moov and Togocel, etc., with the aim of finding reliability and efficiency in their telephone networks. Thus, antennas are implanted on high topographic levels (summits, or mid-slope) throughout the mountains of the territory.

- **Scientific value**

The mountains of Togo are full of several sites that are solicited as part of educational outings organized by the departments of geography, geology, botany universities of

Togo. In the same way, several research works relating to the human sciences and sciences of the life and the earth touched on these reliefs. All this gives them a scientific or educational value. The preservation and enhancement of these geosystems will strengthen some geodidactic and integrate the socio-cultural aspects, pillars of sustainability, into development projects.

- **Threat for mountain ecosystems in Togo**

Household surveys reveal that mountain areas in Togo are impacted by climate change. The effects are felt through prolonged periods of drought, irregularity and poor distribution of rains. In addition to these effects, whose impacts are increasingly felt on mountain ecosystems, human interventions have amplified the extent of the risks in recent decades. In fact, since the fall in prices of the 1980 annuity products and the economic crisis of the 1990s, the Togolese mountaineers prefer to practice the food crops, sun-loving species, to feed themselves, then the extra intended for sale, than to engage in the cash crops, whose prices fluctuate. The shifting agriculture on slash and burn with a flat technique, the search of the forest products to satisfy the food and economic needs and the exploitation of the quartzitic rocks, granites, clays, and sands for the construction or the sale constitute the factors that exercise a true departure from mountain ecosystems (Plate 4). This continual degradation of forest layers has exacerbated deterioration of zoo diversity, land erosion, reduced crop yields, irregular rainfall, and triggered landslides.



Plate 6: Harmful human practices: exploitations of quartzites in Kloto (A), sawing wood in the Akébou (B), eastern slope of Kloto Plateau exposed by fires (C)

Conclusion:

This document lays the foundation for undertaking sustainable management actions in mountain areas in Togo. Among the actions to be undertaken, we can mention:

- Inventory of mountains by identifying them and identifying their potential: ecosystems and their components;
- Realization of more localized studies on mountainous entities in the country for monitoring;
- Promotion of environmental education and public awareness of bio (geo) sciences. This ideal involves the creation of information centers and museums, the creation of excursion trails punctuated with information panels on the environment or the publication of books, postcards and educational pamphlets intended to popularize work and scientific knowledge acquired on the mountains.
- Sensitization of local populations on various mountain issues;
- Restoration of the mountains by enrichment, reforestation with spontaneous species;

- Promotion of agroforestry and the development of crop systems or techniques for the conservation of crop soils;
- Diversification of economic activities by promoting crafts and geotourism or, more broadly, ecotourism, in a perspective of sustainable development.

Experience report 32

Changing farming systems and its implications on livelihood: an observational findings from rural area of Garhwal Himalaya

Institution: Department of Geography and Resource Management, Mizoram University, India

Presenter: Vishwambhar Prasad Sati

Experience description:

This study examines changing farming system and its implications on livelihood in the rural areas of the Garhwal Himalaya. It is based on the observational findings. Cultivation of traditional subsistence cereal farming has been a major occupation and an option of livelihoods of a large number of people of the Uttarakhand Himalaya. During the past, the major crops grown were barley, millets, pulses and oilseeds. Although, a substantial proportion of arable land was devoted to grow paddy however, production from it was very little. Seasonal vegetables including potato and onion and were grown. Along with growing population, output from traditionally grown cereals was insufficient and thus, the farmers suffered from food insecurity and malnutrition. As a result, the farmers shifted cropping pattern mainly from the traditionally grown subsistence cereals to cultivating wheat and paddy. This shift has substantiated food demand of the farmers and a sizeable arable land was devoted to paddy and wheat cultivation. In the 1970s, the state government created fruit belts mainly in the temperate region of mountainous mainland for cultivating apple. For a decade or so, this move has increased the income of the apple growers. Along with apple, farmers began growing nut fruits – plum, peach, pear, walnut, apricot and almond. In the river valleys and mid-altitudes up to 1400 m, citrus fruits – lemon, orange, elephant citrus and mandarin were grown. During the period, farmers also cultivated off-season vegetables – cucumber, beans, cabbage, tomato, eggplants, pumpkin, ladyfinger and leafy

vegetables – along with potato and onion. Cultivation of fruits and off-seasonal vegetables has decreased in due course of time. Lacking market and transportation facilities were the major driving forces mainly for growing fruits and off-season vegetables as they are perishable in nature. High variability and changing climate had a greater role in decreasing production of these crops. Warming of the valleys and mid-altitudes affected rainfall trends, which is erratic in nature. Increase in a number of wildlife in the forested areas, due to implementation of Wildlife Conservation Act of India 1980, forced them to move in the inhabited and cropped land and they have been destroying crops. All together have paved a way to exodus rural-urban migration. Land abandonment due to out-migration has caused to drying natural springs, which are the major source of drinking and irrigation water. After Uttarakhand became a separate state, the government initiated cultivating medicinal plants and tea leaves. Further, cultivation of medicinal plants could not be successful because of lacking in market facilities and the government lenient policy towards sustainable farming. Because, medicinal plants need about two years to grow and after harvest, the farmers did not get market and they left cultivating medicinal plants. Tea cultivation is feasible however, area under it is not sufficient. Agriculture has been practicing as trial and error for the centuries however there has not been found any suitable farming system in the Uttarakhand Himalaya so far. In the meantime, agro-climate is very suitable to grow a number of crop races/cultivars from the valleys to the mid-altitudes and the highlands. Agriculture is mainly rain fed except in the valleys where a small proportion of arable land is irrigated. Traditional crops can grow in the highlands with cultivation of apple and nut fruits. Paddy and wheat along with citrus can grow in the mid-altitudes and the valleys. Paddy is the most suitable crop in the valleys because of irrigation facilities. Medicinal plants can also grow accordingly. The need of the hour is to develop market and transportation facilities and for that, the role of government is inevitable. Cold storages can be constructed to store perishable fruits and vegetables. This will lead to food security and will create employment and control out-migration.

Symposia

- 1 - Mountain Agriculture and Agroecology
- 2 - Biogeography of the Andean and Amazonian regions
- 3 - Biosphere Reserves in mountain regions: resilience and adaptation to global changes
- 4 - Rural Tourism and Agritourism in Mountain Areas as Vectors of Sustainable Development
- 5 - Population and Local Governments as Allies in the Sustainable Use of Biodiversity as a Strategy for the Mountain Ecosystems Conservation
- 6 - World Famous Mountains Association: experiences of sustainable development
- 7 - Mountain forests management and ecosystem services: a desired balance
- 8 - Water harvesting: transforming grassland and livestock production in high Andes puna ecosystems, past and present
- 9 - Climate Change Adaptation in mountains regions
- 10 - Management and Social Control in Mountain Territories
- 11 - Exchange of experiences and local public policies that can collaborate with the sustainable development of municipalities and localities
- 12 - Mountain Agriculture and Field Education
- 13 - The role of Science, Technology and Innovation for territorial development from Andean and Latin-American Perspectives

14 - Mountain Cities: inclusive, safe, resilient and sustainable

15 - Conservation of Mountain Landscape and Sustainable Development

16 - Responses of natural disasters to climate change and disaster risk reduction

17 - Rural landscape and ecosystem services provision

18 - Addressing land use dynamics and global change in the Andes: Research priorities for the sustainable management of mountain landscapes

19 - Sustainable territorial development in arid mountains? Paths and current challenges

20 - Value-adding strategies from postharvest to fork: challenges and opportunities of small food and beverages production in mountain environments

21 - Art in Nature - Projects in Mountain Regions

22 - How Much Science vs How Much Practice? Bridging 'The Sustainable Development' Chasm in Africa's Mountains

23 - Earth surface patterns and processes & ecological conservation for sustainable mountain development – towards scientific cooperation along the Belt and Road

24 - Methodological strategies to construction of territorial identities applied to mountain zones in a social innovation perspective

25 - Open Session

1 - Mountain Agriculture and Agroecology

Performance of farmers in Rio de Janeiro mountains environments

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Abstract:

The agrarian history of Rio de Janeiro helps to understand and shows that the cultural hybridizations initiated with the public policy of immigrants colonization in nineteenth-century, contemplated mountain environments and contributed to its agrobiodiversity. These regions today have an important role in food production in the state of Rio de Janeiro. The objective of this work is to analyze the agricultural efficiency, using quantitative variables, trying to highlight the productive diversity or agrobiodiversity. The Data Envelopment Analysis (DEA) methodology was chosen because it allows the incorporation of the variables used in the calculation of indices that facilitate the desired evaluation. The variables considered were: cultivated area in hectares, different number of items produced, billing in reais, machine hours, man days and total external inputs in reais. A first DEA model used the agricultural production data of the municipalities of the state in the year 2015. It was verified that 91.7% of the municipalities revealed efficient, practice agriculture in mountain environments. A second DEA model will assess the performance of agroecological producers in these environments and it is expected that crop diversity promoted efficiency and stability over the months of 2017. Interactions between agricultural crops can optimize the use of space, labor, machinery and supplies. These assessment systems can help to

assist in decision-making and in directing strategies that increase the efficiency of agriculture, by identifying and disseminating good practices of efficient producers.

Keywords:

agrobiodiversity, data envelopment analysis, efficiency in agriculture, productive strategy.



Analysis of Agroecosystems as an agroecological proposal for family farming in mountain environment in Brazil and Argentina

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Abstract:

The agroecosystems in the mountain environments of the state of Rio de Janeiro (Nova Friburgo - Brazil) and Alpa Corral (Córdoba - Argentina), can benefit from alternative agroecological actions. The methodological base treated is the Economic - Ecological Analysis of Agroecosystems (ASPTA - RJ) for family agriculture, as technological and interventionist potential for agroecological purposes. The emphasis of the research is to test the efficiency of the method in relation to economic and productive aspects in the studied agroecosystems. The importance of communication within the process and how individuals are responsible for several stages in the productive chain of agroecosystems is investigated. Flow diagrams of agroecosystems, technical-ecological and economic

system (ASPTA-RJ) are established. From the establishment of flows and the timeline in agroecological units of production and conventional, it will be carried out analyzes for the studied agroecosystems, strategies of family economy and optimization of the value of the work with respect to the members of the family unit, starting from the assumption that the feminine economy, ecological and productive, can be added from critical analyzes of their strategies of organization within their agroecosystems.

Keywords:

agroecossistemas, agricultura familiar, agricultura de montanha.



Participatory evaluation of sustainability of agroecosystems under direct planting in the municipality of Nova Friburgo, Rio de Janeiro State, Brazil

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Abstract:

The municipality of Nova Friburgo, located in the state of Rio de Janeiro - Brazil, is one of the largest producers of vegetables in the country and the main pole of production of this type of culture in the geographical area of Serra do Mar, whose mountains reach in Nova Friburgo its high point. This production is based on familiar production systems with strong insertion in the market and intensive use of agrochemicals. In the challenge of transcending Agroecology

as a science, inclusive, didactic and participative methodologies are of great importance. Thus, the authors worked with family farmers using a participatory evaluation of soil quality indicators and crop sanity, as a strategy for collectively building knowledge about the local adaptability of no-tillage. This strategy was presented as an important tool in the dialogue between technicians and farmers on agroecological practices. In this way, it was possible to enable farmers to appropriate the general knowledge about soil physical and biological dynamics, relating them to the management of vegetable crops in local mountain environments, especially regarding the importance of the insertion of soil cover crop rotations, intrinsic need for the proposed technological innovation of no-tillage worked with farmers.

Keywords:

agroecology, sensory analysis, perception, exchange of knowledge, family farming.



Development, sustainability and agriculture: peasantry in mountain environments

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Abstract:

The peasant *modus operandi* and its relations with society is relevant in the heterodox interpretation of rural social phenomena. For Karl Marx, in the context of capitalism, in the medium term, the difficulties of peasant investment in their productive units increase, jeopardizing their sustainability. In turn, for Alexander Chayanov, the peasant family represents unit of production and consumption.

Thus, in order to understand the maintenance of the peasant mode of production, despite the advance of capitalism, it is necessary to analyze its forms of life, whose reference - labor in its productive establishment - is limited not by profit but by satisfy the necessity of the family demands. In this sense, productive activity with a focus on agroecology is more adequate for the sustainability of peasant production systems, since they provide greater stability and resilience, due to lower environmental impact, greater diversification and equity. A case study in Nova Friburgo, Rio de Janeiro state, Brazil, there were practices anchored in agroecology as a basis for productive sustainability in local mountain environments.

Keywords:

peasantry, sustainability, agroecological practices.



HOPS - a cultivation option for mountain agriculture

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Abstract:

Hops (*Humulus lupulus* L.) is a plant of the family Cannabaceae, whose flower is used in the composition of the beer, giving it bitterness and aroma. Originally found in the Northern Hemisphere, between latitudes 30° and 60°, which comprises the cold regions of North America and Europe. Drawing a parallel with the Southern Hemisphere, hop cultivation should theoretically only be recommended from south-central Rio Grande do Sul to the extreme south of Argentina and Chile, due to similar conditions of exposure to light in winter and summer and temperature. However, experiments carried out in Nova Friburgo (Rio de Janeiro), initially a municipality that is not suitable for the development of culture (latitude 22°), are showing viability of cultivation, promising in

productivity and product quality. However, because it is a species unknown in our state and to avoid unrestrained planting without a minimal technological base, care should be taken by those interested in growing it. The general objective of this work is, from the very few international literature, to discuss the main technical parameters necessary for commercial scale cultivation. Aspects such as the genetic quality of the propagating material, water requirement, luminosity, soil fertility management and susceptibility to pests and diseases will be considered, so as to have a research base indicator and to minimize the probability of failure with the crop that emerges as a good cultivation option for mountain farming regions.

Keywords:

hops, cultivation option, mountain agriculture.



Agroecological Backyards: montane territorial identity of peasant-based family farmers in Rio de Janeiro State – Brazil

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Abstract:

Agroecological backyards maintained by peasant-based family farmers in the central-northern portion of Serra do Mar in Rio de Janeiro state - Brazil; its products, uses, values and meanings, fall within the perspective of montane territorial identity. Nova Friburgo. It is an agroecosystemic niche resulting from the human inter-relationship historically constructed with the Atlantic Forest biome, in two cases studied: in the regions of Cambiasca and Campo do

Coelho, respectively in the municipalities of São Fidélis and Nova Friburgo. It is verified that in the productive arrangements the idea of integrative socio-spatial appropriation prevails in relation to the domain of the diversified cultivars, their seasonality, management of the socioagrobiodiversity and interdependence with the environments. They are established as units of agroecological resources adapted to the environment, with consortia of domesticated vegetable species, native fruits, unconventional food plants, herbs, fibers and woods. A cultural identity that expresses itself in the appropriation of the territory in tangible and intangible ways; agrifoods, phytotherapys, culinarys and landscaped; embodied in distinct recipes, medicinal prescriptions and linguistic vocabularies; including processes of perception-cognition, where farmers, holders of knowledge and meanings, provide temporal consistency to the biophysical territory. Therefore, recognizing the coexistence of symbolic culture from agroecosystemic dynamics becomes relevant for family farming montana, in the multifunctional aspects that surround it, such as: in the area of ethnoscience, the notion of agro-environmental territory in mountain regions, and especially in relation of the promotion of health, food safety, and the protagonism of these subjects as agents of traditional knowledge.

Keywords:

agroecology, food safety, mountain environments, atlantic forest, socioagrobiodiversity, traditional knowledge.



Agroecology and organic agriculture in local rural development: case study in the agroecological association of Teresópolis, RJ

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Abstract:

The implementation of sustainable agricultural systems depends on profound changes in the paradigm of development in contemporary society, among other aspects, in the elaboration of agricultural development strategies that are based on local and regional production. In this study, agronomic reflections and analyzes are carried out through the environmental practices and issues of the organic agriculture producers linked to the Agroecological Association of Teresópolis (AAT), state of Rio de Janeiro, Brazil, based on the social, environmental, cultural and environmental categories. economic, to respond if the experiences in the Participative Guarantee System (SPG), organic agriculture, especially the AAT, contribute to the processes of local rural development. The research covered a historical trajectory of agroecology and organic agriculture and was based on the regulations and legislation that guide organic agriculture in Brazil. The methodology used was the research-participant with bibliographic review based on multireferentiality, field research and oral history, in a methodological triangulation that included visits to agricultural production units, participant observation followed by individual interviews, and application of a semi-structured questionnaire. The analyzes and reflections of the data considered that despite the lack of knowledge of the Brazilian public policies and programs for organic agriculture, and without receiving any governmental support, the associates are predominantly owners of their lands, educated, organized, working in the GSP in accordance with organic production, and their agroecological practices are participatory. We conclude that AAT contributes to local rural development processes.

Keywords:

agroecology, organic agriculture, local rural development.



Agroforestry systems design for Montane Ombrophylous Forest in Serra do Brigadeiro-MG

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Abstract:

The Serra do Brigadeiro, located in the southeast of Minas Gerais, is a strategic area for the conservation of the Atlantic Forest's biodiversity. The native vegetation is composed by different phytophysognomies ranging from semi-deciduous forests to montane and upper montane ombrophilous forests. Coffee monoculture and pasturelands are the predominant land uses in the region. This culturally consolidated land occupation hampers the sustainable use of the rural properties, hinders rural family's possibilities to remain in the land and threatens the ecosystem services provided by the forests. The objective of this work was to design and implement agroforestry systems adapted to the environmental and cultural reality of Serra do Brigadeiro, aiming to enhance both local socioeconomic development and environmental preservation. While coffee stands out for its economic and cultural relevance, the juçara palm tree (*euterpe edullis*) holds environmental relevance and potential for the commercial exploitation of its fruits. The system's linear and forested design embraces both the ecophysiological needs of juçara and the possibility of producing specialty coffees. The plant species selected to provide these conditions was banana tree. The results show that not only design, but also system's management is fundamental for the establishment of productive systems in a consortium environment. The essential management elements are: the moment and intensity of pruning in order to stimulate coffee's flowering; the propagation of juçara palm trees (seed x seedlings), shade intensity during the initial growth phase of juçara, and the insertion of pioneer trees species for pruning.

Keywords:

agroforestry systems, *eutepe edulis*, biodiversity.



Chemical composition of Cascade hop volatiles in pellets and Cascade in flower cultivated in Brazil by HS-SPME-GC-MS

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Abstract:

Hops (*Humulus lupulus* L.) are large-scale plants used in beer production, widely recognized for their aromas and bitterness). Brazil is one of the largest producers and consumers of beer worldwide, but most of the raw material used for this drink production is imported. After consecutive and unsuccessful attempts to grow hops in Brazil, the first Brazilian hops plants appeared in 2011. A hop planting in the country is not on a large scale, and Brazilian hops have been used in the production of artisanal beers. Thus, the objective of this work was to determine the chemical composition of Brazilian hops volatiles from an *in natura* sample of the cultivar Cascade from Nova Friburgo-RJ and one sample of the same variety, but in imported pellets purchased from specialized breweries in Belo Horizonte-MG. The samples were analyzed by Headspace Solid-Phase Microextraction/Gas Chromatography with Mass Spectrometry detection (HS-SPME-GC-MS) with procedures performed in triplicate. The major components

found in hop volatiles were beta-myrcene, trans-Caryophyllene, alpha-Humulene and beta-Farnesene in the two samples, as reported in literature⁵. We concluded that both imported and Brazilian samples presented the same major compounds and may only present difference in the % m/m of the compounds.

Keywords:

Humulus lupulus L. chemical characterization, SPME.



Persimmon: consolidated option for mountain agriculture

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Abstract:

The cultivation of persimmons is a growing activity in the State of Rio de Janeiro. Each year, traditional producers increase their planting areas, when possible, or technify them, aiming to increase productivity. Others, who did not produce the fruit, are beginning to diversify their agricultural production with the introduction of the species. This is due to the popularization of the consumption of persimmons, which naturally forces the increase of production, and the average profitability obtained, since the cost of production is relatively low, the productivity is good and the marketing value is satisfactory.

Continually, Emater-Rio (Rio de Janeiro State Technical Assistance and Extension Company) seeks to provide up-to-date information to producers, students in the area of Agrarian Sciences and to technicians working with culture, contemplating the main

aspects on the cultivation and the production of this fruit. Subjects like botany, phenology, climate, soil, seedlings, types, varieties, planting, nutrition, pruning, vegetation management, diseases, pests, water management, fruit thinning, harvesting, production, packing and marketing are periodically addressed in the ATER methodologies (Technical Assistance and Rural Extension) developed mainly with the family farmers of the Serrana Fluminense Region, consolidating the persimmon culture as an excellent cultivation option for agriculture in mountain environments.

Keywords:

persimmon, consolidated culture, mountain agriculture



Altimetric distribution of the crops in a family farm in the western of Paraná State, Brazil

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Abstract:

Western Paraná, known for its flat lands, is an important soybean and corn production region. Located on the Paraná Third Plateau, near the slopes of the Paraná River, it has the form of steps (Trapp formation) with altitudes ranging from 80 m in Foz do Iguaçu to 540 m in Cascavel. Although it has characteristics of plateau, it present deep valleys with steep slopes, humid climates, average temperatures between 21 and 22°C and 3 to 6 frosts per year.

The studied farm is located in the Periquito Line, in Marechal Cândido Rondon, Paraná, Brazil, in the Arroio Fundo watershed, at 54°3'17.82"W and 54°2'49.08"W and 24°36'31.43"S and

24°36'54.12"S. It has northern sun exposure, between altitudes of 310 and 470m.

The farm has 24.3 ha, with the crops distributed along the slope, the more susceptible to frost in the higher parts. The farm has 0.5 ha of agroforestry coffee, located between altitudes of 440 and 455m; 1.1 ha of sugarcane, between 370 and 385 m; 6.2 ha of temporary crops, divided by windbreakers on the terraces, between 340 and 390m. It has 1.6 ha of agroforestry, between 350 and 380 m; an agroforestry home yard of 0.2 ha at altitude 340m; 6.0 ha of pasture in the Voisin System (PRV), between 310 and 355m; 7.7 ha of native forest between 335 and 470m. The permanent preservation area of 0.5 ha along the river between the heights of 315 and 385m, and the house, facilities and road occupy 0.4 ha, at 340m high.

Keywords:

agroecology, family farming, organic farming



Organic carbon in different areas of cultivation in the municipality of Bom Jardim, RJ

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Abstract:

Organic matter (OM) promotes improvement in soil chemical, physical and biological attributes, such as aggregation, infiltration, porosity and nutrient supply to plants. Due to its sensitivity, the management practices, soil MO, can function as an indicator of soil quality. The evaluation of the content and forms of MOS can be

done through different ways, such as fractionation techniques. Through the granulometric fractionation of OM, the carbon content of the sand size (CO_p), more labile forms and the most recalcitrant forms are determined, associated with fractions and clay and silt (CO_{am}). The objective of this study was to quantify the CO_p and CO_{am} contents in three different areas: Mata (M), tomato (PT) and maize (PM) planting at depths of 0-5cm, 5-10cm and 10-20cm. The analyzes were done according to Cambardella & Elliott (1992) and Yeomans & Bremner (1988) and the results were submitted to the Kruskal-Wallis test at 5% using the Agricolae package (Mendiburu, 2016) Team, 2016). Greater levels of CO_p in the area of M were quantified at all depths when compared to PT and PM. As far as the CO_{am} values were concerned, they presented in greater proportions in PT and PM areas at all the depths, not being verified difference between the areas. It is concluded that the management techniques in the cultivation areas are favoring the reduction of the more labile fraction of the organic matter (CO_p) in detriment to the most recalcitrant fraction.

Keywords:

granulometric fractionation, soil organic matter, soil quality.



Organic light in cultivation areas in the Serrana region of Rio de Janeiro State

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Abstract:

The evaluation of soil organic matter (SOM) is one of the main indicators of soil quality, establishing direct relationships with

several other attributes. One of its fractions is light organic matter (MOL) associated with roots, hyphae and vegetable residues, which presents a rapid decomposition, being sensible to the actions of management, fertilization and crop rotation. Through the analysis of this compartment we can verify how the soil reacts to these actions, in order to provide a better environment for crop development. The objective of this study was to evaluate the MOL contents in three different areas and depths in the municipality of Bom Jardim-RJ, being: virgin forest (MV), tomato planting (PT) and corn planting (PM) 0-5cm, 5-10cm and 10-20cm. MOL was determined according to Anderson & Ingram (1989) and the results were submitted to a 5% Kruskal-Wallis test using the Agricolae package (Mendiburu, 2016) in R software (Core Team, 2016). It was verified that the MOL values in the three depths of M were larger when compared to the PT and PM areas. In the area of M, the highest values were quantified in depth of 0-5cm. In the areas of PT and PM, the same pattern was observed in the three depths. It is concluded that the management practices carried out in the cultivation areas are directly affecting the MOL contents and consequently reducing the supply of nutrients available to the crops.

Keywords:

organic carbon, soil quality indicators, soil management.



Ethnotourism and Agroecology, possible way to consolidate the Touristic Routes in the Bananal - Pacaraima Community

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Abstract:

After approval of the itinerary of ethnic and ecological tourism in Terra Indígena (TI) São Marcos, in 2016, where local guides and bodies linked to the Indian issue and tourism, elaborated the Roadmap: Macunaíma Paths (FUNAI 2015), having its approval in the community Boca de Mata, by the Macuxi, Wapichana and Taurepáng ethnic groups, thus creating the Sustainable Land Development Program of the São Marcos Indigenous Land, inserted in the State Plurianual Plan (PPA) 2016-2019. Roteiro with more than 400 km by fields and roraima with some ecological communities and archaeological sites, and where some indigenous communities are located, including Bananal, located 210 km from Boa Vista by BR-174 Norte, in the Municipality of Pacaraima, where Portuguese, Taruepang and Castilian predominate, highlighting the production of flour and banana, whose production is taken by freight, for weekly sale in Pacaraima. The community, with more than 200 inhabitants, has, for the most part, “Seventh-day Adventist” members, and even though they are not allowed to “keep the Sabbath,” tourist guides, not adherents to the denomination, income, another aspect is that the increase of activities and visits, may, by local belief, bring discontent on the part of “spirits”, such as the figure of kainamé. Sugere the increase and diversification of the organic production of these communities where the income generated by the visitation goes up to the sale of its production, respecting the community reality.

Keywords:

ethnotourism, agroecology, Kainamé.



Mountain farming at Bonfim and Jacó communities in the Serra Fluminense region – Brazil

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Abstract:

In the city of Petrópolis, located in the Serra Fluminense region (Brazil), communities of Bonfim and Jacó have as their main activity the production of vegetables, mainly leafy ones, besides the production of cut flowers. Those communities are going through the process of land regularization, which is being held back due to conflicts with the Serra dos Órgãos National Park. In the local mountain environments, the cultivated areas present predominantly strong wavy relief, where the social organization of family farming is prevalent, although there are other agents present, such as neo-agricultural and tourists. The present study aims to analyze the agriculture practiced at these communities, considering the tensions with the Park administration, and to identify improvement opportunities that promote a more sustainable activity. The study was carried out through information obtained in the field, interviews with farmers and other social agents, and collection and critical analysis of secondary data, based methodologically on the case study. In most areas, the production is submitted to an intensive manipulation, with high input of high solubility fertilizers and pesticides, frequent soil rotation and occurrence of several phytoparasites. There were advances in the relationship between the communities and the National Park, but these advances still do not stimulate changes in manipulation. However, there are farmers who have opted for the agro-ecological transition and who are currently commercializing organic products, as well as identifying opportunities for improvement and agro-ecological practices experienced in the communities, pointing out other possible routes for the mountain farming in the region.

Keywords:

family farming, horticulture and agroecology.



Public policy strategies for family farming strengthening in Barão de Cocais' mountain environments - Brazil

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Abstract:

The aim of this work is to understand, among Cocais' mountain environments in Barão de Cocais municipality Brazil, the productive strategies and forms of work of family farmers and their relationship with public policies for the rural sector, in the local context of dispute for workers with mining activity the main local economic activity. We used documentary analysis, bibliographic review and interview based on an open script, together with 20 farmers assisted technically by EMATER-MG. It was verified that agro-ecological practices were used and that the interviewees accessed several public policies. In addition, other non-agricultural activities with potential to be developed were identified, indicating the importance of pluriactivity for the promotion of local development actions. The aging of the population and the decline of male labor in rural areas were also observed. Family farmers, even suffering from the pressure of mining activity, have invested in production, accessing new marketing channels, such as fairgrounds, exhibitions and institutional markets, generating new occupations and income. This insertion in new markets has enabled the return of people to agricultural activity and the improvement of life quality in local mountain environments.

Keywords:

agroecology; institutional markets; pluriactivity; rural extension; activities.



Water Balance studies in Ferralsols and Acrisols in coffee plantations and pastures on the mountainous region in northwestern of Rio de Janeiro – Brazil

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Abstract:

The knowledge of changes in the hydrological cycles in agroecosystems existing on a mountainous region in the northwestern of Rio de Janeiro is key factor to manage and verify the suitability of land systems for a specific region. Simulation techniques has been development in order to describe the water, nutrients and productivities fluxes in agroecosystems. However, to apply these models, data are required for its parameterization and thereafter a simulation of changes in water balances with modification of agroecosystems. The coffee plantations is one of the most important economic and social activity to the mountainous region of the state of Rio de Janeiro, and recently it has been discussed programs to encourage and expand this activity. The available areas to expand the coffee plantation are mainly the low-income pastures. Although the changing in the use of land from pastures to coffee plantation may affect the hydrological balances, due the modification that may occurs in the water properties of the soil, as the soil water retention, infiltration and transmission rates and the evapotranspiration processes. This study had the purpose of characterize the soil hydrological properties of Ferralsols and Acrisols on pastures and coffee plantations on the mountainous

region in the northwestern of Rio de Janeiro. It was obtained the functions of water retention and water transmission on the soils. These data will be used to simulate the effects in the hydrological cycle due the changing in the agroecosystems, especially related in the conversion from pastures to coffee plantations.

Keywords:

water balance, agroecosystems, soil.



Quality of purple passion fruit grown under organic and conventional management systems for industry usage

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Abstract:

The passion fruit is a fruit of great commercial importance all over the world due to the nutritional characteristics and the benefits related to consumption. The postharvest quality of passion fruit (*Passiflora edulis* Sims), produced by organic and conventional systems, was compared based on the physicochemical characterization of the fruits. The fruits from the experimental area of Embrapa Agrobiologia in Seropédica-RJ, were harvested in mature stage (totally purple coloration of the peel). In the evaluations, 20 fruits were used for each type of cultivation. The physicochemical evaluations analyzed were: total fresh mass (g); longitudinal and transverse diameter (mm); DL/DT; peel firmness

(N); yield of constituent parts (%); soluble solids (°Brix); pH; titratable acidity (% citric acid); SS/AT and vitamin C (mg/100 g). The purple passion fruit under conventional cultivation presented higher average values for fresh mass (169.95 g), pulp extraction yield (39.53%), soluble solids (13.90 °Brix), titratable acidity (4.63%) and vitamin C (65.00 mg/ 100 g), while organic purple passion fruit had higher average values for peel firmness of 96.76 N, longitudinal diameter (76.91 mm) and pH (2.70). Fruits produced by the two types of cultivation did not show differences in the DL/DT and SS/AT of the fruits. Although there were differences in the characteristics of the fruits produced by the two cultivation systems, the studied fruits in this work were adequate for the industrialization with good quality attributes, aiming to meet the demands of the consumer market.

Keywords:

Passiflora edulis Sims; physicochemical characteristics; postharvest



Postharvest quality of 'Prata' banana produced in organic cultivation system

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Abstract:

The demand for organic fruit is growing worldwide and banana (*Musa* spp.) can represent a growth in this sector, both in the domestic and in the foreigner market. Therefore, the objective of

this work was to evaluate the chemical attributes of 'Prata' banana from organic production in Seropédica-RJ in different maturation stages: 1 (totally green), 3 (yellowish green) and 6 (totally yellow). The degree of maturation was evaluated according to the Von Loesecke maturity scale ranging from 1 to 7, according to the color of its bark. The fruits were harvested at maturation degree of 1, in may 2018, and stored at room temperature for subsequent analyzes. The chemical attributes evaluated were: soluble solids, titratable acidity, SS/AT, pH and vitamin C. The 'Prata' banana presented soluble solids content of 4.7, 15.0 and 23.8 °Brix and titratable acidity of 0.2, 0.4, 0.6% of malic acid, respectively, in the same degree as the color index of the fruit indicated a higher maturation stage. The relation SS/AT increased (21.4, 31.4, 39.7) according to the degree of maturation of the fruit. The pH was higher in stage 1 (5.5). Regarding the vitamin C content, it presented a reduction in the degree of fruit maturation, which showed its lesser values in the last maturation stages. In this way, it is recommended the use of 'Prata' banana in organic system since it produces fruits with better characteristics aimed to serve the consumer market.

Keywords:

Musa spp., banana orgânica, composição química.



Agroecology and Institutional Markets: strategies for sustainability in mountain environments of Nova Friburgo, Brazil

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Abstract:

The region of Campo do Coelho, in Nova Friburgo County, in the Serrana region of Rio de Janeiro state, is characterized by the large presence of farm families due to local land inheritance. Historically the economic dynamics and occupation of the territory was strongly influenced by the population growth of the Metropolitan Region of Rio de Janeiro city and its demand for food. Although agriculture in the region is mostly conventionally produced, there are small farmers adopting agroecological practices, notably after the climatic tragedy that occurred in January 2011, when many farmers lost not only all of their production, but also had buried production areas in which was necessary to seek alternatives for productive rehabilitation, and perceived viability through the agroecological transition. However, the promotion of process changes that lead farmers to adopt more sustainable practices for their production needs to be articulated with access to low-cost techniques appropriate to the local mountains environment reality, as well as technical advice that not only provides monitoring in the productive process, but which contributes to link the chain from production to consumer. In the meantime, public policies such as the National School Feeding Program (PNAE) and the Food Acquisition Program (PAA) have contributed to a diversification of production, with the introduction of new products in the rotation systems of local vegetables, to meet collectively the demand of these institutional markets, in addition, strengthening the associativism and food and nutritional security of the farmers families.

Keywords:

agroecological transition, public policies, sustainable development.



The production of quinoa and its relationship with the sustainable livelihoods in Colombia

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Abstract:

Boyacá is a departament of Colombia, that is characterized for have geographic regions mainly on the 2500 meters of altitude, with climates that propitiate the diversificación of crops fot the agriculture family, among them is the quinoa (*Chenopodium quinoa* Willd), native pseudocereal of the American south region, mainly of countries with Bolivia, Perú, Ecuador, and north of Chile, however, this crop has spread in worldwide for example Colombia, where has been generated environments socials, culturals and politicians, that it allow interact with the livelihoods, through the strengthening of the family agriculture. The experiment will be development in five municipality, where will be evaluated the five capitals of sustainable livelihoods of familys productors of quinoa and their interaction with the objetives 1,5,8,12 and 13 of sustainable development the program of the United Nations for the Development PNUD. We waiting contribute in the techical environments and associatives of the quinoa productors, with the purpose the achieve autonomy in food safety and commercial strengthening.

Keywords:

Development, capitals, sustainable.



Area-based agricultural resource management in mountainous regions of Thailand

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Abstract:

Highland Research and Development Institute (HRDI) has adopted area approach for sustainable development in Thai mountains where are home of ethnic groups and origin of upstream water serving the nation. The mountainous regions cover diverse elevation, micro-climate, economy and accessibility to public services. Agriculture is the largest HRDI intervention improving food crop productivity, local plants conservation and alternative crops extension. In 2016, HRDI has implemented an area-based research program recognizing agro-ecosystem properties and driving forces in mountains.

The study reveals five agro-ecological zones classified by dominant land use in agriculture; agroforestry, opium poppy cultivation, terracing paddy rice, emerged maize cultivation in sloping land and land settlement. Participatory action research with extension officers and farmers assesses livelihood assets that include physical, economic, natural resources, human and social capital. Agro-ecosystem analysis deliberates four system properties; productivity of food and economic crops/husbandry, stability of price and pest/disease outbreak, environmental-friendly production and equity of stakeholders. Disclosed assets and properties identified priority of extension activities, research questions and target groups.

The study concludes that agriculture development in Thai mountains must comply with biophysical capacity, local community context and driving forces in each agro-ecological zone. Collaborative action research facilitates joint assessment, decision making and claim of results.

Keywords:

agro-ecosystem, area-based research & development, mountains.



Agroecological Training for young citizens of Rio de Janeiro

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Abstract:

The summary is about the Agroecological Training project for young citizens of Rio de Janeiro, which is a partnership with UFRRJ with the Special Secretariat for Family Agriculture and Agrarian Development and aims to stimulate and train rural youth in the State of Rio de Janeiro. The project includes the Serrana, Baixada Fluminense, Ilha Grande Bay and Northern Fluminense regions. Its organization has four thematic axes: Social Organization; Production; Processing and Processing; Commercialization. The methodological proposal is given by the pedagogy of alternation, through the formative times *School Time* - UFRRJ and *Community Time* - in the regions/territories of young people, totaling 220 hours of formation. The activities began in January 2018 and will last one year. Among the goals of the project, we highlight: Training of 60 Youths, aged 10 to 29 years, these young people participate in the project as Young Trainers; Grassroots Youth Training - young farmers in the communities/settlements served by the project. The young trainers are responsible for multiplying the knowledge acquired about agroecology for the Young Bases, totaling 900 young people throughout the State of Rio de Janeiro. We believe that the *young pedagogy young form* presupposes the protagonism of the young in the process of knowledge construction and its organization as a collective for the construction of intervention proposals in their reality. Currently, we are closing the first Tempo Community and in July 2018, the UFRRJ will receive the young

people for the second Time School, which happens during the school holidays.

Keywords:

agroecology, rural youth, training.



Characterization of aromatic compounds and α and β acids from *Humulus lupulus* L.

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Abstract:

This study as the objective of aromatic compounds and α and β acids characterization from *Humulus lupulus* L., commonly known as hops.

Volatile components extracted from spontaneous hops collected in the Bragança area were analyzed and compared with those of commercial varieties. Hops have bactericidal and bacteriostatic action, promoted by α and β acids, also responsible for some of the bitter aromas of beer. The plant material was harvested in different areas of the district of Bragança, next to water courses.

The female cones were collected and the volatiles were extracted in a Likens-Nickerson system and then analyzed by CG and CG-MS. Extraction of α and β acids of selected varieties and spontaneous clones, these samples were analyzed in HPLC.

The results obtained show a certain similarity in the monoterpene

component, with β myrcene as the major compound and notorious differences in the sesquiterpene component, evident in the cases of α humulene. Also worthy of note is the greater richness of the sesquiterpene component of some spontaneous clones, in particular in the oxygenated compounds. In relation to the data obtained in HPLC, we compared samples of different varieties of cultivars (Nugget, Cascade, Chinook and others), with samples of spontaneous clones from distinct places in the region.

Keywords:

hops; aromatic; α acids; β acids



Use of alternative plant protection products and biocontrol agents for agro-ecological phytosanitary management of vegetables in the family production system of Nova Friburgo, Brazil

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Abstract:

Agriculture in the mountain region of Nova Friburgo, state of Rio de Janeiro, Brazil is characterized by cultivation of vegetables in small family production units, with intensive use of concentrated synthetic fertilizers and pesticides. To create opportunities for the promotion of innovations appropriate to this socio-environmental reality, groups of farmer-experimenters were established in order to promote the agroecological transition, with emphasis on the use of

alternative plant protection products and biocontrol agents, for phytosanitary management of the main vegetables in the region. For the articulation of experimental farmers it was carried out a survey of phytosanitary demands for the use of alternative products and biocontrol agents. In order to reduce environmental risks and production costs, based on the proposed strategies, it was possible to demonstrate alternatives to the use of pesticides in the phytosanitary management of vegetables, with special emphasis on the use of Trichoderma in strawberries and brassicas, which favored the greater rooting of these cultures. The use of lime sulfur favored the control of mites in tomato. It is essential to improve the dialogue with farmers about the importance of plant diversity for the establishment of mechanisms to promote conservative biological control, with emphasis on knowledge about the role of green manures as promoters of microbiological biodiversity antagonistic to agents of soil diseases and refuge for natural enemies of agricultural pests.

Keywords:

agroecological transition, family agriculture, vegetables.



HimalAndes Initiative: mountain to mountain cooperation to improve livelihoods

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Abstract:

The HimalAndes Initiative have promoted since decades ago cooperation and information sharing among the Andes and the

Himalaya, focusing on the potential for improvement of the livelihood of their mountain people. In addition to a couple of preliminary comparative research projects in mountain crops, community-based tourism, and fish farming on rice paddies, more recently the issue of knowledge sharing between both regions was addressed. In recent years via several this has been accomplished through efforts supported by electronic communication means. From its inception, the HI has explored ways where the information exchange and cooperation could led to outcomes for conservation of the natural and cultural heritage of both regions, sharing innovative experiences, including traditional crafts production for income generation and community-based tourism. The HI organized several inter-regional cooperation workshops, the first was a experts workshop held in Nepal in 1993, followed by an e-conference organized by the Mountain Forum in 2006, which dealt with the sustainable use of biodiversity, including genetic resources, in the Andes and the Himalaya. In 2013, HI conducted a Knowledge Sharing electronic conference sponsored by KM4Dev, which focused around water management innovations in the Andes and the Himalayas. HI is an active member of the Mountain Partnership since 2015. Its current efforts include promotion of the use of Andean camelids (llamas) fiber in the Tibetan carpets industries, both in Nepal and Peru (through the local Andean weaving traditions), aimed at enhancing the livelihood of the rural Andean communities. Quite recently, the HimaAndes Initiative actively participated in the Lima Carnival on Mountain event, with a presentation on a Andes – Himalaya comparative approach to traditional natural resources management and farming systems. Two publications on HimaAndes initiatives were recently published in the weekly Caretas magazines, in Lima, Peru.

Keywords:

mountain livelihoods, mountain cooperation, Andes, Himalaya.



Evaluation of the environmental aspects and

impacts of the olericulture production methods in a tropical mountain ecosystem: a case study in Teresópolis, Rio de Janeiro State

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Abstract:

The agriculture is responsible for feeding more than seven billion people in the world. The demand for foods and the change in the consumption pattern did with that the agriculture needed to mechanize, with the use of machines, defensive agricultural and of other several technologies, that started to generate significant impacts, as the degradation of the soil, water and air. To oppose to the model of conventional production, the organic agriculture appears with a production model that sustains the relationship man-nature. The Fluminense Highland Area became the most representative place of agricultural production in mountain atmospheres in Brazil. In some areas the oleraceous production the appeared more than a hundred years and today has become the pole of production of horticultural of the State of Rio de Janeiro, with important job generation and income. In order to mitigate the effects of the impacts of this activity, it is necessary to know them. Starting from a bibliographical rising and of field, this work has as objective evaluates the impacts generated by two models of different agricultural production: the conventional family and the organic business in the Bengalas watershed located in the municipality of Teresópolis. Starting from that it is looked for to analyze through a checklist, based on the literature, which the existent impacts and the most significant for the production characteristics in the area observed in field and to present alternatives to mitigate them, seeking the conservation of the productivity and quality of the water.

Keywords:

agriculture, agroecology, environmental impacts, mountain environment.



Challenges of mountain family farming to global environmental change. Experiences of adaptation in Chile and Colombia

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Abstract:

Global environmental change implies new climate scenarios and greater socio-economic pressures for mountain family farming (MFA). The rising temperatures and the increasing frequency of extreme events have caused water scarcity and loss of agrobiodiversity. Likewise, the implementation of development models based on only productive approaches and the rural exodus are significant threats.

In Latin America, MFA comprises around 10% of the farms. Family farming is a major source of employment and the largest contributor of GDP in mountain areas. It is also crucial to ensure food sovereignty of the Andean communities. Family farming is also a key to trigger inclusive rural development processes. However, the adaptive capacities to these changes vary considerably between countries and communities. Addressing these complex problems requires strategies that consider family systems from a socio-ecological perspective, where all affected dimensions are considered. What key aspects allow us to understand the differences in the adaptations processes of the Andean communities? Is it possible to scale up solutions at the regional

level?, ¿how can be improved the resilience of mountain communities to global environmental change?

Using a methodology of comparative case studies, two rural communities were analyzed: one in southern Colombia (Popayán, Cauca: 30 farms) belonging to the TeSac project (climate smart villages) and one in southern Chile (Araucanía, Curarrehue: 30 farms). Using a qualitative approach including predial and rural livelihoods analyses, the different strategies used to deal with these changes were study in depth. The foregoing was complemented by a review of public policies that support these strategies. The results show the importance of the community based approach to define their own strategies (local adpatation), and also the participation of women and youth in decision-making.

Keywords:

adaptation, mountain family farming, Chile, Colombia, Global environmental change.



Cultivation of velvet bean in no-tillage system under organic production management

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Abstract:

No-tillage is an important technique for soil conservation, and the

efficiency of this system depends on adequate soil cover, which should have high biomass production. The cultivation with green manure is a viable practice for improve the conditioning treatment soil, because when the biomass is disposed on the soil after its cutting, processes of decomposition and mineralization occur, and consequently, there is supply of nutrients for the successor crop, besides protecting against erosion. The present study aimed to analyze the green mucuna biomass production submitted by different soil preparation management in a organic system. The experimental design was a randomized block with four replications. The treatments corresponded to different soil tillage, being: a) no-tillage without herbicide use and with waste disposer, b) conventional tillage with the use of rotary hoe and c) conventional tillage of the soil with the use of a plowing and two harrowing. The sampling consisted in the collection of biomass of the aerial part of the mucuna contained in two square meters. There was no significant difference between treatments, indicating that no-tillage can produce legume biomass equal to conventional tillage. This can be a management strategy to increase organic matter and increase nitrogen contribution to organic agriculture. The inclusion of pre-cultivation with mucuna in no-tillage can be an environmentally and economically viable alternative for organic cultivation.

Keywords:

conservation management, hedge plant, *Mucuna pruriens*.



Public policies for the qualification of ecologically based agricultural production: the case of SAT certification - no agrochemicals in the state of Minas Gerais

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Abstract:

The growing demand for food without pesticide residues, has triggered a strong demand for the guarantee of products conformity, processes and services with technical standards and regulations evaluated by the certification systems of establishments under ecologically based productive handling. A number of standardization, regulatory and quality assurance initiatives have emerged throughout the world for a wide range of farming and forestry products. Different streams of sustainable production with a full set of standards and protocols make up this scenario, which is gaining prominence. The public policies of food and nutritional safety played a fundamental role for the family farmers in this transition process of the productive systems.

The goal of this work was identify and analyze the initiatives of voluntary sustainable standards for agroecosystems, food production in agroecological transition and public policies, focusing on the certification “SAT - without pesticides” developed in Minas Gerais as a qualification tool for agricultural production and access to distinct markets, using the case study methodology. The SAT certification scope as an alternative to certification processes for organic production audits, with the purpose of assigning qualification to products produced by farmers inserted in processes of agroecological transition, mainly on environmental and social sustainability aspects.

The SAT system has been emphasizing in the agricultural scenario of Minas Gerais, since minor producers in the agroecological transition SAT-certified have been able to obtain values on their products above those practiced for conventional products in the markets as occurs with organic products that are institutionalized in federal laws.

Keywords:

technical regulations, conformity assessment, sustainability



The perception of family farmers in mountain environments of Nova Friburgo (Brazil) on the use of covering plants

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Abstract:

Horticulture is an activity with intensive dynamics, to which diverse needs converge, among them the market pressure on supply and diversified mix of products, using small spaces for production. There are factors that make it difficult to operate in mountain regions, such as the inadequacy of mechanization in rugged topographies, as well as the lack of incentives for conservation management, which provides lower costs and better quality products. However, agriculture is an activity that occupies the land during 12 months of the year, so the occupation of the soil is a fundamental aspect. The objective of this work was to conduct, from interviews with farmers, a study about the use of soil cover plants in crop rotation systems in Nova Friburgo – Brazil. It was verified how family farmers appropriated soil conservation practices, and its behavior in relation to: perception of soil quality indicators; spontaneous plant management, phytosanitary and irrigation management; planning and management of the activity and other operational and environmental factors. Through reports and scores for fundamental parameters in soil quality, farmers' expectations and perceptions about the use of hedge plants in the productive

dynamics of their production units were revealed, showing innovative solutions adapted to the socioeconomic and environmental reality of the local food production.

Keywords:

soil conservation, family agriculture, soil organic C management.



Dynamics of dry matter intake, n and c content in white lupine and black oats in Nova Friburgo (Brazil)

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Abstract:

In Nova Friburgo's mountain environment, state of Rio de Janeiro, Brazil, farmers have used green fertilizers, notably black oats, as a soil cover plant at different times of the year, in addition to the recommended ones, generating demand for knowledge about the contribution of biomass at these times and the effective return to the farmer. The experiment was carried out in three randomized blocks with six plots each and four subplots to evaluate dry mass production, organic N and C yield and productive efficiency of black oat and white lupine in three planting seasons during one year. In the plots, the planting times were evaluated, in the subplots, the collections were done every 30 days to evaluate the contribution of dry mass and Nitrogen and Carbon content. Black oats produced a higher dry mass from 90 days after planting in July, followed by planting in March. Planted in October, the biomass contribution of black oats had a significant decrease due to constant rainfall, which

led to phytosanitary problems. Like oats, white lupine produced more dry mass at July planting, followed by planting in March, and production was maintained in October, indicating good climatic adaptability to local conditions. Black oats had an average N content of 30 kg.ha⁻¹ and C of 2200 kg.ha⁻¹ and 83 kg N.ha⁻¹ lupine and 1800 kgC.ha⁻¹. The contribution of C and N favors the biological attributes of the soil.

Keywords:

soil conservation, soil organic carbon, soil organic management.



Development of agro ecological based organic production in the mountain environments of Rio de Janeiro State

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Abstract:

Mountain environments are recognized as being more vulnerable to intensive farming practices, particularly in the context of climate change. In turn, the principles of agroecology and organic agriculture that apply ecological concepts and principles for the sustainable management of natural resources, enable production systems more resilient to this general environmental framework. The Serrana Region in the state of Rio de Janeiro (Brazil), is a mountainous region characterized by a pungent agriculture, a great supplier of vegetables, originating mainly from industrial-based production systems that generate great negative environmental impacts. In spite of this context, the region is a pioneer in the implantation of organic production units in Brazil, a fact that

intensified in the period from 2001 to 2017, increasing the quantity from 92 to 217 units of organic production. If we consider all municipalities that have mountain environments in the state of Rio de Janeiro, the number of farmers with organic production increased from 99 to 377 in the same period. The number of mountainous municipalities with organic farmers also doubled over the same period, increasing from 15 to 34. It was observed that the implementation of the Participatory Guaranty System (SPG), operated by the Rio de Janeiro Biological Farmers Association (ABIO), was fundamental for this growth, since this movement enabled and was fed by the strengthening of the networks of actors involved, making possible the adoption of new productive models in the rural environment of the state of Rio de Janeiro, mainly in their mountain environments.

Keywords:

organic agriculture, agroecology, participatory guarantee system.



Herbicide influence on soil macrofauna in mountain environment

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Abstract:

The steep slope from the Serrana Region of the state of Rio de Janeiro (Brazil), the steep slope demands the maintenance of the soil cover in order to reduce erosion losses. Farmers have a good receptivity to the use of cover crops, however it's harder to handle

without using herbicide, which affects the soil biota and ecological processes. The aim was to evaluate the soil macrofauna under different cover crops, under and without herbicide influence. A four-block design was randomly implemented. The treatments corresponded to four types of soil cover with four replicates: black oats (A), white lupine (T), 3: 1 consortium of A+T seeds and spontaneous vegetation. The sowing was the haul with densities according to that used by the farmers of the region (A: 30g.m⁻²; T: 15g.m⁻²; C: 30g.m⁻²). The macrofauna was sampled 90 days after the management of the cover plants, at depths of 10, 20 and 30cm. The individuals of each sample were counted and identified in large taxonomic groups. The ecological indexes of abundance, density of individuals and the relative frequency of each group were calculated. The macrofauna density decreased by at least half due to the herbicide. Lupine provided higher quality organic matter, with a density of 2516 ind.m⁻² in the treatment without herbicide, which was 10 times higher than the one found in herbicide treatment. The abundance of the macrofauna was higher with the herbicide-free management in the AT and T. The herbicide treatments presented similar values among the different cover crops.

Keywords:

cover crops, black oats, white lupine.



Evaluation of the impacts of the use of green manure with black oats on family production systems in mountain environments in the state of Rio de Janeiro - Brazil

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Abstract:

The use of the Environmental Impact Assessment as a political instrument occurred for the first time in the US with the creation of the National Environmental Policy Act in 1969. CONAMA defines environmental impact as being any change in the physical, chemical and biological environment caused by human activity. The objective of this study was to evaluate the environmental and social impact and to discuss the estimation of the economic impact of the technology of the use of green manure with black oats on family production systems in mountain environments in the state of Rio de Janeiro implemented by Embrapa Agrobiologia in partnership with Municipal Secretariat of Agriculture and Rural Development of Nova Friburgo (SMADR-NF) and Emater-Rio. For the accomplishment of the work, the reference methodology developed by EMBRAPA, called the AMBITEC System, was used, which brings together several methodologies that use indicators that are punctuated by users of the technology based on specific criteria. Among the social impacts, the most outstanding was “food safety”, which obtained a maximum score of 15.00, due to the use of green manuring with black oats, allowing the direct planting of vegetables, promoting the increase of organic matter in the soil, improving its biological, physical and chemical qualities and preparing it to adequately sustain crops. Among the environmental impacts, “soil quality” was the one that presented the highest coefficient of impact of the use of technology, with a value equal to 12.50. The reduction in the use of agrochemicals, labor and machinery are items responsible for the superior economic impact of technology.

Keywords:

impact assessment, green manuring, mountain environments.



Design and management of syntropic agroforestry

systems at Instituto Refazenda - Secretário, Petrópolis - RJ, Brazil

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Abstract:

The mountain region of Rio de Janeiro state is the main horticultural production center of the state. It is also the region that most uses agrochemicals, threatening human and environmental health. In response to this scenario, organic production has been increasing in the area. In the present study we report the process of design and initial management of syntropic agroforestry systems at Instituto Refazenda, located in Petrópolis, Rio de Janeiro. Through Syntropic Agriculture, Instituto Refazenda seeks to re-signify food production and contribute to Forest Landscape Restoration (FLR). In two years, eight different plots were established (almost 7000 m² combined), which have different objectives and spacings between tree lines. The design of the systems were elaborated based on the life cycles and space occupied by the different crops and tree species. Performance of consortia is presented based on the producers' perception. Results indicate that these systems are a viable option to incorporate native trees into agricultural landscapes, conserving biodiversity and agrobiodiversity: 133 plant species were recorded, including 84 species of trees or shrubs, of which 48 native to the Atlantic Forest Biome. Soil analysis show that fertility has increased, and animals have been registered using the agroforestry areas. We discuss the challenges encountered and the systems' potential for sustainable intensification and its role in FLR.

Keywords:

syntropic agriculture, successional agroforestry, analog forestry.



Technical assistance and rural extension (ATER) in the Serrana Region. ATER Sustainability Project Serrana

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Abstract:

The ATER project to promote Sustainable Family Agriculture - Municipalities of the Serrana Fluminense Region, was a project executed by CEDRO Cooperative, through a contract with the Ministry of Agrarian Development - MDA. A multidisciplinary team of 12 technicians was formed to serve 900 families, distributed in four municipalities located in the Serra do Mar context: Paty do Alferes, Nova Friburgo, Petrópolis and Teresópolis. The execution of the project was carried out from February 2014 to January 2017. In the first year the focus of the activities was: (1) Social mobilization; (2) Selection of families; (3) Survey of productive, commercial and access difficulties to farmers and their communities; (4) Definition of the work plan for the next two years, with each farmer and his communities. It was possible to establish an understanding of the reality of the family production units and to provide participatory technical assistance, using strategies of collective construction of knowledge that made it possible to adapt practices and productive processes to the specificities of the local mountain environments, always focusing on agroecology and sustainability of the family production systems assisted by the project.

Keywords:

Technical assistance and rural extension (ATER), family agriculture, agroecology, sustainability.



Bioinsumes for production of olive groves seedlings in mountain environment

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Abstract:

Nowadays the production of organic inputs for plant production has a relevant role. These can come from the composting process, using organic waste and plant biomass. Composting is a cheap and efficient biofuel, and one of the alternatives to mitigate waste generation and reduce production costs. In this study, two compounds were produced, one with Trout fillet processing residue and the other with *Tithonia diversifolia* biomass, to be used as substrate in the production of oil palm seedlings. The temperature observed in the two compounds during the composting process reached strictly mesophilic temperatures. However, they were sufficient to kill pathogenic organisms in the two compounds. The compound of the Rainbow Trout Residue had a pH of 4.1 and the compound of *Tithonia* Biomass presented 6.1 at the end of the process. The electrical conductivity was found to be 953 $\mu\text{S cm}^{-1}$ for the rainbow trout residue and 373 $\mu\text{S cm}^{-1}$ for the *Tithonia* compound. The Density 240 kg m^{-3} and 169 kg m^{-3} in the compound of Trout and *Tithonia* respectively. The C/N ratio of 23/1 and 64/1 for the Trout and *Tithonia* residue compounds respectively. The endophytic bacterium *Ochrobactrum* was found in the *Tithonia* biomass compost. There was no contamination by Helminth eggs in the compounds produced. The bioinsumes produced were tested as substrates in the production of seedlings and presented good potential, being indicated as another alternative of substrates in organic production.

Keywords:

compost, rainbow trout, biomass of tithonia diversifolia



the upper part of the Grande River Basin (Nova Friburgo/RJ): environmental dynamics and small production

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Abstract:

The upper part of the Grande River basin lies in the city of Nova Friburgo/RJ, located 136 km away from the capital city, Rio de Janeiro. The geomorphological context of the area is inserted in an area of corrugated plateau (dissected hills), pre-cambrian rocks, on the Serra dos Orgãos slope, covered predominantly by Latossolos, which is turned towards the inside, following the main course of the Grande River, to the north, towards the Paraíba do Sul River, with the valley bottoms covered by alluviums. The average altitude of the basin is 1300 m and the climate is high-altitude tropical with summer rainy season and winter dry season. The studied area lies in agricultural lands, with small production integrated and articulated to the market of the metropolitan area, being a part of the agricultural dynamics of the mountain region. The agricultural production of this area has been changed in the beginning of the 21st century because of environmental changes in the landscape, specially after the 2011 torrential rains, which modified the rivers courses and degraded the cultivation area, with great loss of soil by

silting. This resulted in a new stage in soil management and in agricultural production, from intensive production to organic production, which adjusted to the new environmental conditions, as many areas were covered by up to 3 meters of sediment. The present paper aims to identify the evolution of the landscape and the dynamics involved in the small production, with the aid of Google Earth pictures.

Keywords:

small production, environmental dynamics, landscape evolution.



Challenges and advances of mountain agroecology in the State of Rio de Janeiro: the case of the Third Region of Nova Friburgo / RJ - Brazil

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Abstract:

Campo do Coelho, 3rd Nova Friburgo district, is in its lowlands, about 1,000m of altitude above sea level, with a predominance of Altitude Tropical Climate, in the remaining central belt of Atlantic Forest of the state of Rio de Janeiro. Its highest point is the internationally visited set of granite mountains known as Salinas Three Peaks or Nova Friburgo Three Peaks (2.366m), the highest point of the Serra do Mar, which is located a significant proportion of highlanders family farmers of Rio's mountains. In view of the strength with which the Green Revolution technological package

has altered traditional and popular forms of ecological management, conviviality, modes, means and lifestyles, today the region has alarming rates of use of pesticides, agROTOXICALS and agrochemicals, degrading agricultural practices and especially for mountain environments, where the naturalization of poison uses in the region became objects of studies of relevant universities and research agencies in Brazil, with worrying results. Currently, after a few years of these studies, it is necessary to evaluate the challenges for the construction, dissemination and retrieval of agroecological knowledge and organic practices, income generation, access to land, experience in Pedagogy of Alternation and Field Education. These elements are visible priority agendas for youths, rural women's movements and traditional peoples and communities, promoting processes of agroecological transition and the dispute of their meanings through the active participation of those involved. Through the experience reports of two professors and researchers of the Family Center of Formation in Alternation Agricultural State College Rei Alberto I, we sought to reflect on the challenges and advances noted in the region in recent years.

Keywords:

mountain agroecology, field education, experience reports.



Forrage peanut as living mulch in orchards of persimmon

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José Guilherme Marinho Guerra

Abstract:

Forage peanut (*Arachis pintoï*) is a plant which use as living mulch in persimmon orchards may be viable, because it is a legume and fixes atmospheric nitrogen, improving the chemical, physical and biological characteristics of the soil. The objective of this work is to verify the behavior of forage peanuts as living mulch in a persimmon orchard, through several cuts at different times of the year. It was evaluated the seasonal production of biomass and the nitrogen content of forage peanut and spontaneous vegetation. An experiment was carried out at the rural area of Sumidouro municipality, in the Mountain Region of Rio de Janeiro state, during the months of December 2015 to December 2016. The experimental design was a randomized block design, consisting of five treatments, corresponding to different number of cuts of forage peanut. During one year, samples of aerial part of forage peanut and weeds were collected, in five different times. The results showed that the treatments that made two cuts (March and October) and the one that made three cuts (March, August and October), did not present a significant difference in the production of biomass to the system. With regard to infestation of weeds, it was verified that from the period of the first cut to the last one, there was a tendency of domination of the area by the forage peanut in detriment of weeds, evidencing the better competitiveness of this legume in relation to the weeds when routine cuts are made.

Keywords:

Arachis pintoï, cover crop, *Diospyros kaki*



Participative evaluation of soil quality and crop health in family production systems for the construction of integrated management of club root

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Abstract:

In Nova Friburgo, mountainous region of Rio de Janeiro, the environment degradation process has been progressing with major intensity causing an intense imbalance, which is affecting soil, crops, and, mostly organisms. Plagues and diseases are highlighted to the detriment of benefic organisms. The imbalance has been benefiting organisms that cause huge production losses, as in the case studied: the incidence of clubroot in Nova Friburgo, caused by protozoan *Plasmodiophora brassicae*. Seeking the development of a more beneficial agriculture, the participation of farmers becomes primordial, so that the engagement of the young and their families was sought, giving them the opportunity to use the evaluation tools and participate in the posterior discussions about the necessary actions in the productive units (PUs). The goal was to analyze the soil, the crop and the potentiality for the clubroot from PUs of Rio Grande, using the laboratorial analyses for the soil and the ones with the use of participative indicators, aiming to subsidize the discussions about the handling adopted by the brassica producers farmers to assay the soil, the crop and the potentiality for the disease. The use of indicators to assay the local potentiality of the clubroot was shown to be efficient to point the obstacles in the productive system of brassicas in relation to the disease, showing that it is highly potential to clubroot. The feedback is an indispensable tool so that the farmers can have contact with the results obtained in other proprieties, as well as what they represent.



Prospection of residues for use in the organic agriculture of the Serrana Region of Rio de Janeiro

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Janeiro

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Abstract:

The present study aimed to prospect the residues with potential to be used in organic agriculture in the Serrana Region of Rio de Janeiro. For this, the methodology Snowball was used, as described in Velasques and Díaz de Rada (1997). The research was carried out in three stages: (a) the development of the questionnaires; (b) the application of the questionnaires through interviews, initiated with Embrapa Agrobiologia researchers, in the city of Seropédica-RJ, followed by people from the Serrana Region of Rio de Janeiro (researchers, technicians and farmers indicated throughout the interviews) the saturation point is reached, that is, until the number of prospected residues is stabilized; (c) creation of a “database”, related to information obtained during interviews. The results showed that from the fifteenth interview there was a stabilization of the number of prospected residues. This demonstrates that the “snowball” methodology was adequate and practical enough to meet the purpose of the work. 25 different types of residues with potential for use in organic agriculture in the Serrana Region of Rio de Janeiro were prospected. This survey will serve as the basis for a second stage of the research project, which will consist in the quantification and characterization of these residues. Among the main expected impacts, the study will allow to demonstrate processing, storage and transport strategies aimed at the rational use of agrosilvopastoral waste, contributing to the expansion of organic agriculture, as well as subsidizing public policies to increase the competitiveness of Brazilian family agriculture.

Keywords:

small farm, organic fertilizer, agroecology.

2 - Biogeography of the Andean and Amazonian regions

Biogeography of Montane Vegetation in Atlantic Forest, Brazil

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Abstract:

The Atlantic Forest is hotspot of diversity within Neotropics, with 15.001 species of plants and nearly 50% of it are endemic. Although, this environment is highly fragmented and it has several serious threats due to human activities. Within Atlantic Forest, two major mountains chains, Serra do Mar and Serra da Mantiqueira ranges, represent 20% of the remaining vegetation. These two mountain ranges occur above 1.000 m., reaching 2.000 m. and 2.890 m., representing the coldest orbiomes in eastern South America. The upper montane vegetation occurs exclusively on uplifted blocks of old igneous or metamorphic rocks, from Archean, Late Proterozoic, and Late Cretaceous. This special type of environment encompass several types of phytophisionomies, such as Araucaria montane forests, seasonal montane forest, cloud forest, high altitude grasslands, peat-bogs, and rock outcrops. These montane vegetations holds high levels of diversity and marked endemism. Several plant genera are typical from this environment, such as *Anemone*, *Alstroemeria*, *Araucaria*, *Baccharis*, *Berberis*, *Chusquea*, *Drimys*, *Escallonia*, *Fuchsia*, *Ilex*, *Luzula*, *Myrceugenia*, *Mutisia*, *Senecio*, *Symplocos*, and *Weinmannia*. A series of distinct events of colonization of upper montane vegetation in Atlantic Forest highlights the complex biogeographic history of this mosaic environment. The evolutionary history and the patterns of distribution of these taxa help to clarify

the biogeographical links between the upper montane vegetation of Atlantic Forest with other biomes, such as Cerrado, Andean montane forests, lowland Atlantic Forest and other temperate vegetations.

Keywords:

biodiversity, endemism, Brazilian paramo, Upper Montane forest, Mantiqueira and Serra do Mar mountain ranges



Conservation biogeography at the crossroad of two biodiversity hotspots: element of a South American “Rand Biota” in the Atacama

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Abstract:

Classic study objects in biogeography are disjunct families like the Proteaceae and Nothofagaceae. Explanations for these large disjunctions are yet in conflict, appealing to plate tectonics (vicariance) and alternatively to long distance-dispersal (LDD) as explanation mechanisms. Only recently, new methodological frameworks open the possibility of an interplay between vicariance, LDD and extinctions. Studies in arthropods are scarcer, especially in the Neotropics. The North of Chile, characterized by its arid climatic regime, which is part of a wider climatic zone (the Arid Diagonal) has been described as a barrier that prompted the origin of a number of intracontinental disjunctions in different groups like birds and mammals. In comparison, the extent of the presence of

these types of disjunctions for the entomofauna occurring at the semiarid region of central Chile remains relatively unknown. The plant-arthropod interactions appear as crucial at this intersection of two biodiversity hotspots around 25 to 26 degrees South. It is expected that at the biogeographic crossroads the diversity increases due to the addition of different biogeographic elements together, but this biogeographic crossroad shall be an exception due to its situation at the margin (“Rand”) of the Atacama Desert. Preliminary results show indeed the presence of a high amount of antitropical taxa in the plant and arthropod communities, with consequences for phylogenetic diversity, functional diversity, and the building of endemic interactions. The better understanding of the biodiversity patterns of biotic assemblages will be crucial to propose new conservation units and improve conservation actions in already protected areas.

Keywords:

rand flora, Atacama, conservation, disjunctions, antitropical element.



Evaluating the impacts of climate change on the ecosystem services of the Andean páramo plants of Boyacá (Colombia)

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Abstract:

Colombia is known to be one of the most biodiverse countries in the world. Nevertheless, the current knowledge on inventory and

monitoring of biodiversity and ecosystems does not fully reflect this richness, being incomplete in many regions. Counteracting this situation, the nation-wide overarching 'Colombia Bio' programme has been recently established by the Colombian government, with the main objective of making sustainable economic use of Colombia's biodiversity resources. Here we present results of one of the subprojects "Plants for life" which aimed at modelling the impact of climate change on ecosystem services from the hyper-diverse Andean ecosystem called the páramos using key plants as surrogates. We assessed critical functions of the key plants in the ecosystem and their potentially significant value to livelihoods of communities in the department of Boyacá. Supported by extensive fieldwork verification and ecological niche modelling approach, we identified a complex regional network of uses and ecosystem services which are likely to undergo significant change due to shifting climate conditions. However, the high diversity of uses of páramo plants also exemplifies the extraordinary potential of the region for future resources to be explored and expand economic diversification by the local communities. The project obtained novel knowledge about previously unreported species and the potential sensitivity of Boyacá's páramo key plant species to climate change. Results are being used to inform decision makers and conservation/social organizations about the predicted impacts of climate change on livelihoods depending on the páramos' ecosystem services.

Keywords:

Colombia, biodiversity, ecosystem services, páramos, livelihoods, climate change



Assessing richness, turnover, endemism and regional hotspots of the Andean Compositae

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Abstract:

It has been estimated that along the Andes there are about 50,000 plant species (~50% endemic). However, the patterns that shape Andean biodiversity show differences between plant groups and are still not well understood. Being the most diverse South American angiosperm family, and showing high levels of endemism, the Compositae is an excellent model for the study of Andean biogeography. There are some ~3,500 Andean species of the family, with both ancestral and recent origins. This work aims to understand the patterns of richness, species turnover and endemism of the Compositae family throughout the Andes, to help understand the mechanisms that have facilitated its radiation in these high-altitude environments, and to identify regional areas of importance for conservation (regional Compositae hotspots). As a first step in this long-term study program, we compiled a database with >65K georeferenced records belonging to ~3,200 species and ~400 genera. Analyses were carried out using richness estimators, diversity indexes, Beta-diversity models and metrics of sampling efforts. The results show three to four richness centres mainly in the northern and Central Andes of Colombia, Ecuador and Bolivia. The southern Andes show comparatively reduced collection efforts, but levels of endemism appear remarkable. These results disaggregated at the tribe level, allow to test hypotheses regarding the radiation of the different lineages within the family, identifying areas with sampling gaps, and regional priority areas for conservation efforts, eventually related to the ancestral uses of the species.

Keywords:

Asteraceae, biodiversity, biogeographic patterns, conservation biology.



Exploring the presence of Antitropical and Arid Diagonal entomofaunal disjunctions in Northern Chile

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Abstract:

Disjunct distributions have been a key topic for biogeography since the early beginning of the discipline. Early recognised disjunctions were mainly related to large-scale phenomena like continental breakup. Explanations for these large disjunctions are still in conflict, appealing mainly to plate tectonics and consequent vicariance, or alternatively to long distance-dispersal and extinctions. The occurrence of Antitropical (AT) entomofauna disjunctions within the Chilean North-central region remains poorly documented and it is crucial to identify not only the existence of unique biotic associations but also the existence of specific mutualistic relationships and to clarify speciation processes that originate such disjunctive patterns. On the other hand, the arid/semiarid climate regime of northern Chile is part of a wider climatic zone known as the Arid Diagonal (AD). This AD has been described as a barrier that has originated a number of intracontinental disjunctions in groups like birds and mammals. On the other hand, the presence of these types of disjunctions for the entomofauna in this area remains also poorly studied. Within this context, we explored the presence of AT and AD insect genera disjunctions in northern Chile. We discuss our findings in terms of the importance of the validity of the taxonomic records, the relevance of some genera as key elements for conservation and the potential origin of such disjunct patterns.

Keywords:

disjunct, conservation, desert.

3 - Biosphere Reserves in mountain regions: resilience and adaptation to global changes

Identifying bioindicators to assess ecological change in Himalayan Protected Areas: Nanda Devi Biosphere Reserve - World Heritage Site, Western Himalaya

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Abstract:

Biological indicators detect the impacts providing a cost-effective method to assess environmental alterations. Selection of indicator species targets to maintain the ecological integrity and strategise for managing protected areas. Invertebrates are hugely diverse and taxonomically well-defined leading to their evaluation as effective bioindicators and are applied to various habitat and environmental scenarios. Invertebrates as bioindicators have shown prominence in the last two decades and are gaining momentum in present conservation endeavours. The changes in the mountain ecosystems can provide an early warning of the changes to the environment, so it is vital that the biological and physical components of mountains are strictly monitored and studied. Study on identifying bioindicators has been initiated in the Nanda Devi Biosphere Reserve, World Heritage Site, which includes the Nanda Devi and Valley of Flowers National Park. The area exhibits the typical features of the Western Himalayas characterized by temperate forests, sub-alpine forests and alpine meadows. The heterogeneity of this landscape provides a refuge for such endemism and supports over 1,000 species of flora and about 520 species of faunal diversity. Studies on invertebrates aim to evaluate indicator species reflecting certain habitat conditions providing a knowledge base for long-term ecological monitoring in this fragile

landscape.

Keywords:

Himalaya, Nanda Devi Biosphere Reserve, Bioindicators development, ecological monitoring.



Community based sustainable livelihoods approach for conservation of biodiversity in Nanda Devi Biosphere Reserve: World Heritage Site Uttarakhand, India

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Abstract:

Garhwal region of Uttarakhand state is rich in cultural and natural heritage. The state has distinct geography and ecological marginal conditions in this frazil landscape in the western Himalaya. Nanda Devi Biosphere Reserve (NDBR), the World Heritage Site, located within the high mountainous ranges of Uttarakhand state includes the Nanda Devi and Valley of Flowers National Park. This region harbours rich diversity and distribution of high altitude floral and faunal species, which is characterized by high endemism, rarity and existence of numerous local geographical subspecies. A total of 47 villages fall within the buffer zone of the reserve. People living in these villages have two ethnic groups viz., Indo-Mongoloid and Indo-Aryan with indigenous culture, tradition and religious beliefs. They reside close to the park with small land holdings, inaccessibility and remoteness coupled with short working season makes any development initiatives difficult in this area. The main

occupation is agriculture, sheep rearing and tourism based economy and traditional knowledge system of medicinal plants for sustainable livelihood. Study has been conducted on documentation of indigenous knowledge of medicinal plants and natural resources in different villages around NDBR. The study provides to support the rural community for the conservation and management of biodiversity and natural resources for long term sustainable livelihoods. Major objectives of the study were to explore the potential of natural resources, to understand the challenges and opportunities in this areas and suggest recommendations for establishment of long term sustainable development for improving the living standards of the underprivileged communities.

Keywords:

Natural resource, rural community, indigenous knowledge, Garhwal Himalaya



Adaptation to climate change in semi-arid mountainous area in Iran

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Abstract:

The importance of water management in Iran is reinforced through the recently published World Bank report on Water Security in the MENA^[1] which states that “A fundamental development challenge for the region is to take the actions necessary to navigate sustainable pathways toward water security. Sustainable pathways would anticipate and manage the inevitable increases in water

scarcity and water-related risks—against a backdrop of climate change, urbanization, growing fiscal constraints, and widespread fragility and conflict. Planning and action are needed to strengthen the resilience of economies and societies to protect them from water-related disasters”.

This project aims to bring these issues into focus, within the context of climate change, in the mountainous Bakhtegan Basin in Fars Province in southern Iran. The recent study on the relative effects of climate variability and human activities on runoff in the Bakhtegan Basin showed a trend of decreased annual runoff over the 40 year period from 1972-2011. Climate variability accounted for 62.45 % of this decrease whereas human activities accounted for 37.55 %. Climate change is already manifesting in the Bakhtegan Basin with evidence of increasing temperatures and below average rainfall over the last decade. The objective of the project is increase the resilience of communities and the natural environment of the Bakhtegan Basin to climate variability and change through integrated landscape management.

[1]World Bank. 2017. Beyond Scarcity: Water Security in the Middle East and North Africa.

Keywords:

adaptation, bakhtegan basin, climate change and semi-arid mountainous



The chilean network of biosphere reserves: challenges on scientific research and adaptive governance

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Abstract:

We are living within the era of the Anthropocene, in a globalized economy that does not assume its environmental and social costs. The Biosphere Reserves concept represents a practical framework to discuss and promote a paradigm shift that promotes a new long-term vision of development that overcomes the dichotomy between preservation and development; and that promotes actions towards the necessary regenerative processes of the Biosphere. For achieving this goal, radical changes in the current governance of Biosphere Reserves need to be undertaken. Chile, with its heterogeneity of natural and cultural landscapes, presents important challenges and unparalleled opportunities for research in all areas: from basic biodiversity studies, to the potential effects of global change on ecosystems and resilience of the socio-environmental systems. Chilean Biospheres, encompassing terrestrial as well as marine environments and ecosystems, need urgently a new direction in which stakeholders change the status-quo towards real changes and advances. We developed a strategy based in six axes: a) conceptual changes including deep revision of the common pitfalls of reserves in Latin America; b) practical changes, based on the Lima Action Plan; c) legislative changes associated with the revision of the new Biodiversity Law; d) stakeholders inclusion as adaptive governance, and adoption of local knowledge found in the different territories in which the Biosphere Reserves are located; e) integration of new technologies of information (apps and drone images) for the edition of a collaborative Atlas; f) networking and organization of seminars towards the consolidation of the Chilean Network of Biosphere Reserves.

Keywords:

adaptation, climate change, governance, regenerative development



Expansion and zoning methodology of the San Rafael Lagoon Biosphere Reserve, Aysén Region, Chile

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Abstract:

The Region of Aysén is characterized by its rugged geography modeled by the action of glaciers that have left landscapes dominated by fjords and mountains that conserve extensive areas of ice. Precisely that is one of the features that seeks to conserve the San Rafael Lagoon Biosphere Reserve, nominated by UNESCO in 1977. Forty years after its nomination as a Biosphere Reserve, it is necessary to update it to meet the current objectives of the UNESCO Man and Biosphere Program. These objectives are: a) to comply with the zoning established in the Seville Strategy of 1995, namely core zone, buffer zone and transition zone; b) involve local communities in the management of the Biosphere Reserve through adequate governance. In order to meet these objectives, it was necessary to propose an expansion of the Biosphere Reserve, since at present it only has one core area (National Park) and does not involve communities. In addition, a rezoning was proposed from the new surface. For the extension, ecological criteria were used, such as vegetation formations and the distribution of representative fauna, resulting in a proposed expansion of approximately 3 million hectares. In the zoning proposal, ecological variables were used (vegetation, wildlife populations and conservation areas), productive variables (resource management zones) and normative variables (territorial planning instruments); As a result, the areas that UNESCO requires to comply with the conservation, development and research of the Biosphere Reserve were obtained.

Keywords:

zoning, conservation, management.



Lifestyle migration and the nascent agroecological movement in the Biosphere Reserve Las Araucarias, Chile: is it promoting sustainable local development?

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Abstract:

Amenity and lifestyle migration is a global phenomenon that may be considered an agent of transformation of the local dynamics of rural areas. This new migratory trend has been observed in the last few years in the Andean Araucanía in southern Chile, an area rich in natural and cultural attractions, which also is one of the most visited biosphere reserve within the country. Migrants to the region who are proponents of agroecology—considered in the broad sense of the term as practice, theory, and social movement—have sought to contribute to local economic, environmental, cultural, and social development. Taking a qualitative methodological approach, including in-depth interviews of migrants and key local informants, this study sought to identify the motivations for the development of agroecological practices and to analyze their impact on local sustainable development.

Keywords:

lifestyle migration, agroecological practices, Andean Araucanía, local development, Chile.



La Campana: The mountain as an organizing and regenerator element of the territory

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Abstract:

The demographic development of the last decades, and the evident need to harmoniously conserve natural and agricultural environments in conjunction with the urban expansion, motivated us to analyze the available Instruments of Territorial Planning in the zone of influence of La Campana Peñuelas Biosphere Reserve.

This Biosphere Reserve, declared by the Unesco in 2009, is almost entirely in the Valparaíso Region, and is characterized by territories with great ecological value and biodiversity, high yield agricultural land, multiple industrial activities, transport services and mining.

Therefore, the zonification, occupancy models, and allowed and forbidden uses of the soil, proposed by the La Campana Intercommunal Regional Plan, and the three proposed areas for the Biosphere Reserve: core, buffer and transition zones were contrasted.

It was possible to identify areas of social and environmental conflicts, which affect areas of the Biosphere Reserve and other areas of natural and agricultural value. This allows us to reinforce: 1) The need to update the tools of citizen participation and awareness, to identify their interests and needs in early stages, and

2) Adapt the Sustainability Criteria with which the Instruments of Territorial Planning are made, since the current environmental crisis demands not only protect environments with natural and agricultural value in a context of urban expansion, but also must allow and promote the regeneration of many environments that have already been damaged.

Keywords:

territorial planning, urban expansion, biosphere reserve.



How private conservation can improve regional development – two case studies from Southern Chile

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Abstract:

Since the 1990s plenty of private conservation initiatives have occurred in many Latin American countries especially in Chile. They are located predominantly in mountain areas. These initiatives come from domestic and internal investors. Their goals vary from pure protection to profit orientated tourist destinations. In Chile 652 916 ha of its territory is under private conservation. This is a share of 2,2 % of its total territory. This makes Chile after Belize (5,7 %) and Costa Rica (5,19 %) to the country with the third largest proportion of private conservation in Latin America. This research project is a comparative study focused on two experiences: The Pumalín Park and the Reserva Biológica de Huilo Huilo. The first one is the second biggest private protected area in Chile. Both are located within the boundaries of a Biosphere reserve. Following

research questions were asked:

What are the effects of private conservation on regional development?

How does the local population perceive large scale private conservation in their region?

In order to elaborate the results questionnaires were handed out in the nearby cities Chaitén and Neltume. Furthermore, mappings of the regions with the focus on services for tourist and locals were carried out.

Results show in both cases that the majority of the local population sees these private protection initiatives positive. Their socio economic situation has improved. Pumalín Park has triggered a positive economic effect on the village of Chaitén after the volcanic eruption. In the city of Neltume near the Reserva Biológica de Huilo Huilo a feminisation of the workforce has occurred, because the economy has turned from forestry towards tourism. The majority of the questioned group sees mainly an economic advantage through the private protected area.

Keywords:

private conservation, Valdivian rainforest.

4 - Rural Tourism and Agritourism in Mountain Areas as Vectors of Sustainable Development

Future of Ethnic Minorities with Tourism in Chittagong Hill Tracts, Bangladesh

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Abstract:

The region of CHT is ethnically, culturally and linguistically diverse with as many as 16 different ethnic groups living in the region. 11 of the minority groups are considered 'indigenous' as per the CHT Accord. CHT is also one of the most disadvantaged regions in Bangladesh.

The region has been bogged down over a protracted period of conflicts for more than 2 decades. The December 1997 peace accord although formally put to an end the conflicts, has failed to bring in the much-expected stability. The district of Bandarban equally suffers from these post-conflict symptoms. It is also the most ethnically and culturally diverse among the 3 Hill Districts with all the ethnic minority groups found here.

Moverover, the Bandarban Hill District is adjacent to the board of India and Myanmar. There are lots of tourist places in the region that becoming popular towards national and international tourist. But the most concern is the safety, security regardign rights of culture, rights of land, rights of identity and violence againgst women and girls in the region.

By now the ethnic minority girls and women fall in sexual

harrasment and prositution for the poverty and single money earning. This is much alarming to the locality that will also implies to the global accordilgy.

Keywords:

survival as human being with own identity and rights.



Rural tourism and agritourism in mountain areas as vectors of sustainable development.

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Abstract:

The activities of humans, are gradually contributing towards the destruction of the natural environment. The danger is that activities like mining and logging are now moving gradually to the mountainous regions of the various countries in the world because the forest covers are almost depleted and something must be done real quickly to salvage the mountains before it is too late.

The Aburi Mountains, in the Akwapim South Municipality, in the Eastern Region of Ghana, will be suitable in this regard for the promotion of Rural Tourism and Agritourism. For example a natural mountain park for amusement and holiday makers, where dummies of the historical Dinosauria will be on display in the natural forest environments on the Aburi Mountains, could be created to promote local and international tourism.

The siting of Aburi Mountains will be appropriate. The elevation of

Aburi is 461metres or 1,513 feet above sea level. According to the World Population Review, 2018, the Aburi Township population is 18,399. The Aburi Town is also famous for its Botanical Gardens, with rare plant species, bird species and butterflies. The establishment of this Park in such a mountain environment like Aburi will help boost local and international tourism in the area. This will help improve the economic lives of the people in these three main areas:

1. Generation of income from tourists to improve upon infrastructure.
2. Creation of employment for the youth as tour guards, receptionists.
3. Creation of values and awareness in waste management and recycling practices.

Keywords:

Aburi Mountains, Dinosauria, rural tourism.



Opportunities and potentialities of rural tourism in mountain areas in the west of Paraná

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Abstract:

The western of Paraná state, although it presents mountainous areas of diverse origins and altitudes, is characterized by the strong agricultural aptitude, with economic base in the production of commodities and well-developed productive chains. In this way, mountainous areas with shallow soils and high declivities are ignored by farmers, due to the low agricultural profitability. This paper aims to analyze the use of declining areas as an opportunity to generate income, employment and environmental preservation of family farming properties through rural tourism as a tool to promote sustainable development. We used a critical analysis of secondary data obtained through documentary research and unsystematic observation of rural tourism experiences in the region. It was verified that there is a development of ecotourism and an increase in the number of practicers in adventure sports in the west of Paraná, especially of climbing sports, ecological trails, abseiling. The implementation of rural tourism as an activity in the property can represent the economic increase and the improvement of the general conditions of the life of the families and communities involved, as well as the valorization of the natural and cultural patrimonies, of the protection of the environment and the valorization of the man as beneficiary of the whole process. In this context, rural tourism, especially in mountainous areas or with high declivities, considered not suitable for agricultural purposes, is characterized as an opportunity for farmers, as well as a tool to promote sustainable development, promoting the sustainable use of terrestrial ecosystems and environmental education.

Keywords:

tourism, rural, sustainable



Agritourism as a means to sustainable development: case study of mountainous regions of Southern Brazil and Northern Italy

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Abstract:

In recent years, the support of national organizations and governments to tourism has increased. Therefore, the rural tourism and agritourism has been considered as means to promote sustainable development in rural areas, particularly, in mountainous regions. Successful experiences of rural tourism and agritourism can be found in many countries, which evidence the importance and viability of these activities in promoting socioeconomic inclusion of rural population associated to sustainable valorization of rural capital. The objective of this paper is analyzing, comparatively, two experiences of agritourism and their contribution to sustainable development to the area they are located. Based on qualitative and quantitative analysis, this paper investigates the role of the associations Gallo Rosso, in the mountainous region of Alto Adige, Italy, and Acolhida na Colônia, located in Encostas da Serra Geral Region of Santa Catarina, Brazil. This comparative analysis will allow to identify common characteristics of both initiatives, specially according to the collective promotion of the regions' rural capital.

Keywords:

agritourism, sustainable development, rural areas, rural capital.



**Collaboration and tourism sustainability networks.
Challenges for valuation of mountain destinations in
Portugal - Serra da Estrela study**

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Abstract:

The globalization of markets, transnational competition, increasing revenues and education, deregulation and legislative harmonization, forced companies to adapt. The collaboration established within a network induces significant changes to participants by changing perceptions about competition. In this context the technological, cultural and social changes that characterize the last decades have created significant impact on business organization and competitive formats between companies, promoting the development of adaptive strategies and greater competitive capacity. Collaboration promotes strategic and organizational alignments that in the field of tourism, to show decisive for the qualification and sustainability of the destination, promoting new markets and facilitate synergies of greater dynamism between companies. The destination Serra da Estrela the development of collaborative relationships is valued as a resource for businesses and territory, as well as a source of competitive advantage. The sharing of knowledge and experience, the association of corporate images and willingness to absorb new methods are favorable considerations, however presenting formality and communication problems.

Keywords:

collaboration, mountain, networks, sustainability, tourism.



Returning to the roots - Responsible rural tourism

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Names of any other authors: Satyendra Singh

Abstract:

We are living in difficult times today.

Neoliberal policies, changing weather pattern, unsustainable development processes, is gradually turning agriculture, economically unviable and environmentally unsustainable in countries like India. Since agriculture is the mainstay of hill economy, and is intricately connected with forestry, water, livestock, its impact on people's survival is serious.

This is pushing people to dislocate themselves from their local habitats, and migrate, aggravating the vulnerability of already vulnerable, women and children.

Community based responsible ecotourism can be one such potent environment friendly, profitable, respectable livelihood option, especially in mountains with immense cultural and biological diversity and picturesque surroundings. Villages as tourism destinations, owned and managed by local community, while could showcase the beauty of nature, would also provide a glimpse into sustainable, environment friendly way of living of local people. Diverse theme based issues from forest diversity, its relation with health, food, ecosystem services, local history, traditional crafts to traditional knowledge systems and practices (with women as holders and practitioners), sustainable farming, natural resource management adding to the climate resilience, nutrition security, substantiated with scientific facts, could add a remarkable educational dimension to the programme.

Such an initiative would help local people gain respect and pride in their culture, climate resilient practices, healthy food, and immense natural beauty. This can be instrumental in reinforcing people's faith, confidence in alternate ways of development, based on judicious amalgamation of traditional knowledge with modern information, which are effective, efficient and productive and motivate them to preserve, strengthen and promote them.

Keywords:

Community managed responsible tourism, thematic tourism.

5 - Population and Local Governments as Allies in the Sustainable Use of Biodiversity as a Strategy for the Mountain Ecosystems Conservation

Title of paper: *Water crisis and agriculture water conflict: public policies and institutional arrangements to minimize water consumption in horticulture in the mountains of the Fluminense Serrana Region*

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Institution / organisation: *EMATER-RIO*

Abstract:

In recent years irrigated agriculture in Brazil has always grown at rates higher than the growth of the total planted area, nowadays it is believed to be in the order of 15% of the cultivated area. The water crisis combined with the low uniformity of water application makes the water factor one of the biggest problems of agriculture and, consequently, of society. It is fundamental to build roads and solutions that can reduce the use of water in agriculture without losing and compromising the production and productivity of the sector, identifying problems regarding the operation of irrigation systems to increase the efficiency of the application. The objective of this work was to develop public policies that enable concrete actions to promote real adjustments and to increase the efficiency of the application of irrigation water by spraying in the agricultural areas of the municipality of Petrópolis, contributing to prevent future water crises in the region. Through an action research initiated with field surveys, bibliographical research, reflection, action, adjustments and, finally, elaboration of guidelines, it was possible to develop arrangements to minimize the water problem in the rural community of the municipality of Petrópolis in the State of Rio de Janeiro of January. With the support of EMATER-RIO, the state public prosecutor of the State of Rio de Janeiro, the Municipality of

Petrópolis, the Piabanha Committee, Águas do Emperador and the Association of Rural Producers, it was possible to confirm that the institutional arrangements are fundamental in the construction of public policies and can contribute to the sustainability of mountain regions.

Keywords:

water crisis, public policies, institutional arrangements, uniformity in irrigation.



Integrated approach to biodiversity conservation as strategy for healthy mountain ecosystem

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Institution / organisation: Kenya Wildlife Service

Abstract:

Complex mountain ecosystem challenges require combined efforts of rural communities and governance authorities to address them. A study to explore individual and concerted contribution of local communities and County Government towards mountain ecosystem biodiversity conservation is proposed to be undertaken from August 2018 at Gwasi Hills water tower in Homabay County, Kenya. Multipronged methods of data collection including desktop reviews, field observation, key informant and focus group interviews will be used. Interview data will be transcribed and analyzed using an inductive coding method where segment of texts in interviewee responses will systematically be organized and analyzed to identify discrete areas of contributions. Overall evaluation of performance per capita (individual community groupings, County Government only, Community groupings and County Government combined) will also be compared. The results of the proposed study will be useful in providing insight into a set of contributory efforts that may foster

appropriate biodiversity conservation and hence the possibility of their applicability to achieve healthy mountain ecosystem and associated services.

Keywords:

participation, keystone species, diversity, resilience, ecology.



Community forest management and ecosystem conservation in the Vicos Recuayhuanca microbasin, Ancash, Peru

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Abstract:

During the last years communities around the world are playing a more central role in the management of local forest and ecosystem conservation. In the Andes communities have a long tradition in managing the forest based on a particular worldview. This research contributes to the understanding of the management and conservations strategies of local forest by the community of Vicus. The research aimed to shed light on the engineering and social practices, and on the strategies of organizational management at community level. The methodology applied is qualitative. Peasants, public agency officers and local NGOs representatives were interviewed. The research concludes that social practices such as solidarity, reciprocity, collectiveness and equity are key to manage the forest sustainably by the Vicus community and the those practices condition the organizational structure, power relationship and collaboration schemes in the community. The research identifies that the efforts of the Vicus community are not backed by the Peruvian state agencies and most of local NGOs, as a result the

community social practices are being eroded and conflicts enhanced. Finally, the research suggests a model of sustainable forest management at community level worldwide based on the Vicus community case and the monitoring of organizational and cultural aspects beside of ecological ones for a sustainable community forest management.

Keywords:

community, management and ecosystem.



Towards the sustainability of the mountains and their inhabitants

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Abstract:

The paramos in Colombia occupy 2'906,137 hectares divided into 37 complexes, important for water production and regulation, supplying 70% of the population. The State strives for the integrity and safeguarding of natural conditions that guarantee its environmental function. Law 1753 of 2015 (National Development Plan 2014-2018) and Judgment 035 of 2016 of the Constitutional Court indicate that in the badlands areas agricultural activities or exploration or exploitation of non-renewable natural resources cannot be carried out, nor construction of hydrocarbon refineries ...

“

The Pangea Foundation with the support of entities such as Corpocaldas and CHEC has been developing actions for the conservation of the paramo for years focused on sustainable productive development based on actions such as 1. Governance

as a process of building agreements between community and institutional actors that defines actions that diminish the vulnerabilities and that contribute to the increase of the Resilience. 2. Participatory land planning at a 1: 1 scale, generating detailed information on farms, production systems, biophysical, socio-economic and cultural resources, in order to determine more efficient activities with a focus on environmental, economic and climate change adaptation 3. Development of technical and social capacities that allow the generation of alternatives for sustainable production and improvement in the quality of life of the communities; and 4. Implementation of conservation, restoration and rehabilitation actions in the paramo, such as the isolation of protective belts and high Andean wetlands, the planting of species of the paramo generating biological connectivity and productive reconversion.

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production and improvement in the quality of life of the communities; and 4. Implementation of conservation, restoration and rehabilitation actions in the paramo, such as the isolation of protective belts and high Andean wetlands, the planting of species of the paramo generating biological connectivity and productive reconversion.

Keywords:

paramos - governance, participatory land planning.



Bio-cultural diversity- a matrix for survival

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Abstract:

Himalayas happen to be the most magnificent mountain ranges and also one of the most environmentally fragile ecosystems being the youngest, geologically unstable, faced with frequent extreme events and densely populated. Difficult conditions of living have given way to immense richness in biodiversity and traditional knowledge. These 'islands of biodiversity' and also cultural diversity help communities become resilient to cope with challenges posed by nature, geography, harsh climate for centuries together.

"In the Middle Himalayan ranges, in India, women, tribals, and other marginalized, happen to be the chief custodians of traditional knowledge systems", because of their close interactions with the surroundings due to nature of responsibilities.

Participatory research approaches were adopted to **document and research** diverse resources and the associated knowledge (health, agriculture, forest related practices etc). This

helped **analyse (gender ,social equity, sustainability, effective,productive perspective) traditional and modern systems,critically and jointly, substantiated with scientific facts**,with practitioners and users, followed by Action. Women and marginalised inclusion in decision making processes and informal ,formal local self governance bodies,was crucial for realistic, sustainable and effective outcomes through integration of their knowledge and wisdom. **Holistic, inclusive, diverse (scientific,traditional) and a trans disciplinary perspective** was integrated in the development of strategies and their implementation.This resulted in putting women and vulnerable groups in a powerful position, and as co-researcher and co-partner to take necessary measures to protect biological and cultural diversity and strengthen it. It helped them address food and nutrition ,livelihood security and holistic health issues.

Keywords:

bio-cultural diversity, gender and social equity, participatory and inclusive approaches.



Developing a conciliatory approach between environmentalists and landowners of the Escarpa Devoniana APA, in the Campos Gerais region, Paraná State, southern Brazil

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Abstract:

The Escarpa Devoniana Environmental Protection Area (EPA) is

a 392,971 ha conservation area created in 1992 to protect the East border of the Paraná Plateau, an unique topographic feature with high biogeodiversity and testimony of important cultural and economic cycles of the South-southeast of Brazil for the last three centuries. Since implementation there has been many conflicts between the manager (State environmental agency) and the landowners, and a widespread misinformation on the part of the communities involved. Several initiatives from government, academy and NGOs has not made much progress in to conciliate conservation and development in the scope of the EPA, who now finds itself endangered of a proposal of area reduction by local political forces. This analysis highlights questions of scale on the dissonance among the conservation speeches of the EPA leaderships and technical-environmental arguments. Landowners and locals allude to a temporality that hardly exceeds three generations, where oral information, mainly qualitative, enters gradually into the diffuse field of symbolic and social representations. Technicians and academics have a collection of 80-yrs imagery, making it more accurate as providing orbital images with higher covering and resolution. From this clash emerge from one side issues as subject and memory, space production and territoriality; by the other, perception of environmental degradation and the need for regulation of use. We gather data from community perception of the EPA importance and evidences of the converted area since the 90`s and discuss what approach could aware both parts in order to improve the EPA governance.

Keywords:

conservation, clash mediation, sustainability, grasslands.



Social mobilization against the bill 527/2016 upon reduction in the Escarpa Devoniana Environmental Protected Area, Paraná State, Brazil

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Names of any other authors: Rosemeri Segecin Moro; Lia Maris Orth Ritter Antiqueira; Danislei Bertoni; Katya de Lima Picanço

Abstract:

We analyze the social involvement of students, teachers, professionals, researchers, environmentalists, social observatories and mainly of the citizens in the movement against the bill project 527/2016 that foresees a reduction in 70% of the Escarpa Devoniana Environmental Protected Area in south Brazil. It is the largest conservation unit of sustainable use of Paraná State, created in 1992 with 392,000 ha along 12 municipalities in the Campos Gerais region. In 2016, taking into account the interests of agribusiness, this bill was presented with a fragile technical study and not consulting the stakeholders, not even to the Managing Council of the unit. Since the beginning, its conduct has caused real nuisance in various sectors of the society, even being considered unconstitutional. A web search has located hundreds of opinion papers, reports, editorials, and other events. The terms more applied were “environmental downturn”, and “political interference”. A petition with thousands of signatures, tumultuous public meetings, manifestations of intolerance to popular participation and commitment on the part of the media are samples of the tense atmosphere surrounding the discussions. One supporter deputy has withdrawn his name from the project claiming of popular pressure to rethink the proposal and currently the bill is out of the legislative assembly agenda. Public management shows unable to manage the natural heritage of the State, which allows a culture of environmental laws and public opinion disregarding, but now it is opened a new phase where the society is alert for further attempts like this.

Keywords:

campos gerais; conservation; natural heritage.



An assessment of atmospheric deposition of pollutants in a montane pond in the Iron Quadrangle region (Southeast Brazil)

Name: *Natacha Jordania da Silva Alves*

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Abstract:

Research into the vulnerability of altitudinal aquatic ecosystems to atmospheric deposition of pollutants is still emerging in Brazil. Forty-five wet deposition samples were collected from passive fog collectors installed in the vicinity of a small, sensitive, oligotrophic, altitudinal pond (Seca Pond) located at 1650 m.a.s.l. in Parque Estadual do Itacolomi (Quadrangle region, Minas Gerais), from August 2016 to November 2017. Samples analyses using inductively coupled plasma optical emission spectrometry (ICP-OES) were performed to determine the presence of metals and semi metals. The samples exhibited slightly acidic characteristics (mean pH 4.6 ± 0.8). Results for selected metals (Al, Fe, Mn, Cr, Cu, Zn, Pb, and Ni) indicated that the deposition of these elements in the studied pond is noticeably through wet deposition. High concentrations of Aluminum (Al) were detected in all of the samples (minimum of $6.7 \mu\text{g/L}$ and maximum of $15.4 \mu\text{g/L}$). The detection of Iron (Fe) varied widely (between $3.2 \mu\text{g/L}$ and $9.2 \mu\text{g/L}$), while Manganese (Mn) concentrations were very high (usually surpassing $100 \mu\text{g/L}$). Deposition of Zinc (Zn) was also high with values ranging from 47.7 to $217.6 \mu\text{g/L}$. The deposition of lead (Pb) was detected at relatively low values and with a highly variable frequency (detected in six samples with values lower than a $2 \mu\text{g/L}$). Since altitudinal aquatic ecosystems are considered reference areas from the point of view of environmental health, our results indicate that

the incorporation of these atmospheric sources of pollutants should be considered in actions of aquatic conservation in altitudinal aquatic ecosystems from Iron Quadrangle region.

Keywords:

poluição atmosférica, conservação aquática, ecossistemas montanhosos.



Obstacles and perspectives of the state environmental legislation of the RJ applied in the mountain region

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Abstract:

The state environmental legislation of Rio de Janeiro guides human actions and their consequences directly and indirectly in the environment, with the main objective of allying economic and social development to the protection of its ecosystems and landscapes, through the foundation of federal laws and applying the necessary specificities. In its landscapes are plains, lowlands, lagoon systems, beautiful beaches and a beautiful view of the sea of hills, result of the accentuated relief of the mountainous region, integrating the mountainous complex of the mountain range of the sea. However, allying the development in these landscapes to the conservation of their natural has been presented with a high degree of complexity in front of the model of development of the territories particularly found in the mountain region of the state. Applying the forest code is only part of the task in the process of environmental regularization, considering that the current state legislation now takes into account that the cities of the region have developed in different types of

permanent preservation area, or it does not allow the use of areas , but ends up disqualifying the technification of agriculture that is not limited by local relief.

Keywords : forest code permanent preservation area agriculture.

6 - World Famous Mountains Association: experiences of sustainable development

Ecological Restoration and Socio- Economic Empowerment of Rural Community for Sustainable Development in Uttarakhand Himalaya, India

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Abstract:

The present study tries to analyse the study of ecological restoration and socio- economic empowerment of rural community for sustainable development. The paper is mainly based on participatory approach, field study, primary survey and also secondary sources. Sustainable development is an important component for the future development in different sectors and for the development of future policy and important for ecological restoration. In this regard institutions can play a very important role to make sustainably developed society. The SEWA-THDC (a unit of Tehri Hydro-Electric Development Corporation) is running a project for sustainable development through corporate social responsibility in Nauguragad watershed in Garhwal Himalaya of Uttarakhand (India). This programme is an example of success action project and it is managed by Department of Geography, Shaheed Bhagat Singh Evening College, University of Delhi. The work highlights of role of institution for sustainable development of any area particularly mountains. The project came into existence in 2011 under the guidance of Prof. Kaushal Kumar Sharma and Dr. Suresh Kumar Bandooni. Before that large variety of data of different resources like physical and human was collected by the research scholars. After completing and submitting the baseline survey the SEWA-THDC gave the responsibility to Dr. Kaushal Kumar Sharma

and Dr. Suresh Kumar Bandooni to start the work and make success the sustainable programme. The experiences of near about seven years are a good example of expectation, reality and challenges in mountain areas of Garhwal Himalaya and also to understand mountain economics and environmental changes. The action project is also a good example of interaction and interrelationship among administrators, scholars and stakeholders to achieve the goals of sustainable development proposed by UN. The locals feel that current project under the supervision of University of Delhi as a way to solve the problems. Keeping all these points in mind, the present paper analysis different ongoing main programme in detail like health, water conservation, horticulture and education.

Keywords:

sustainability, ecological restoration, Himalaya, empowerment, rural community and environment.



Sustainable Tourism Practices.

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Institution / organisation: Deputy Secretary General for Oceania World Famous Mountains Association Board Member responsible for Sustainable Development.

Abstract:

I would like to take the time to revise or consolidate the practices that are important and need to be carried through in the work of the World Famous Mountains Association.

The last decades have seen an increasing role for sustainable management in sensitive areas. Today this role is becoming increasingly important as issues relating to sustainability and

climate change are debated. World Heritage and Global Geoparks promote geological sites for Geotourism, education and research; we are exploring new ways to promote geological heritage sites of significance and the role they will play in sustainable development strategies.

The aims are to encourage understanding of earth science and its influence on human culture and make them widely available to both visitors and residents alike and to assist and enhance the sustainable management of the environment. This can be implemented through community capacity building projects and by promoting respect for geological heritage through education and art activities.

In pursuing this primary purpose, account has to be taken of the needs of agriculture, forestry and other rural industries and the social and economic needs of the local communities. Particular regard has to also be paid to promoting sustainable forms of social and economic development through Geotourism that in themselves conserve, enhance and promote the area be it, a Geopark, World Famous Mountain or World Heritage area.

Keywords:

geoparks, world famous mountain, world heritage area.



Where Prayers and Protection meet : Finding equilibrium between environmental protection and religious practice in Table Mountain National Park

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Abstract:

Table Mountain National Park is a declared a Natural World Heritage Site and a Grade 1 National Heritage site. The purpose of the Park includes allowing '... spiritualopportunities that do not compromise ecological integrity'. The Park is surrounded by Cape Town with more than 4 million residents, has multiple access points and receives millions of tourists and recreational users. The mountain is also a spiritual icon in many belief systems representing spiritual elevation and physical access to God. Visiting mountains is therefore both a pilgrimage and a duty. This demand for access by thousands of worshippers clashes with the custodianship mandate of SANParks to manage environmental damage, noise and visual pollution, waste and fire management and the protection of heritage sites. How does a conservation agency reconcile its environmental mandate with the constitutional rights of citizens to practice their religion without persecution? How does it find the ideological neutrality and operational efficiency to accommodate the range of traditional and 'non-mainstream' religious groups that include African Churches both local and foreign, Muslim, Buddhist, Wiccan, Rastafarian, Atheist and Satanists practicing cleansing rituals that require natural medicines, mountain water, warm rocks, fire, chanting, trance dances or blood sacrifice ? And how do we reconcile the fear, anger and resentment that these ceremonies foster with landowners who feel their lives negatively impacted ? The case study discusses policy, processes and solutions.

Keywords:

natural park, pilgrimage, environmental protection, ecological integrity.



World Famous Mountains Association: a brand with potential to enhance value added of mountain products

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Abstract:

The World Famous Mountains Association (WFMA) is a distinguished brand that congregates mountainous sites with exceptional features related to physical and culture aspects. Members of WFMA are much desired sites for tourism and leisure time, religious functions and culture activities, as well as for research purposes. As special places, most members of WFMA have done substantial conservation work to ensure the integrity and sustainability of their sites. Some members have also developed interesting projects to preserve and enhance the history and culture of their territories, both to maintain traces of the past and to foster increasing interest of locals and visitors. However, much less common are cases of members using the reputation of their mountain territories to enhance the value of their products. Clearly, mountain regions have potential to boost quality, value and reputation of goods and services they provide, especially those that incorporate, in various forms, mountain properties, including physical and cultural features. This is a remarkable opportunity to promote local sustainable development initiatives based on intrinsic value of the territory. Examples of these cases include some agriculture products that benefit from mountain properties, processed goods that incorporate traditional modes or typical recipes grounded in mountain communities, and services that are directly related to the attractiveness of these sites, such as tourism. This research focuses on cases where specific features of members of WFMA have been used to add value to their mountain products and services.

Keywords:

world famous mountains association, mountain products,

sustainability.

7 - Mountain forests management and ecosystem services: a desired balance

Projections of global forest's share in land area

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Abstract:

In view of forest's important role played in maintaining the function of global ecosystem, with the continuous deforestation worldwide, both governmental and academic attentions has increasingly attracted to the variation trend of global forest's share in land area (abbreviated as GFSLA). Therefore, analyzing decline rate of GFSLA is of great significance to develop the strategy to prevent worldly deforestation from worsening. However up to now, there are few reports on the research into the change of GFSLA on the bases of 'time series' model. In this paper, the rate of global forest's decline by 2020 is projected using ARIMA (Auto-regression Integrated Moving Average) model based on historic data in 1990 to 2015 from UN-FAO. The results show that, in 2016, 2017, 2018, 2019 and 2020, GFSLA is projected to be 30.64%, 30.60%, 30.56%, 30.52% and 30.48% respectively, which signifies that GFSLA is decreasing almost in a linear trend by 0.03% to 0.04% annually and then international societies is deserved to take action together to alleviate such tendency of deterioration to keep our globe ecosystem sound.

Keywords:

arima model, global, forest, share.



Efforts made by Morocco to conserve mountain biodiversity and ecosystem services

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Abstract:

Located at the northwest corner of the African continent between 21 ° and 36 ° north latitude and between the 1st and the 17th degree of west longitude, Morocco with a total area of 715,000 km² enjoys a privileged position with a coastline of 3 446 km long opening to the Mediterranean and the Atlantic Ocean.

Its privileged location with a double coastline and its diverse mountain with four major mountain ranges: the Rif, Middle Atlas, High Atlas and Anti Atlas with altitudes exceeding 2000 m in the Rif, 3000 m in the Middle Atlas and 4000 m in the High Atlas.

The Moroccan mountains are characterized by an important forest genetic diversity represented by a rich and varied flora and many ecosystems: forest, preforest, presteppe, steppe, Sahara that spans a range of bioclimatic zones: arid, semiarid, subhumid and humid.

The vascular flora of Morocco has 3913 species and subspecies in 1298 (including 426 sub-species types), distributed among 155 families and 981 genera. The number of endemic species amounted to 640 (16%) and 280 subspecies (32%). The rare or endangered flora species is estimated to be 463 and 1284 subspecies.

However, this diversity is subjected to many natural pressures (climate change, parasitic attacks...) and antropic pressures (clearing, overgrazing etc.).

Conscious of the risks that weigh on biodiversity, Morocco set a strategy of biodiversity management that focus on programs of in-situ conservation and more 154 protected areas in Morocco are

proposed for a management of their natural resources.

This presentation is focused on research conducted in Morocco in terms of ecology, flora, ecosystem of Moroccan mountains while focusing on the major threats and conservation strategies developed by Morocco.

Keywords:

mountain, biodiversity, ecosystem, conservation, Morocco.



The temporal variation of ecosystem carbon pools of Chilimo dryafromontane forest along environmental factors and forest patch , Central Highlands of Ethiopia

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Abstract:

Forests have a crucial role in the global carbon cycle by capturing carbon from the atmosphere in the process of photosynthesis and storing it in the form of aboveground biomass, belowground biomass, deadwood, litter and soil organic carbon. Understanding and identifying the amount of carbon and its pool systems in the forest ecosystem enables us to generate information and knowledge on forest management endeavours and its impact. However, such studies and informations are scarce in Chilimo dryafromontane forest. Therefore, the study was conducted to estimate the amount of carbon stored and major carbon pool systems for the aforementioned forest. A discussion forum and

reconnaissance survey was held across the study area before doing any activity. Then, the natural forest was stratified into three forest patches based on species composition, diversity and structure. A total of 35, 20 mx20 m permanent squared sampled plots were established, laid out 100m horizontal distance from two consecutive plots from top to bottom ridges of the mountain. Two times inventory in 2012 and 2017 were conducted. Moreover, within the main sampled plot three quadrants, 1m² were used to collect litter and herbaceous plant samples. However, biometric, soil, deadwood and stump data were collected in the main plots. Carbon %, total N and bulk density analysis was performed in the laboratory following appropriate chemical procedures. ACD and BCD was calculated using formulas taken from literature. Data analysis and graphics were performed using R soft - ware. The aboveground biomass, deadwood, herbaceous plant and stumps carbon density significantly varied along altitudinal gradient, forest patch and slope classes. The soil organic carbon and nitrogen stock density of the natural forest was higher than other land use types in all the soil depths in all the measured years. Whereas, bulk density of degraded land was the highest in all soil depth in all the measurement times. The average number of illegally cut stumps and its ACD was ranged from 25 to 925 stems ha⁻¹ and 1.56 to 51.17 t C ha⁻¹, respectively. The newly grown trees in the sampled plots was also ranged from 25 to 225 tree ha⁻¹ with accumulated carbon density of 0.07 to 201.11 t C ha⁻¹. The mean carbon stock density of Chilimo forest was found to be 289.86 to 298.22 t C ha⁻¹ in 2012 and 2017, respectively. The total ecosystem carbon density was accumulated in 2012 as 56.12 % as soil organic carbon, 31.21 % aboveground biomass, 8.43 % below ground biomass, 3.65 % humus carbon, 0.47 % stump carbon and 0.12 % deadwood. In the sameline in 2017 the highest share for ecosystem carbon density was soil organic carbon (59.64 %), aboveground carbon (29.78 %), below ground carbon (8.04 %), humus carbon (1.69 %), stump carbon (0.48 %), herbaceous carbon (0.33 %) and deadwood carbon (0.04 %), respectively. The total carbon stock valuae have direct relationship with altitude and slope, it was also increased with increasing slope percent and altitude. The overall ecosystem carbon density of the natural forest was 1,494,619 tonne carbon or 5,584,624 tonne CO₂ eq. The Chilimo dry-afromontane forest can be served as a carbon sink at local and regional levels. We

recommend that, the local communities should be awared and trained about the role of Chilimo dry-afromontane forest for climate change mitigation and adaptation. Moreover, the natural forest should be under carbon trade scheme to benefit the local community and to earn income for better management. Sustainable forest management options should be also advocated and implemented

Keywords:

aboveground biomass, deadwood, humus, herbaceous, natural forest, mineral soil, stump and year.



The need for integrated management to protect biodiversity in the highest mountain chain in southeastern Brazil

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Abstract:

The Serra da Mantiqueira Mountains is priority area for the Brazilian Atlantic Forest Biome conservation and considered as irreplaceable for the world's biodiversity. These Mountains have a high richness of endangered species, and also forms the headwaters which have national and international importance for supplying and producing energy. Although most of the mountain range is within several protected areas, as Itatiaia National Park – INP, there are still many threats that can lead to biodiversity loss. Since 2007, monitoring research has been carried out on threatened plant and mammal species occurring in and around the park. The plants species monitored occur exclusively in the high altitude grasslands, an ecosystem restricted to the top of the

mountains that is about 2400m high. Frequent anthropogenic great fires are considered the main threat because some endemic and threatened plants are not resistant. Considering the mammals, the recent records of wild boar, an invasive exotic species, have a negative impact on wildlife as well as on surrounding crops. In addition, roadkill of large mammals threatened around the Park represent a major negative impact on the maintenance of these populations in the region. The death of primates caused by yellow fever during this year also amplifies the threats to this group. Several researches have already been published on these impacts. These are some of the major threats to biodiversity in the Park, and there is an urgent need for integrated management and control plan for the conservation and maintenance of biodiversity and its ecological services.

Keywords:

serra da Mantiqueira, management, threats.



Allelopathic effect of exotic species on *barbacenia purpurea* a native and pionner plant of sugar loaf inselberg – RJ, Brasil

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Abstract:

In this work the allelopathic relation between bamboo (*Phyllostachys aurea*) and leucena (*Leucaena leucocephala*), two exotic especies introduced in Sugar Loaf, Rio de Janeiro inselbergs, and *Barbacenia purpurea*, a native species, which play a role on

colonization of southeastern Brazilian inselbergs, was investigated. Inhibition assay with 20% (w/v) of branches and leaves aqueous extract of both invaders plants inhibited *B. purpurea* seeds germination and radicle growth. The inhibition effect of *P. aurea* extract shown the greatest effect, leading to a delay of germination at 20% to 60% concentration, inhibiting germination totally, in 80% and 100%. Leucena cold extract at 20% and 80% concentration delayed *B. purpurea* germination and inhibited totally seed germination at 100%. The effect of heat extract (80°C) of leucena was more drastic, reducing seed germination at 60% to 100% concentration. *P. aurea* showed allelopathic effect on leucena plants, inducing to necrosis, radicle inhibition and anomalous seedlings plants at 80% concentration, as well as, the total seedlings lost at 100% extract. Seeds of *P. purpurea*, which did not germinate until the seventh day of incubation in leucena extract transferred to water. The results suggested that part of invasion success of both exotic species may be explained by the inhibitory effect of their allelochemical. The high allelopathic effect of the *P. aurea* on *B. purpurea* and *L. leucocephala* seedlings in association to its vegetative propagation by rhizome suggested that the utilization of these plants in slope contention program of inselbergs must be avoid.

Keywords:

bambu, leucena, seed germination.



Tools for sustainable and multifunctional mountain forest management

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Abstract:

Forest management is slowly incorporating concepts such as ecosystem services and multifunctionality as a reaction to increasing recognition of forests as providers of multiple irreplaceable ecosystem services and, simultaneously, to growing awareness of degradation of many forests in the world forests due to overexploitation and vulnerability related to changes in climate and society. Tools to support sustainable and multifunctional forest management in mountains are also under development but their application by large communities of stakeholders is still in progress. In an attempt to overcome chronic constraints related to lack of information, knowledge, and technology in the forest sector in the “Nordeste Transmontano” region in Portugal, we developed a group of computer tools to support forest management. The tools include a stand growth and yield simulator, a landscape management optimizer, a fuel and carbon emissions calculator, and tools to develop customized programs and mobile applications. The tools allow users to model and simulate forest growth, yield and management, to produce optimized management plans, and to assess forest scenarios, strategies and policies to support decision-making at several scales. In addition to wood production, indicators of other ecosystem functions and services, such as carbon sequestration and emission, and fire hazard are also taken into account. These tools are innovative also in being designed to support technology and knowledge transfer process to forest stakeholders, being therefore accessible, friendly to operate, and open to the forest community in the region and abroad

Keywords:

sustainable forest management, ecosystem services, Portugal.



Post-fire natural regeneration of high altitude grasslands, southeast of Brazil: perspective for

management of plant biomass fuel and endangered species

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Abstract:

The anthropogenic fire is a major threat to the high altitude grasslands of the Itatiaia National Park, where over 70% of cases of fire in this ecosystem in the Rio de Janeiro state. However, their impacts are still unknown. Understand the process associated with the vegetation regeneration is a priority research according to the Park Management Plan. The objective of this study was to evaluate the floristic composition and structure of the plant community in five sites located at 2500 m altitude and with different historical fires (1988, 2001, 2007, 2010 and 2016). It was studied area of 2000 m² of grassland and vegetation islands on rocky outcrops. In total were sampled 183 species of angiosperms, ferns and lycophytes, with 32% endemic and 11% threatened. Asteraceae showed nearly 20% of the species among the 63 registered families. There was floristic similarity within and between sites comparing the two vegetation types, with rocky outcrops showing lower values. Life forms, habit and dominance were also similar between sites. The number of species from four to seven years after fire had a significant increase (30% of species), with sites in 1988, 2001 and 2007 with values above 80% of the recorded species. Despite of the re-establishment, structure, composition and richness of vegetation have occurred relatively quickly (between 4 and 7 years), endemic and endangered species were not found after fire. The reduction of the plant biomass fuel from the controlled burning and the population recovery of the threatened species are necessary management actions.

Keywords:

anthropogenic disturbance, endangered species, serra da

Mantiqueira.



A preliminary study of the conservation, use and management of brazilian-pine in Mantiqueira mountains, Southeastern Brazil

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Abstract:

The Mountains of the Serra da Mantiqueira is a priority area for the Atlantic Forest conservation and considered as irreplaceable for the world's biodiversity. They also have a high richness endangered species, as *Araucaria angustifolia* (Brazilian-pine) which has its pine nuts used as a food resource and complementary family income is therefore an object of public policy. Traditional knowledge is used in fruit growing and horticulture, which results in the production of organic foods. To protect this rich genetic heritage, in these mountains there are several protected areas and environmental agencies that establish norms for different activities. However, environmental oversight and inspection are inefficient due to the economic crisis scenario, inadequate training and infrastructure, among other issues. New strategies are necessary for face of the existence of a rural population formed mainly by family farmers, who receive few benefits from public policies. Sustainable initiatives for rural development, such as correct soil management, are still little stimulated and debated. In this sense, measures that promote: food security, generation of income in line with the biodiversity conservation and environmental services, having local communities

as partners, become priorities. The Brazilian Pine Project aims to increase the knowledge and esteem of the population of the Southeastern Region by this species of native flora, thus increasing its presence in the landscape, for the benefit of forest conservation and climate, food security and generation income for traditional populations.

Keywords:

brazilian pine, Mantiqueira, management.



Historical ecology of ancient water harvesting systems in the Cordillera Blanca and Cordillera Negra, Peru

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Abstract:

Archaeological investigations in the Ancash highlands of northern Peru have revealed a range of prehispanic water harvesting technologies, including anthropic lakes and artificial *bofedal* wetlands that continue to have impacts on the hydraulic landscape today. This paper summarises research on the long history of construction, use and disuse of high altitude systems, at the ecotonal interface of farming and herding. Major changes in hydraulic systems in the Ancash River basin appear to have gone in hand with periods of climatic stress, especially around AD 600-800. The symbolic anchoring in mortuary landscapes of glacier runoff harvesting and inter-basin canal systems that constituted these technologies in the past, contrast markedly with the near exclusive emphasis on techniques of ongoing efforts to restore indigenous technologies in the name of rural development. Focussing on changes in ritual practice involving Andean camelids

through time helps contextualise key shortcoming of ongoing rehabilitation efforts.

Keywords:

archaeology, water harvesting, indigenous technology.

8 - Water harvesting: transforming grassland and livestock production in high Andes puna ecosystems, past and present

Mapping indigenous adaptations to climate change impacts on water security in the High-Andes: policy gaps and biases towards mountain regions

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Abstract:

This paper presents results of the project 'Restoring ancient water technologies through hybrid science to aid climate change adaptation in mountain communities' in the Andean region of Peru. Glacier recession in the 19 glacier ranges of Peru is leading to a reduction in water base-flow and the drying out of grasslands, moorlands (bofedales) and waterholes on which pastoralist communities depend. These processes are triggering a chain of additional impacts, including overstocking of animals in grasslands that still have water, soil erosion, destructive fires, and increased vulnerability to agricultural failure. Mountain communities are responding in multiple ways to these impacts to reduce their risks. These responses include both autonomous and externally supported initiatives to restore ancestral technologies of water management in high-altitude grassland territories. Building on institutional experience supporting processes of community-based restoration of ancestral systems of water management in high-Andean puna region, the paper (i) analyses the data base of projects presented by over one thousand mountain communities to government agencies to develop water management projects to present a typology of local responses to climate change; (ii) describes selected cases that illustrate the typology of community

responses to water scarcity; (iii) identifies the factors that are associated with successful adaptations. We identify bottlenecks for the incorporation of indigenous perspectives and socio-technological solutions to secure water into current government programs, discussing strategies to adapt public policies to the needs and context of mountain communities of the high-Andes.

Keywords:

indigenous knowledge, climate change, water security, mountain policy, adaptation.



Understanding high-Andean wetlands to improve their ecological functions and local management

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Abstract:

In Peru, we called 'bofedales' to many types of Andean wetlands (AW), mainly wet meadows and peatlands. They represent small areas of the Andean landscape, but they are key to conserve biodiversity and ecosystem services, such as carbon sequestration, water regulation, and provision of forage for livestock.

Archaeologists have found that pre-Columbian cultures done water management to improved 'bofedales' condition; however, currently, these mountain ecosystems are poorly understood. Despite their importance, the AW ecological condition is being threatened by overgrazing, peat mining, and many hydrological alterations.

To improve our socio-ecological understanding of AW, The Mountain Institute have conducted studies during last three years,

in Huascarán National Park in Peru. Our main results will be present here. We have characterized seven AW using indicators of water, vegetation and soil condition. These results were used as basis to do a proposal for Peruvian Environmental Ministry to measure the AW ecological condition in Peru. We have also researched social aspects of AW management: perceptions of change of local herders, the relationship between local herders, livestock and AW, and the management decisions made for local people about AW. Additionally, we have established two restoration experiment, using small exclosures for livestock, and restoring a ditch. Their impacts have been monitoring during two years.

In AW, all processes and changes are slow. However, a better knowledge about these socio-ecosystems will allow us to promote a better prioritization of sites, and actions, to conserve and restore them, in addition to suggestions for improve the management of local people, and Protected Natural Areas.

Keywords:

andean wetlands, ecological condition, socio-ecosystem.

9 - Climate Change Adaptation in mountains regions

Towards enhancing and disseminating scientific knowledge on the upper-tropospheric warming and its impacts on the overall integrity of páramo environments

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Abstract:

Multiple disruptive processes are synergistically driving an unusual tropical upper-tropospheric warming. On-the-ground signals include fast decreases in fog/cloud cover in high elevations and abrupt upward shifts in the freezing level. Disruptions are having region-wide, cumulative and irreversible negative impacts on the overall integrity of páramo environments. Our knowledge of the interplay of their physical mechanisms and concomitant impacts remains limited. Our long-term, multi-tiered research initiative aims to deepen our understanding of the function and importance of páramos, to assess the best suite of adaptation strategies for their conservation. The target region is right in the heart of Colombian Andean region, by the Los Nevados key protected area. The socio-ecological mountain monitoring initiative is supported on primary data collected in gauging sites, weather stations, experimental plots, and data loggers. After more than a decade, the balance of

our initiative includes projects, publications, dissertations, and participations in scientific events. It also includes a catalog of high-altitude flora, an illustrated book of Andean forests and outreach products in social networks. Current activities include reconstructions of ~ 30 kyr-to-present glacial events, eco-hydrological analyses and quarterly field trips to monitor on-the-ground environmental variables. We are threading the international scientific networking and offering a vast consultancy portfolio. An in-situ, high-tech visitor center will be established, where we can enhance our academic coursework at all levels and offer training to all audiences. We argue that ambitious sustainable management strategies are urgently required to protect our unique and highly endangered páramos.

Keywords:

tropical mountains, adaptation, páramo environments.



Epigenetic variation may contribute to the acclimation of a clonal invasive plant to new environments

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Abstract:

Epigenetic variation may play an important role in plants coping with new and heterogeneous environments. Although significant epigenetic differentiation among contrasting habitats has been frequently observed in field, its stability remain largely unknown. Here, we used field monitoring, multi-generation cultivation in common garden and growth chamber to investigate the dynamics of

epigenetic variation in *Alternanthera philoxeroides*, a clonal invasive weed in China. Using both MS-AFLP and mSLAF-seq markers, we found little genetic variation, but considerable epigenetic variation, in natural populations along a broad climatic gradient. Repeated measurements indicated that the epigenetic diversity and differentiation was largely stable in field, but showed significant and progressive erosion under common environments. It seemed that the epigenetic variations observed in field origin from repeated induction and reinforce by environments rather than from spontaneous epimutations selected by environments. Indeed, loci-based analyses suggested that the stability of epigenetic variations was genomic-context dependent and decreased significantly over time in cultivation. Environmental association analyses indicate that, at least some of the epigenetic variations were significantly related with certain climate variables. Taken together, our results suggested that the epigenetic variation may contribute to the acclimation of the clonal invasive species to heterogeneous environments across a broad climatic gradient.

Keywords:

adapation, epigenetics, plasticity.



Climate change impact on the Western Ghats Mountain forest: Challenges in sustainable management

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Abstract:

Changing climate together with environmental degradation is a threat to the biodiversity of the Western Ghats Mountain forest, a

recognized global biodiversity hot spot in India. Climate extremes, unsustainable use of resources and unwise government policies pose serious threat to the existence of many rare species of animals and plants. Encroachment and introduction of plantation crops in the last century lead to the depletion of vast area of natural forests. Poachers have hunted hundreds of elephants and bisons and widely destroyed precious trees such as sandal and rosewood. Hydropower projects submerged large areas of forests. Rainfall in the region is becoming more seasonal and intense, resulting in the erosion of the already degraded soil. Long dry season and falling groundwater storage lead to human-animal conflicts and extinction of seasonal plants. Forest fire has become common. Strong winds uproot big trees. Shift in regional climate may affect the biodiversity significantly. Rules and regulations to protect the forests become farce because of weak administrative mechanism, corruption and vested political interference. Sustainable utilization of forest products may boost the current economic development and help alleviating poverty of the tribals. There are large areas of restorable degraded forests and afforestable wastelands. Community forest projects with the cooperation of local population could improve livelihood conditions of the poor. Present paper assesses the impact of climate change and environmental degradation on the forest and critically reviews current policies and strategies related to climate and forest to suggest guidelines for an appropriate forest policy and management strategy.

Keywords:

western ghats, mountain forest, climate change, environmental change, policy.



Managing risks and future options emerging from new lakes in the deglaciating tropical Andes (Vilcanota-Urubamba basin, Southern Peru)

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Abstract:

Rapidly growing lakes in deglaciating mountain regions bear both multiple risks and options for human livelihoods. While these lakes represent potential reservoirs for domestic, agricultural and hydropower use, the Glacier Lake Outburst Floods (GLOF) represent a serious threat. We present an integrative assessment of current (1988-2016) and possible future (2050/2100) glacier and lake changes considering GLOF-related hazards, hydrological risks and water management options of growing lakes in the Vilcanota-Urubamba basin (Cusco, Southern Peru).

Particularly in headwaters and during dry seasons, the glacier contribution to streamflow is crucial (~26%). Considering the IPCC emission scenario RCP8.5 until 2050 (2100), however, this contribution would substantially decrease to ~22% (~3%) with strong glacier shrinkage of 44.1% (92.2%). Although we estimate as far as 16 (20) lakes to possibly develop towards 2050 (2100) in potentially exposed glacier-bed depressions, the associated volume would only rise by 5-6% (0.037-0.041 km³) in the same period. Three key hotspots of current and future water risks can be identified which combine potential water scarcity and high GLOF hazard as well as strong human vulnerabilities and exposure. Particularly, in the middle and lower basin, long-term water availability could diminish during dry seasons while irrigated agriculture and hydropower capacity are increasing. Related strongly growing water demand has the potential to outweigh climate change impacts on water supply. In the context of the identified risks, robust adaptation planning is necessary within an integrative long-term water management framework embedded in local and national policies which need to tackle complex hydroclimatic and socioenvironmental intertwining.

Keywords:

new lakes, glacier contribution, water scarcity, integrative water management, risks, future options.



Adaptación al cambio climático en fincas familiares en el sector Obraje- Acopampa, Carhuaz, Ancash-Perú:

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Abstract:

This research evaluates the agroecological practices and organizational strategies that family farms perform to adapt to climate change, in the Obraje Sector - Acopampa District, Carhuaz Province, Ancash, Peru, intended to generate consumption of Agroecological products and income to the population of rural areas. Among the most important results of the research are the following agronomic and ecological changes identified by the farmers: local pollution, increased pests and diseases, extreme temperatures of heat and cold, melting of ice, seasonal changes in planting and harvesting times of their crops. In addition, agroecological practices carried out by farmers are: zero tillage, use animal manure, live fences, agroforestry, crop rotation, crop association, crop diversification, composting, natural biocide and technical irrigation. Similarly, the organizational strategies applied by farmers mainly correspond to reciprocity, solidarity and collectivism, which are practices of ancestral social organization. It is concluded that taking into account the knowledge and the perceptions of farmers on climate change and putting in value their agroecological practices and collective organizational strategies of ancestral roots will be key to make crops resilient and adapted to climate change, thus ensuring local food security with high quality

agricultural products.

Keywords:

family farms, agroecological practices, organizational strategies, climate change, adaptation.



Urban and Rural Micro-Watersheds of tropical mountain ecosystems: case study in Teresópolis-RJ

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Abstract:

Serra dos Órgãos, Serra do Mar Ecoregion, due to the interactions between the Andes Mountain Range, Atlantic Ocean, Relief, Atmospheric Masses, Amazon and Atlantic Forests, presents a dynamic of climatic variations that determine, condition and/or limit the organization of society in space on account of its characteristics: high hydrological potential; biodiversity, rainfall and slopes; human settlements and productive arrangements located in risky and precarious areas. In this context, Micro-Watersheds (MWS) are considered the smallest unit of analysis and monitoring of this tropical mountain ecosystem in which socio-environmental, socio-ecological and ecosystemics potentialities and vulnerabilities are exposed against the climatic risk, such as qualitative water availability, susceptibility to floods, landslides and soil erosion, characteristic of its local dynamics. In order to support adaptive strategies for water management and governance for

urban and rural Micro-Watersheds, this study aims to present morphological, morphometric, environmental aspects and impacts data of two strategic micro-watersheds of the Rio de Janeiro State highlands, Teresopolis city: the Meudon River MWS, called strategic hydrological unit by the Water Resources Plan of Rio de Janeiro State in face of extreme climatic events; and Lucios Valley MWS, an important producer of horticulture integrant of Sustainable Rural Development in Micro-watersheds Program. At the end, intends to elaborate a comparative analysis between these MWS based on the criteria adopted by the Force-Pressure-State-Impact-Response methodology.

Keywords:

tropical mountain ecosystems, micro-watersheds, climatic risk.



Cascading Adaptation of Rural Livelihood to Changing Environment in the Koshi River Basin

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Abstract:

The Koshi River Basin is one of the key trans-boundary river basins in the Hindu Kush-Himalayas. Climate change related impacts like drought and flood are currently affecting rural livelihood. In this paper, we developed the SITS framework for livelihood from the four aspects of structure dimension, issue dimension, time dimension, and space dimension. Following the SITS framework, the cascading adaptation for reducing disaster stressors on livelihoods, cascading adaptation for enhancing access to crucial livelihood capitals, cascading adaptation for improving

equal rights to livelihood, and cascading adaptation of livelihood for trans-boundary river basin nexus are discussed and examined respectively. The findings revealed that the SITS framework provides a comprehensive design approach for cascading adaptation at trans-boundary river basin level, while such integrated approaches are being explored conceptually, there is much less emerging to implement such integrated approaches. Cascading adaptation of rural livelihood is a comprehensive, diverse and effective network of adaptation strategies, and it could effectively enhance the adaptive ability and level of livelihood transformation and outcome. Even though to setting the focus on selected four sectors only, the cascading adaptation also emphasizes the importance to look at the interconnections and related trade-offs between those sectors. The trans-boundary context requires consideration of a greater diversity of perspectives, while the cascading adaptation can help to refocus the stakeholders' activities and extend their understanding and even policy leverage. It would be important to implement the cascading adaptation through a multi-stakeholder process.

Keywords:

cascading adaptation, rural livelihood, trans-boundary river basin, SITS framework, climate change, nexus.

10 - Management and Social Control in Mountain Territories

Composting for family farmers

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Abstract:

Composting is a form of recycling in which the organic fraction of the trash is transformed into a compound that can be used in agricultural soil fertilization, as in the improvement of your physical structure, increasing your resilience to erosion, retention of moisture and other beneficial aspects. The Brazilian urban waste, has, in general, high organic matter content, which makes it extremely viable your use for the production of compost. The reduction of greenhouse gas emissions are one of the largest environmental advantages of composting, especially if we consider homemade composting as from family farming sites, where waste can be separated at source, rather than transported to a screening plant. Other aspects of the life cycle of the composting to be considered are the environmental gains relating to the replacement of traditional chemical fertilizers by compound, due to minimizing the potential for acidification of the environment, reduction of ecotoxicity and human toxicity via soil and water as well as reducing emissions related to the production and environmental exposure to fertilizers, usually contributed to excess in agricultural crops, which translates in the contamination of water bodies, for example. This work identified the garbage compostable fractions, usually generated by family farmers and, from this, it was proposed form of behavior of these fractions, so that the farmer reduce your generation of garbage as well as do not require purchase chemical fertilizers.

Keywords:

environmental impact, municipal solid waste, contamination of water resources.



Proposals and practices of Management and Social Control, Tourism Solidarity in Mountainous Territories. 2017-2018 A year later, in the Saws do Piloto and Matoso (Territory of the Bay of Ilha Grande - RJ)

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Abstract:

It is extremely important to understand historically the formation of localities in the Brazilian territory, mainly mountainous regions, which are characterized as areas of development of their particularities. For this purpose, this article presents proposals (according to the concepts of social control and management) , being applied as a measure of valorization of dialogical practices aiming at an autonomy for civil society and its relation with the State and Market. These scalar practices between the global and the local undergo continuous pressure (economic, social, cultural, political, etc.), so social participation is a position of valorization and maintenance of these territories for their endogenous development. Specifically, this article deals with the rural region of Serra do Matoso / Serra do Piloto, located in the municipalities of Itaguaí - Mangaratiba, in the Rural Territory of Baía da Ilha Grande, Rio de

Janeiro - Brazil. The methodology used is an approach, qualitative exploratory characteristic model (VERGARA, 2007), with bibliographic, documentary and telematic bases (GIL, 2002). This article is a second moment of a territory already analyzed in the year 2017, with projects presented at congresses in the area. The setbacks are presented a year after the first impressions established, exposing a path to which these territories are following and which they could follow, if it promoted practices that centralize the role of their communities, henceforth management actions and social control, alternatives to capitalist scenarios globalization and predation, providing mechanisms of endogenous local development in a cohesive and horizontal way, increasing a collective advancement of socio-human, historical and environmental aspects.

Keywords:

management and social control, solidarity tourism, mountain territories.



Improving territorial governance through community self management in microwatersheds towards sustainable development in RJ mountain regions

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Abstract:

The Rio Rural Program is a public policy implemented by the Secretariat of Agriculture, Livestock, Fisheries and Food Supply of the State of Rio de Janeiro, to support family farmers' transition to sustainable productive systems. To this end, it developed a community self management methodology adapted from the UFRJ

's Technological Incubator of Popular Cooperatives for rural social groups. The incubation of rural community organizations was an innovative approach implemented by the Rio Rural Program assembling farmers, rural women and youth, extensionists and researchers to build, upon community empowerment, new institutional arrangements, alternative income generation and natural resources conservation strategies towards sustainability. Through participatory diagnosis and planning processes, stakeholders were democratically engaged in microwatershed management committees (COGEM), with self established rules and representatives, expressing the demands of the social diversity of the territory. It will be demonstrated the Program's methodology and how it supported the development of more inclusive and democratic public spaces, thus enhancing social capital and rural community protagonism in decision making process. Results from three case studies collected on field open interviews to relevant stakeholders (farmers, women, extensionists, local policy makers) will be presented in order to show evolution of social capital indicators and networks activated by the Program improving territorial governance for sustainable rural development in several mountain regions of the State of Rio: in Nova Friburgo, integrating agroecological farming and rural tourism; in Porciúncula and Varre Sai, Northwestern region, linking improved coffee quality and rural tourism, and among dairy productive chain, at Médio Paraíba region.

Keywords:

territorial development, social management, sustainable rural development.



Theoretical Approaches to Social Management in Mountain Territories: possible deliberative institutions towards the agroecological model?

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Abstract:

This work has the character of an essay with the main objective of presenting the theoretical reference of social management as a theoretical and methodological contribution for the consolidation of the spaces of institutionalization of social participation in mountain environments. The discussions and approximations of the term social management depart from the perspective of a shared management model, which aims at the common good (Tenório, 2009). França Filho (2003) denotes the relevance of social management also as a process, dismantling the structuring paradigm of the theoretical field of administration, largely focused on the purpose of the *modus operandi*. From the confluence of visions and conceptions of social management as a field of process and purpose; this paper seeks to present the field from a posture that subsidizes the emancipation of new practices and new theoretical contributions that substantially promote actions in different fields of knowledge, such as agroecology and sustainable development. For this, this article is structured as follows: a) present the characteristics of social management; b) identify elements of social management that can favor the territorial development of mountain environments on the strategic / rational paradigm; and, c) analyze the possibilities and limitations of institutions based on deliberative logic. It is note in the final considerations that although broad, the field of social management has some challenges not to become a “formless” element, but instead, that can establish bridges with the principles of mountain agroecological development.

Keywords:

social management, agroecology, development.



Social Management, Participatory Budget and Public Policies: a Literature Review

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Abstract:

The present work has the specific objective of reviewing the literature on social management, participatory budgeting and public policies, presenting relevant concepts and ideas within the scope of the work. Characterized by dialogue and understanding among people, social management becomes a competent catalyst for local development, since through its practice through the Participatory Budget, councils and other bodies, decision-making without coercion interferes positively in the process of public policies, because by bringing importance to the participation of the population in the discussion of the problems lived by it, these policies end up embracing and solving effectively and efficiently the problems that are present in everyday life. The methodology adopted was based on the bibliographical analysis of works pertinent to the subject studied.

Keywords:

social management, participatory budgeting, public policies and participation.



University Extension in support of the Territorial Council of the Bay of Ilha Grande - RJ for Sustainable Territorial Development

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Abstract:

The propose of the article is to evaluate the actions of the Teaching, Research and Extension in Territorial Development and Public Policies Program (PEPEDT) next to The Territorial Council of Ilha Grande Bay, RJ, to promote multidimensional and sustainable development. Participant observation and discourse analysis were made from the 12 meetings of the territorial council. It was also evaluated the joint developments that occurred from the actions of the council members. The territory is part of the Atlantic forest biome, where six of its municipalities are constituted of what remains of the forest along the coast: Paraty, Angra dos Reis, Mangaratiba, Itaguaí, Rio Claro and Paracambi. These municipalities have mountainous environments with potential for tourism and rural production. The PEPEDT has been able to stimulate and make feasible projects in this sense. This is the case of actions taken through the interaction between doctoral students and communities: the political strengthening and performance of youth in the field; and rural tourism in the Piloto mountain range, in Mangaratiba and in the Matoso mountain range, in Itaguaí. The Council has shown itself to be an instance of articulation and alliances for the promotion of these actions. It is concluded that PEPEDT, in advising the Council under the principles of social management, has contributed to broaden the dialogue between civil society and the public power, enabling the permanence of communities in the field.

Keywords:

territorial council, social management, university extension.



The empowerment of participative and representative democracy supported by the Program of Studies in Social Management (PEGS/EBAPE/FGV) in cities of the State of Rio de Janeiro

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Abstract:

In the years of 2016 and 2017 the Program of Studies in Social Management (PEGS/EBAPE/FGV) performed two editions, of its oldest course, in the interior of the State of Rio de Janeiro, in the cities of Nova Friburgo (2016) and Valença (2017). The course of “Política e Cidadania: os conselhos municipais como referência” has the objectives of empower and strengthen civil society in front of the many multidimensional transformations (politic, social, economic, environmental, technological, and other dimensions) experienced by Brazil, mostly in the last years. Supported by Cáritas Diocesana de Nova Friburgo and Cáritas Diocesana de Valença, the PEGS/EBAPE took the course to these places together with the supporting institutions: UFF (Volta Redonda), UERJ, FAETEC, UFRRJ and Controladoria Geral da União (CGU). With spaces provided by Cáritas and material and teachers by the PEGS / EBAPE, the course was held for students interested in participating in thematic councils, those who were already working in the area or for professional improvement purposes with actions in management and social control. The strengthening of participatory democracy and representative democracy was present for the populations of these cities, since the transmission of knowledge and teaching on the themes around social participation made it possible to disseminate social management and control as an instrument of development.

Keywords:

social management, social control, social participation.



Public Policies for Youth: the construction of processes for the emancipation of rural youth in the Bay Territory of Ilha Grande-RJ

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Abstract:

The abstract is part of the doctoral research aimed at analyzing the comprehensiveness of public policies for youth, identifying what these policies are and what impacts they have on the social and political organization of rural youth in the Ilha Grande Bay Territory - Seropédica, Itaguaí, Mangaratiba, Angra dos Reis, Paraty, Rio Claro, Costa Verde region, with coastal and mountainous areas are important for agroecological and agroforestry production. It seeks to understand if these policies stimulate young people to seek training that potentiates sustainable economic viability actions to strengthen family agriculture and whether these policies promote social participation, productive organization and access to fair markets, in order to gain autonomy and affirmation of youth protagonism, enhancement of the countryside and the permanence of young people in their territory. It also analyzes the issue of the exodus of the rural youth population in the Territory of Ilha Grande Bay, in relation to the succession in family agriculture in the face of the impacts caused by economic growth in the region. The youth protagonism is deficient due to the little participation in decision-making spaces in the construction and implementation of public policies. It is hypothesized that the maintenance of rural youth in the

countryside can be encouraged by public policies for agroecology and for rural youth. These policies can foster social management and control, participation, networking, involving young people in multiple institutions, and public policies developed in an integrated and interactive way contribute to territorial, sustainable rural development and solidarity.

Keywords:

public policies, agroecology, youth.



The role of rural youth in the construction and consolidation of agroecology in the municipality of Mangaratiba-RJ

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Abstract:

This summary is part of the activities of the Agroecological Training project for young citizens of Rio de Janeiro, in which we highlight the work of a young woman from the Rubiã Rural Settlement, located in the Serra do Piloto, Mangaratiba-RJ and member of the Youth Committee of the Rural Territorial Collegiate of the Bay of Ilha Grande, which represents a strategic space for strengthening the protagonism of the people, with respect to the social management and control of the public policies, demands and desires of the community. The project aims to empower rural youth, empowering actions for family farming on agroecological bases. The partnership with the municipality, through the Reference Center on Social Assistance, was fundamental for the accomplishment of the project activities in this place. The activity proposed by the

young woman was the implantation of an agroecological garden. Initially, few young people signed up to participate. In spite of this, the young woman did not discourage and mobilized other young people of its community, being able to develop the activity. We believe that youthful young pedagogy provides the construction of knowledge and its organization as a collective, for the planning of intervention actions in its reality and also contributes to the identification and formation of youth leaderships. Through the training provided by the project, as well as the rescue of young people who did not believe in agriculture as an option to stay in the field, these young people are currently producing healthy food, both in the agroecological garden of CRAS and in their own homes. Currently, there are 32 young people participating in the agroecological garden.

Keywords:

training, agroecology, youth protagonism.

11 - Exchange of experiences and local public policies that can collaborate with the sustainable development of municipalities and localities

Use of an economic instrument in environmental public policy: The ecological ICMS and its potentiality in relation to the sustainable territorial development in mountain environments – The case of Petrópolis (RJ).

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Abstract:

This work has been developed having the analysis of the evolution in application of the economic instrument called ecological ICMS (ICMS-e) over a county of mountains environments, which is Petrópolis, Rio de Janeiro, during the period between 2011 and 2016. About this context, the main goal of this work is to check if the application of the ICMS-e and new practices of environmental public policies are related linked in the period that has been studied, in a way that it is possible to indicate the existence of programs of Sustainable Territorial Development (DTS) in Petrópolis' mountain environments. The methodology chosen in a qualitative feature, was based in documental and bibliography researches and the application of semi-structured instrument of the analysis of the content near to public managers in environmental counties and members of public institution as well as civil society that acts in the environmental thematic in this county. The achieved results showed that there are some gaps between the realizations and potentialities that the use of ICMS-e resources could have provided for elaboration, implementation, and

continuation of environmental projects of sustainable bases in special conditions, which is the case of mountain environments. The lack of normative explicit mechanisms about public policies to determine the application of resources there are coming from the past through ICMS-e doesn't contribute for the integral reach of the goals previously proposed by this instrument of economic incentive about practices of environment management that could support the DTS process in its environments of mountains.

Keywords:

environmental public policy, ecological ICMS, mountain environment.



Central Asian New Pasture Laws eliminate occupation and privatization of pastures through bottom-up management approach

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Abstract:

In almost all Central Asian countries, Pastures have always been owned by the state as an inheritance from the USSR. However, there has been the possibility of obtaining short-term and long-term lease. Besides that, there was also a possibility of obtaining low-productive pastures to develop into higher category of agricultural land by rich farmers.

In 2009, Kyrgyzstan enacted a new "law on pastures", which protects the interests of all pasture users. The law immediately closed the doors of privatization as mentioned development of low-productive and lease of pastures. Also legal use was transferred to the lowest level of state administration - local self-government. Such

bottom-up approach in other words community based management, ensured the active involvement of pasture users in decision making processes.

In addition, the law introduced a fee for the use of pastures, which is directed to improve the conditions for shepherds in pastures (pasture infrastructure, transportation during nomadic activities, veterinary services, shooting wolves, etc.). Previously by 2009, there had been collected only 120 k USD as a grazing fee in local self-government budget. In contrast with that, the sum of money received by 2015 reaches more than 2 million USD. This result indirectly shows how much trust of the pasture users were justified by effectively implementing pasture management plans developed jointly.

The experience of Kyrgyzstan has been successful and is spreading in all Central Asian countries. Similar Laws “On Pastures” are adopted in almost all countries; Tajikistan adopted in 2013, Turkmenistan in 2015 and Kazakhstan in 2016.

Keywords:

pasture laws, community based management, privatization, stakeholders-engagement, joint design making.



Public policies for rural development: the case of fertility in horticulture in Petrópolis in the mountains of the fluminense serrana region

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Abstract:

The objective of this work was to draw up public policy guidelines

for sustainable rural development based on soil fertility in order to contribute to productivity, production costs, phytosanitary problems, among other factors. By means of a case study in the municipality of Petrópolis-RJ in the Serrana Fluminense region, we first sought to identify and make a diagnosis of the fertility of the most representative microbasins of the municipality by means of routine soil analysis collected by the farmers themselves and based on the diagnosis, public policy guidelines were developed that could contribute to the family farmers in the management of soil fertility and agricultural production. The soil of 52 family farmers was sampled and analyzed, allowing the elaboration of a diagnosis with the means of the chemical elements responsible for the fertility in the microbasins. The pH, acidity and potential acidity, aluminum, phosphorus and potassium, calcium and magnesium, sodium, organic matter, cation exchange capacity, base sum and Base Saturation were analyzed. It was possible to conclude that public policies should contribute to the strengthening of the following guidelines: a) articulation among actors and development of a technical support structure; b) linking public policies of development, credit and commercialization to the obligatoriness use of soil analysis; c) logistic support for collective purchases of correctives and inputs; d) development of composting poles; and e) communication and awareness of the target public. These guidelines can contribute to sustainable rural development.

Keywords:

public policies, soil fertility, family farmers and sustainable rural development.



Delimitation Project of the Continues Riparian Protected Stripe to Piabanha River at the Rio the Janeiro State, Brazil.

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Abstract:

Riparian Protected Stripe (RPS) are land strips along rivers, lakes, ponds and water reservoirs that are necessary for the protection, defense, conservation and operation of river and lake systems. They are permanent protection areas, defined as a horizontal projection from the regular channel edge of perennial and intermittent natural water courses, excluding ephemeral (Brazil Law No. 12,651/2012). Taking the watershed as a planning and management area, Rio de Janeiro State has nine hydrographic regions, in which the Environmental State Institute (INEA) has the responsibility to establish the RPS. Due to the State Public Prosecution Office initiative, the Delimitation Project of the Continues Riparian Protected Stripe to Piabanha River has begun engaging the Piabanha Committee (CBH-Piabanha) among other institutions. The purpose is to provide a reference to the municipality management in the surroundings of the Piabanha River, avoiding irregular occupation at this region that is highly affected by floods. CBH-Piabanha is a collegiate body which is part of the Water Resource Management State System under the terms of State Law no. 3,239/1999. It was assigned to the CBH-Piabanha to merge into the project its local knowledge and to execute the descriptive memorandum elaborated by INEA. Considering inclusive management concepts, CBH-Piabanha, through its public power members, requested the Mayors of Petrópolis, Areal and Três Rios to indicate experienced collaborators to understand and to contribute with the project. The regional articulation provided by a Basin Committee is an innovation on the Rio de Janeiro State, strengthening the territorial management.

Keywords:

basin committee, riparian protected stripe, Piabanha river.



Research and Education in Mountainous Greece

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Abstract:

The 2030 Agenda for Sustainable Development explicitly mentions mountains among the ecosystems of outmost importance. States are invited to incorporate mountain-specific policies into sustainable development strategies. This procedure needs to be evidence -and knowledge- based. Therefore, research and education on mountain issues are core parts of sustainable mountain policy. The present work highlights the efforts made in Greece for covering a major knowledge gap regarding its mountainous backbone.

Greece is a mountainous country, with approximately 70% of its land being mountainous. However, these areas remain at the sidelines of development policies. Knowledge about mountainous Greece was particularly restricted and fragmentary. The National Technical University of Greece (NTUA) took an initiative in order to help reversing the situation. In 1993, the Metsovion Interdisciplinary Research Center (MIRC) was founded, a research unit dedicated to mountain issues. Furthermore, in 2008, a postgraduate course (MSc “Environment and Development of Mountainous Areas”) was introduced. Both MIRC and the MSc are located in Metsovo, a mountainous town at the Pindus range. This allows direct contact with the mountain environment and societies and facilitates experiential education.

The research and educational activities of NTUA in mountainous Greece have produced fruitful results, systematically disseminated to local societies, authorities and the scientific community. Through

the analytical presentation of the activities and the vision of NTUA for mountainous areas, it is attempted to show that a robust scientific base is a prerequisite for the rejuvenation and sustainable development of mountainous areas.

Keywords:

research, education, mountains, Greece, sustainable development.



Technical, economic and social advice for agrarian reform: the cedro cooperative work in the state of Rio de Janeiro

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Abstract:

The Technical, Economic and Social Assistance for Agrarian Reform (ATES) program was created in 2003 and aimed to promote the Public Rural Extension directly to agrarian reform settlements that were under the jurisdiction of INCRA (National Institute for Colonization and Agrarian Reform). The program began to be implemented in the state of Rio de Janeiro in 2010 under contract 15,000/2009, with INCRA and lasted until 2014. The Cooperative of Work, Consultancy, Projects and Services in Sustainability (CEDRO) served in the four years as a service provider in the ATES program, advising 19 Settlement Projects (SP) in three regions of the state of Rio de Janeiro (North, Northwest and Coastal Lowered), with 06 operational centers and a headquarters in the state capital. There were 1,652 assisted families in total, which corresponded to 32% of families settled in the state. The set up of a territorial base of

14 cities and 21,730ha added to the areas of SP's advised. The technical team was made up of 19 professionals from the agrarian, biological and social sciences. Training activities were developed in the productive areas, always with an agroecological approach, focused on the construction of identities and the empowerment of families, under the technical, social and environmental tripod. However, the program suffered financial and organizational problems on the part of the federal government, which destabilized the contract and culminated in the end of the program. No new public call for technical assistance in agrarian reform settlements has taken place yet.

Keywords:

rural extension, ATES, agrarian reform.



Geotechnologies for the Planning of Public Policies for the Agroecological Transition: Case study in the Hydrographic Microbasin of Barracão dos Mendes, Nova Friburgo, RJ

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Abstract:

It is believed that agroecology can approach geotechnology and use these available tools to create a database and produce fundamental information for territorial studies, taking into account their physical, chemical and biological characteristics as well as particular vulnerabilities to produce specific environmental and agroecological zoning that can support public policies or other

actions to encourage and promote the agroecological transition in areas of family farming. Therefore, this study aimed to make a systemic and multidisciplinary analysis of the Microbasin of Barracão dos Mendes in Nova Friburgo, Rio de Janeiro. The main characteristics of Relief, Soil and Landscape, in addition to their interactions and relationships were analyzed using geoprocessing tools, geostatistics, remote sensing and access to a database of public geographic information, identifying the main vulnerabilities and potentialities for agricultural practice in the microbasin. The results show that the intensive production systems practiced are incompatible with the characteristics presented and unsustainable in a medium to long term. The study makes clear that it is necessary to rethink farming in mountain environments and that studies like this should be carried out wherever and whenever actions are planned and implemented aiming at the improvement of agroecosystems in vulnerable areas, in order to make possible human occupation and agricultural practices in such sensitive environments and with high potential for the production of environmental services and agroecological practices.

Keywords : mountain farming, agroecological transition, geotechnology.



Building dialogues between family agriculture and the university: the action of the junior company of medicine veterinary students of UFRRJ

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Valle

Abstract:

The constructivist rural extension aims to break with the diffusionist paradigm that has been established since the 1970s, in which the farmer was seen as an empty container where knowledge was deposited. In addition, the constructivist rural extension, dialogic, has as pillar the exchange of experiences between producer and extension agent, adding knowledge to both. However, with the failure of traditional models of government extension, the extensionist action was affected. Thus, graduates of the veterinary medicine course of the Federal Rural University of Rio de Janeiro (UFRRJ) created, in April 2017, the “OrganoVet Jr” (Junior Company of Veterinary Students), aiming to establish a link between the extension university education and rural extension, building relationships that strengthen the autonomy of the region’s farmers and that somehow supposes the need for practical learning, which is rarely offered academically. To this end, “OrganoVet Jr” advises two agrarian reform settlements in the region of Piraí-RJ (Roseli Nunes and Terra da Paz), with the collaboration of both professors and sectors of UFRRJ, carrying out veterinary and zootechnical examinations and protocols. In addition, the junior company also uses the animal sector of Fazenda Agroecológica do Km 47 (UFRRJ / EMBRAPA / PESAGRO-RJ) as a source of management techniques and homeopathic therapy, in the construction of an agroecological animal production, in which the autonomy of the peasant family should be encouraged, as well as their quality of life and the welfare of their animals.

Keywords:

agroecologia, empresa Jr., extensão rural.



Subverso Feminino - Women’s Subversion: An

Experiment In Search of Women's Recognition and Gender Equality in Family Agriculture

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Abstract:

Due to the precarious access to information, but primarily due to the few spaces for dialogue on gender issues in family agriculture, the division of labor in rural areas is still gender-linked. The patriarchy rooted in the field disregards topics related to the feminine nature, there is still prejudice against the theme. The values passed from generations to generation are what defines this behavior because they historically hide power relations. Family farmers do not refer to women's work as labor. Instead, they use terms such as 'caring' and 'helping,' even if they are responsible for all the farming areas that are closest to home. To encourage the exchange of knowledge among women, the first edition of the event SUBVERSO FEMININO - WOMEN'S SUBVERSION, made by and for women, was carried out in May 2018. The event designed and carried out by the junior company assembled by the UFRRJ Veterinary Medicine academics, aimed to strengthen relations and absorb knowledge of participants who live from family farming. The lectures and talks were carried out as a laboratory for the acquisition of experience, which will be transferred to other female farmers to deconstruct stereotypes and contribute to the development of an egalitarian society, with women empowered and subversive to macho interests. Also, it is necessary to deconstruct the rooted sexism even among women to create an environment of empowerment and sisterhood that finally reflects a gain of self-esteem. Female empowerment is an important step in ensuring the visibility of women's labor in agriculture and combating gender inequality.

Keywords:

dialogue, woman, empowerment, sisterhood.



The junior company as a social technology for Family Agriculture – The Importance of Complementary Therapies and Veterinary Medicine

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Abstract:

Complementary therapies are based on the well-being and maintenance of life, avoiding the use of curative medicine in favor of preventive medicine. Currently, Brazil is the South-American country with the most significant number of homeopaths, which confirms its acceptance among the scientific society and the general population. In this sense, the University, through the Veterinary Medicine undergraduates members of the junior company OrganoVet, carry out the animal health diagnosis of the rural families, working alongside the Agrarian Reform Settlement Roseli Nunes in Piraí -RJ (created in 2007, with 31 families and 1034.3 ha). The objective of this work is to show how the distribution of knowledge, through the junior company, can promote the emancipation of rural families. With this purpose in mind, a partnership has been settled with teachers of the Rural Extension area, the microbiology laboratory, the Veterinary Hospital for Large

Animals and the laboratory of parasitic diseases of UFRRJ. In the latter, the results of collected material were taken by OrganoVet Jr. to the settlement, initiating the treatment of the animals, that recovered well. The autonomy of rural families represents the emancipation that the non-universalization of knowledge generated because it made them dependent on allopathic and non-preventive veterinary medicine. Therefore, it is important to point out that complementary therapies are an alternative that includes the social and economic aspect at the extensive veterinary action, bringing together the academic formation and the rural-veterinary extension, often forgotten by undergraduate courses.

Keywords:

complementary therapy, junior company, rural extension.



Flower production in Nova Friburgo: Local policies and regional development

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Abstract:

In the State of Rio de Janeiro as a highlight for the metropolitan regions of Rio de Janeiro, highlighting the municipalities of Nova Friburgo and Rio de Janeiro. Floriculture no State of Rio de Janeiro HAVING METHOD OF SOCIAL COMPOSITION BEING, Above all, BY Small Producers Being Relevant STILL FOR Being Family Farmers no What is the spatial cut of the Research and the district of São Pedro da Serra in the Town of Vargem Alta no municipality of Nova Friburgo. The justification of the work is given by a social issue linked to economic aspects and a quality of life, the material needs that sustain rural-urban integration. In this context, the production of flowers and ornamental plants emerges as an

economically and socially important activity for the municipalities, especially those closest to the metropolitan center. Being THUS, this Research has as a Concern to analyze the Spatial patterns of floriculture no State of Rio de Janeiro Associated with the Economic and Social Dynamics of Small and medium Producers located Near a large urban Market, besides Verifying The Issue of the Producers Organization That Gives New possibilities for rural producers and local policies, which act collectively through associations, become important to the community and in the development of activities.

Keywords:

local development, flower production, agriculture.

12 - Mountain Agriculture and Field Education

Contextualization of education regarding the dialogue of knowledge in peasants communities of the Andean area in Boyacá

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Abstract:

The economic development of communities is related to the alteration of natural energy flows to increase productivity; this leads to the simplification of biodiversity, the requirement of greater amounts of fossil energy and the increase of greenhouse gas emissions GHG. Before this reality, the AOF research group has sought to understand how some sustainable practices of rural development in Boyacá allow energy efficiency through the use of renewable energies, rational handling of natural resources, the integration of communities, strengthening of intergenerational links and cooperativism. Methodologically, the work has been carried out through participatory research in the localities, with producers, students and researchers from different disciplines; in order to understand local experiences, on energy saving with the use of renewable energy alternatives from the perspective of sustainable development. Therefore, it is necessary that this type of practices be strengthened and disseminated, so that on one hand the relevance of the rational handling of natural resources in agroecosystems can be understood in an integrated manner, and on the other hand, to contribute to productive innovation with contextualized technology, strengthened with the dialogue of knowledge as an intergenerational participatory strategy. Thus, in the topographical diversity of the department of Boyacá in Colombia, work teams have been strengthened around the

empowerment on the recovery of soils, productive diversity, autonomy, sovereignty and social, environmental and economic security.

Keywords:

rural communities, empowerment, generational relief.



Memories of lives in the countryside: the Green Revolution and the transformations in the “arts of making and socializing” of the workers of rural districts of the Fluminense mountain range. (Nova Friburgo e Sumidouro) (1950-2000)

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Abstract:

This article has a main objective is to analyze the transformations in the economic, social and cultural practices of rural workers in two municipalities of the Serrana Fluminense region during the last 50 years of the 20th century. The theoretical-methodological reference of the research, of qualitative character, is based mainly on Oral History (Ferreira and Amado, 2006; Thompson, 1998). Through it, the socio-economic reality and the social / collective memory (Le Goff, 2013) of these communities were investigated using the concepts of “tactics, strategies, ways of being, of doing and of living” by Michel Certeau (2008). The team, formed by the coordinator, a linguistic professional and two fellows visited and interviewed, from a thematic roadmap, some of the oldest families in these regions. So far, 25 interviews have been conducted. For

the time being, the information obtained shows that farmers realize that: changes in agricultural practices occurred after the arrival of Japanese settlers in the region, as they brought new farming techniques; the pesticide was used in small quantities and there was not much variety of pesticides; and that there was an increase and replacement of some crops in production. The project is expected to: create and make available to society a corpus that will help in the study of the history, agricultural practices and social relations of the rural communities studied; promote the debate on the local consequences of the Green Revolution; and lead to a reflection on the indiscriminate use of pesticides in these regions.

Keywords:

oral history, social memory, regional history.



Strategies for friendly farming practices adoption in family production units in the mountain region of Rio de Janeiro State.

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Abstract:

The climatic catastrophe in January 2011 in the mountain region of Rio de Janeiro State, affected many family farmers who predominantly practice conventional agriculture based on vegetables monoculture. An ecumenical service organization that worked with those affected, formulated the project “Agroecological Backyards: A Path to Food Security in the Mountains Region of Rio de Janeiro State”, with the objective of contribute to improve food security conditions of farmers’ families affected in Teresópolis and Nova Friburgo. With the dissemination of agroecological practices

that stimulated people to question the adopted agricultural model. Concepts about these practices were shared in workshops, with theoretical and practical content, and in technical visits. Considering that soil fertility management have a high cost with the synthetic fertilizers use, two agroecological practices related to this management were observed in two production units located in Teresópolis, led by traditional farmers (organic and conventional) identified as multipliers. It was apply four treatments: control, Bokashi compost, green manure and green manure plus Bokashi compost. The grown of rocket (*Euruca sativa*) and lettuce (*Lactuca sativa*) in succession were avaliated. The results showed that green manure from millet and crotalaria juncea mixture and the use of bokashi compost were satisfactory, in fertilization and production cost. However, the conventional farmers' family, although satisfied, did not adopt the practices, evidencing the necessity of deepening on methodological tools for practices adoption that provide agroecological conversion.

Keywords:

socialization of knowledge, agroecological practices, family farming.



The training of the technician in agriculture of the Interescolar Center of Agriculture (CIA) Jose Francisco Lippi-Teresópolis-RJ

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Abstract:

This study results from the research carried out to present the

vision of the training of the Agricultural Technician of the Interscholastic Center of Agropecuaria (CIA) José Francisco Lippi, agricultural school in the municipality of Teresópolis, state of Rio de Janeiro, under the watchful eye of the actors involved, teachers and graduates. The research showed that the interviewees believe that the training is able to prepare them for insertion in the labor market in a partial way, due to a reduced workload that if it were enlarged, would remedy the lack of deepening in some disciplines considered important for a good formation . The students argue that increasing the workload to three years would be ideal for training, enabling them to deepen the disciplines of greater appeal in the labor market, such as mountain farming and complementary disciplines such as beekeeping. Despite all the placements, the actors involved believe that training in the CIA is good and that they are and will be inserted into the job market in their technical training if there is demand. The study also allowed to indicate some points to be improved in the disciplines in order to meet the demands demanded by the changes in the world of work, as the insertion of the content on Agroecology. The students and the graduates also approve the system of concomitance and subsequence, not being considered the integral or alternating education indicated for their reality, because half of the students come from the urban zone and half from the rural area need to be helping families on a daily basis in agricultural activities.

Keywords:

professional education, technical course in agriculture, Teresopolis farm school.



Contributions from Fazendinha Agrocológica Km 47 for agroecological practices dissemination in the mountain region of Rio de Janeiro State

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Abstract:

Agroecological and organic-related knowledge generated in academic fields sometimes takes a long time to become a common practice on farmers reality. The objective here was to confront this paradigm and reduce the distance between farmers and research institutions. To achieve this, researchers, professors and postgraduate students linked to institutions that make up Fazendinha Agroecológica Km 47 carried out activities in partnership with the Agroecological Association of Teresópolis - AAT and the Biological Farmers Association of the Rio de Janeiro State - ABIO. These activities were supported by the projects "Socialization of knowledge and technological development aimed at agroecology and organic production in Rio de Janeiro State", financed by Carlos Chagas Foundation of Research Support to Rio de Janeiro State - Faperj, and "Agroecological Strategies for Food Security in Mountain Environments" financed by National Council for Scientific and Technological Development - CNPq. Eight activities were carried out, including workshops and field days, with the topics: "Organic fertilization management and use of organic composts", "Soil cover and green manure species", "identification and use of unconventional food plants", "Phytosanitary in agroecology", "identification of natural enemies of crops pests", "environmental suitability in organic production systems", "good practices of processing plant products" and "water resources management in organic production systems". The activities took place in farms or in the agroecological fair of Teresópolis, allowing the application and demonstration of the themes in farmers' action

places. Around 200 farmers were involved, resulting rich times of debate and horizontally knowledge exchange.

Keywords:

knowledge construction, family farming, agroecological production.



Agroecological Mandala Project: benefiting health, rural ways of life and socio ecological environment in mountain region

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Abstract:

The Agroecological Mandala Project was implemented at the farm school by students and professors of The Family Center of Formation in Alternation Agricultural State College Rei Alberto I. The objectives were to attend to the contents of the disciplines of Agroecological Practices, Introduction to Agriculture, Biology, Physics and Sociology, and produce food without the use of chemical inputs, to improve the nutritional quality and food safety of school meals. The chosen methodology involved practical agroecological activities and their theoretical concepts, namely: agroecology; soil; soil analysis and recommendation; production of greenhouse seedlings; scientific methodology; vegetables/greenery; diversity, crop rotation and consortium; dead cover; manual weeding; sprinkler irrigation; composting and vermicomposting;

organic and green fertilization; natural enemies; biological control; alternative defenses and joint effort (mutirão). With the support of sociology, we reflect on the integration between theory and practice, on the political issues of organic and agroecological farming and the importance of peasant family farming. In the development of the project, it was possible to observe positive results such as the excellent quality and productivity of the cultivated products, as well as the great baggage of knowledge acquired through team work and the dedication of teachers and students. It is concluded that the area was productive, meeting the demand of the Family Center refectory, and the agroecological knowledge generated today is a great help to the daily life of students, who carry out their agricultural activities in the region dominated by conventional agriculture, including being chosen as a model for the development of the Professional Project of the Youth of one of the students. The project showed that it is possible to reconcile human beings, socio-ecological environment and production, contributing to the sustainable productive growth in the region's agriculture.

Keywords:

mountain agroecology, field education, interdisciplinarity.



Field Education and Alternation Pedagogy in the promotion of agroecology in the Mountains of Rio de Janeiro State

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Abstract:

It is found in the mountainous region of the state of Rio de Janeiro, in southeastern Brazil, the only experience of technical training in agriculture by Alternation in the State. The Family Center of Formation in Alternation Agricultural State College Rei Alberto I, located in the municipality of Nova Friburgo, receives mainly youngsters of family farmers who present their main agricultural crops and their ways of life closely related to the agriculture in a mountain environment. The mountain region of the state of Rio de Janeiro is one of the most expressive regions of the state in the production of vegetables, supplying daily to capital and all surroundings. Majorly, family farmers in this region practice conventional agriculture, make use of high doses of pesticides, agrotoxicals, and agrochemicals, and are inserted in the market, where farming practices often do not take into account the importance of mountains and their technical and socio-ecological specificities. These environments are important for the conservation, preservation and for the implementation of strategies of sustainable and endogenous rural development, mainly for ecosystem goods and services, for the presence and promotion of water sources that supply water to the various human activities. Thus, it is fundamental that discussions of strategies for these territories should be permeated by philosophical and epistemological principles of the Alternation Pedagogy and Field Education about proposals based on models of ecological agriculture, strategies of accessory multifunctionality and pluriactivity that contribute to agricultural activities. In 2015 the Family Center hosted the 4th edition of the Fluminense Forum of Field Education (FOFEC) where the exchanges strengthened the organicity of the Forum in regionals, composing since then the Mountain Regional. In the present year, the Family Center is also part of the Agroecology Articulation of the State of Rio de Janeiro, being part of the mountain regional, and also including having a student being selected as representative woman, student and farmer participant in the Agroecological and Citizen Training Project for Young Rural Citizens of Rio de Janeiro, developed by the Federal Rural University of Rio de Janeiro, at the VI National Meeting of Agroecology, held in Belo Horizonte - MG at the beginning of June.

Keywords:

mountain agroecology, alternation pedagogy, field education.

13 - The role of Science, Technology and Innovation for territorial development from Andean and Latin-American Perspectives

Conciliation between tradition and innovation for the resilience of traditional mountain cheese value-chains: the role of social capital. Example of the artisanal Serrano cheese value-chain in southern Brazil

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Abstract:

The dominant agricultural model leads to exclusion of rural mountain areas and to marginalization of their cheese value-chains. In such value-chains, the valorization of the traditional know-hows and product quality, as well as, the control over technical innovations are important elements. Territorial innovations, defined as a response to a problem identified collectively in a territory, allow adaptation to changes; and the conciliation between traditions and territorial innovations is a key-factor for the value-chain's resilience. Social capital needs to be mobilized to cooperate and innovate; however, we observe often an organization deficiency in these territories. Semi-structured interviews were conducted with local actors in the Serrano cheese value-chain, in Southern Brazil. It is an informal chain, due to hygiene standards which do not comply with small scale and artisanal production and to new consumers' preferences looking for fresh cheese. The aim of this article is to analyze strategies for building a resilient value-chain, by studying

the role of social capital in the equilibrium between tradition and innovation. First, we observe that the extension services are the central actor in the innovation processes, by diffusing technical innovations and also, by developing organizational innovations through the creation of associations. Indeed, the associations allowed linking different actors of the value-chain through weak ties, necessary for collective organization and territorial innovation emergence. However, the analysis showed instability of coordination between producers and the necessary support from the extension services. Second, the family members within production units are linked through strong ties, allowing the maintenance of traditions.

Keywords:

tradition, territorial innovation, resilience, social capital.



Geographical Indication of coffee of Saw Mantiqueira as a tool for territorial Development

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Abstract:

The research starts from the perspective that nature, historical heritage, culture are part of the landscape and can anchor a territorial development strategy, as it contains particularities that differentiate the territory. In Minas Gerais, southeastern Brazil, the Saw Mantiqueira is a mountainous chain that combines special conditions that contribute to territorial development, being known for its typical mountain climate, with hydromineral resorts and where tourism brand largely on the dynamism of economic activity in the

region. Because it is a region of high altitude, and made up of a particular topography with a healthy climate pattern, it is suitable for the production of specialty coffees. In this context, given the tangible and intangible resources of the territory, the local actors seek to establish coffee as a quality product and, therefore, differentiated. Through the field research, where a survey of information was made through interviews, it was verified that the obtaining of the Geographical Indication registry and the continuous improvements in the production process allow the small and medium rural producers the access to more sophisticated markets both in the internal and external environment, generating greater profitability. In addition, the production of special coffees allow: job creation; preservation of know-how and biodiversity; improvement in the quality of life of producers and employees; increasing the interest of their children and relatives in continuing to produce coffee and, lastly, increasing tourism in the region.

Keywords:

serra da Mantiqueira, geographical indication, territorial development.



Handling of organic waste in the central region of the department of Boyacá

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Abstract:

Human activities generate solid waste and household and agro-industrial liquids of animal and vegetable origin, which can be recycled to avoid problems of contamination to water sources, soil,

air and countryside. Before this situation there are alternatives such as landfill disposal, recycling, composting, which can produce electric energy or heat of combustion to be used in burning, microbial nutrition or plant nutrition. The handling of this waste must be done under controlled conditions (temperature, pH, humidity percentage, percentage of oxygen and carbon to nitrogen ratio), in order to do not to generate contamination to the environment neither soil nor water sources, with heavy metals, organic molecules, gases and microorganisms. The AOF[1] Research Group has developed in the central region of Boyacá (high Andean tropics) projects in the line of handling organic waste, for example, in the municipality of Paipa (2760 masl) have been composting urban organic solid waste - 220 tons average monthly - which 22.51% corresponds to organic, 36.12% recyclable and 19.37% unusable, the organic fraction contains 50% of moisture from which 200 L / ton is collected as leachate. On the other hand, in Ventaquemada (2800 masl), 33 tons of ruminal content per month are transformed from the Villapinzón municipality's beneficiation plant through the California red worm (*Eisenia foetida*). This supply contains 80% moisture. These materials are transformed into fermented solid and liquid organic fertilizers that are used as fertilizer and emulsifiers in crops, since during the process they are free of pathogens such as Salmonella, Clostridium, E coli and helminth eggs, in addition after the process they are heavy metals free, which is used to adjust to the parameters of quality, to be used as soil or foliar fertilizers that produced in a harmless way, can be used in agriculture for the production of food.

Keywords:

energy, fermentation, solid waste.



The contribution of technology in the communitarian process of Salinas Parish located at the Province of Bolívar - Ecuador.

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Abstract:

The parish of Salinas is located at the Province of Bolívar - Ecuador at 3,600 meters above sea level and its average temperature is 12° C. Its community development process began in 1970. Currently, it has 30 communities on an area of approximately 440 km² at an altitude of 800 m (subtropical) to 4,200 m (moor).

Father Antonio Polo promoted this community process, and over the course of fifty years has allowed a process of transformation of this parish that nowadays has different productive units such as cheese factory, confectionery factory, spinning mill, sausage factory, mushroom dryer, hotel, among others.

The communitarian process went through three critical stages that allowed its consolidation: the first stage corresponded to the arrival of the Father Polo as a volunteer of Operation Mato Grosso, temporarily corresponds between 1970 and 1978; it was oriented to build the minimum infrastructure and the creation of different organizations to promote different productive projects. During the second stage, there were developed a production and marketing systems (1978-1990). Finally, in the third stage (1995 to the present) a process of decentralization of production to the communities was promoted.

This research aims to understand the contribution of technology in the communitarian development process of the parish through the focused ethnography.

Keywords:

communitarian process, technology, focus ethnography.



Management systems perspectives: an integrative approach to sustainability dimensions in tropical mountain ecosystems micro-watersheds

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Abstract:

Management Systems that have Man-Society-Nature system coupled may adopt units of analysis differentiated and non-exclusive approaches due to the anthropic pressures on the natural environment. Policies, Plans, Programs and Projects (PPPPs) adopt different qualitative and quantitative analytical perspectives such as corporate environmental, socio-environmental, socio-ecological or ecosystemic management, where the concepts of efficiency and resilience guide principles for establishing specific sustainability goals. The Design of a Framework for a Water Management and Governance system in tropical mountain ecosystems micro-watersheds should consider the interaction and integration between productive, social, institutional, territorial, science and educational arrangements, as an analytical transdisciplinary ecosystemic unity. This Integrative, strategic, perceptive, cognitive and analytical approach would allow a new theoretical, conceptual and practical reality revealing new aspects, impacts, variables and actors for an Engineering focused on Sustainability. This paper aims to present a theoretical-methodological framework based on the concept of Ecosystem-based Adaptation (EbA), Strategic Environmental Assessment and the Driving Force-Pressure-State-Impact-Response Indicators Matrix in micro-watersheds researchs developed by the Serra dos Órgãos University Center (Unifeso)' Engineering courses.

Keywords:

tropical mountain ecosystems, water management governance,

micro-watersheds.

14 - Mountain Cities: inclusive, safe, resilient and sustainable

Where the wild things are? Wildlife and humans coexisting in an African montane town

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Abstract:

Despite rapid urbanization on the African continent, we know almost nothing about urban wildlife in Africa, i.e., wild species that thrive amongst human infrastructure. This lack of information is particularly stark in mountain regions, where human and animal **communities** are subject to an unpredictable and vulnerable environment. For example, the mountains of Qwaqwa, South Africa, are characterized by torrential downpours, large-scale fires, and snowfall. Here lies a protected high-altitude grassland, Golden Gate Highlands National Park, adjacent to one of the economic hubs of the region, the peri-urban town of Phuthaditjhaba. This mosaic landscape of human-modified and undisturbed environments likely represents unique opportunities and risks to both wildlife and human communities. The urban areas may be high-risk zones for small rodents and carnivores, but after snowfall, it could represent refuge and a source of food. Simultaneously, humans utilize wildlife in traditional medicine and as sources of food (mediated by cultural background and livelihood), and may facilitate the introduction of non-native species. This study documents the occurrence of wild vertebrates in GGHNP and Phuthaditjhaba, using transect data from the harsh winter season, before and after snowfall. It also discusses possible reasons for the occurrence and absence of particular species in town, based on interviews with local communities. Combining ecological and sociological data, this unique study gives novel insights into the relationship between

humans and nature in African mountains.

Keywords:

African cities; ecology; high-altitude grassland; urban wildlife.



Socio-environmental changes in the Himalayas from Nepal's urbanization policies- A case for urban sustainability policies

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Abstract:

Nepal's rapid urbanization rate of 3.4% is one of the highest in world. For a long time, Nepal was the least urbanized nation in the region; however, recent social-changes from out-emigration of young people for employment in foreign countries and local development activities have catalyzed rapid rural to urban migration. For example, in 1961 only 3.6% of the population lived in cities, the urbanization process was slow in the preceding decades up to 1991 and spiked after 2000- 4% in 1971, 6.4% in 1981, 9.2% in 1991, 14.4% in 2001, 17.1% in 2011 and 19% in 2016. In the meantime, the number of urban centers increased from 16 in 1961 to over 58 in 2011. The addition of 159 new municipalities in 2014/2015 increased the urban population to 40% of the total. In 2017, the government added 61 more municipalities to make the total 278. This makes Nepal 62.3% urbanized; however, the core urban population remains under 20%. This paper analysis the impact the realignment of administrative units into urban centers has on the environment, particularly in the hilly and mountain regions. These include lack of basic services, land degradation, waste management and slum settlements. The objective is to

develop a sustainability index for urbanization for Nepal that can minimize the impact urbanization can have on the social, cultural and environmental factors in the region. The future of Nepal's urban areas depends on balancing the migration of people, economic growth with environmental values and government policies on urban sustainability.

Keywords: Nepal, Urbanization, Mountains.



10 essential steps for the construction of Resilient Cities to disasters: The municipality of Três Rios/Rio de Janeiro-Brazil

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Abstract:

The world's population is growing and cities are constantly expanding to adapt to the demands and demands that arise. Given this scenario, it is common to observe natural areas being modified for construction of urban areas, agricultural, highway construction, among others. In developing countries, natural hazards and their consequent disasters are mainly correlated with accelerated and uncontrolled urbanization, environmental degradation, fragility of response capacity and poverty. From this analysis, it is proposed to analyze and make feasible the concept of resilient cities for the municipality of Três Rios/Rio de Janeiro-Brazil, following the premises of the campaign " Making cities resilient: my city is getting ready!" (UNISDR/UN). The data were extracted in collection from the Government Secretariats in the municipality, being these Civil

Defense, Education, Finance, Government and Planning, Urban Infrastructure and Design, Environment and Agriculture, Construction and Housing, Health, Public Services and Transportation. Therefore, second to the maximum, “to think globally and act locally”, that is, to think globally the municipality, in a holistic way and to act locally, each secretariat in its actions. It is concluded that the municipality of Três Rios/RJ has well-structured, positive actions for some steps in secretariats that maintains a direct relationship, but deficiencies in others, which should be taken care of to verify such problems and propose adjustments and solutions, the levels of concrete effectiveness in actions in search of the road to a resilient city. We have must maximize positive actions and minimize negative actions to the point of nullifying them.

Keywords:

resilient city, natural disasters, government leaders.



Resilience Applied to Urban Mobility: A Methodological Proposal

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Abstract:

Brazilian cities are still very dependent on fossil fuels, especially the transport sector, which consequently affects other sectors of the economy, as was observed in the recent case of the truck drivers strike in Brazil. After a few days since the strike of truck drivers', some cities have already begun to collapse, affecting food distribution, fuel availability, public transport operation, energy supply, schools, hospitals, public institutions, etc.

Unlike some large cities in Brazil, medium and small cities have little diversity of transportation modes, standing out for their dependence on buses and private modes. This research intends to evaluate urban mobility under two risk situations: spontaneous and significant increase in fuel prices; and lack of fuel availability. The question of this research is: How resilient are we, in the face of fossil fuel threats?

The objective of this work is to generate an indicator for the resilience of urban mobility, with a quantitative methodological perspective. This methodology is based on evaluating the current and future conditions (considering the risk conditions mentioned above), based on the current urban mobility options, the employee expenditure matrix (eg, basic expenses, superfluous and transportation expenses), cost of mobility and morphology of the city.

The proposed methodology was applied to the city of Rio de Janeiro. To complement, this research discusses the importance of extending this study to medium size mountain cities, with the intention of demonstrating the level of social vulnerability of these cities, in regard to urban mobility.

Keywords:

Resilience; Urban Mobility; Fossil Fuels



Mountain cities in Iran, attractions for ecotourism: Kuhkands (carved in mountains)

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Abstract:

There are different types of mountain cities in Iran, a mountainous country. Some of these cities are very interesting historically and have been carved in mountain rocks centuries ago where still people are living there:

1- Meymand village in Kerman Province in South east of Iran;

2- Kandovan village near Tabriz in the Eastern Azarbaijan of Iran carved in Sahand Mountains and is one of three most beautiful rock villages in the World;

3- Delijan mountain village situated in the Markazy Province in center of Iran near the famous caves;

4- Qeshm mountain carved, in the Qeshm Island in the Persian Gulf.

These are very beautiful places every year visited by many Iranian and foreign tourists. As a mountain climber with 50 years of climbing experiences the life in these mountain carved villages will be discussed with photos.

Keywords: Meymand, Kandovan, Qeshm, Delijan, Rock carved.

15 - Conservation of Mountain Landscape and Sustainable Development

Prioritising Climate-Resilient Options For Building Sustainable Mountain Roads, Using Multi-Objective Approach

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Abstract:

Road-transport plays an essential role in overall socio-economic development of a region. The road networks, especially in rural and fragile mountain terrains, are vulnerable to the impacts of extreme weather events like floods, landslides and snow avalanches. Poor maintenance and large unpaved networks further magnify the inefficiencies of road transportation, leading to economic losses. While even under current budgetary constraints, conditions can be improved, a crucial challenge that remains with policy-makers and road-experts is to ascertain the additionality of resilience-cost (cost incurred additionally for climate-proofing infrastructure) and thereby make trade-offs in other social and economic sectors.

As an answer to this policy-dilemma, this paper highlights how multiple objective decision analysis (MODA or co-benefit approach) can be applied to arrive at empirical policy options, identifying multiple benefits and thereby justifying trade-offs during various stages of policy making and development planning. Using a case study from the Indo-Himalayan State of Uttarakhand, "All-Weather *Char-Dham* Highway Development Project" (connecting four pilgrimage spots that has annual footfall exceeding 0.2million and border defense areas), this paper deliberates on the practical application and limitations of MODA approach as a useful cost-benefit tool that decision makers, research institutes and

governments may apply in creating a sustainable future.

Keywords:

Mountain roads, climate resilient, multi-objective approach.



Evaluation of Mountain eco - environmental vulnerability using Remote Sensing and Geographical Information System in Pasol Gad Watershed of Garhwal Himalaya, India

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Abstract:

Like other parts of Himalaya, Garhwal region in Uttarakhand (India) has a complex Physiographic features with diversified climatic conditions and therefore it is suspect to environmental vulnerability. The natural disasters and also anthropogenic activities accelerate the rate of environmental vulnerability. Therefore, it is important to calculate environmental vulnerability to understand and explain the levels of vulnerability in areas like Himalaya. The Mountains environmental vulnerability is calculated by taking factors of landuse class changed, the rate of vegetation cover, slope, soil, forest fire risk, landslide susceptibility zone, human population density and vegetation index based on geoinformatics technologies and numerical models. The data of these indicators has been obtained mainly from LANDSAT, Google Earth , Shuttle Radar Topography Mission (SRTM) of 90 m and Census hand books. From those indicators, the environmental vulnerability integrated index (EVSII) is calculated for Pasol Gad Watershed of Garhwal

Himalaya for the year 2014 and the Vulnerability is classified into five levels i.e. Very low, low, medium, high and very high by means of cluster principle. The result indicates that medium, high and very high levels are dominating in the area and it is mainly caused by the anthropogenic activities and natural disasters and it is found that near about 5.73 % of an area are in safer zone. Therefore, maximum area of the Pasol gad watershed shows extreme environmental vulnerability.

Keywords:

Environment Vulnerability, Watershed, Geographic Information System, Anthropogenic and Himalaya.



An Iterated Gis-Based Multi-Criteria Decision Analysis To Select Conservation Strategic Areas In Mountainous Regions

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Abstract:t:

There is an increasing pressure to regulate human practices taking place in the surroundings of mountain habitats in order to prompt the preservation of their high biodiversity levels. This is particularly true in the buffer zones of protected areas established on key mountain ranges such as the tropical Andes. In our research, we are working on the design and implementation of sustainable management approaches to preserve a key tropical high-altitude Alpine ecosystem: the so-called páramo. Our case study is focused on a key protected area of the Colombian Central Andes. We are building a multi-criteria decision analysis to identify

strategic areas for conservation to guarantee that they receive enough financial management resources. Three aspects are being considered: environmental characteristics (total carbon stock, water yield and biodiversity level), connectivity and total costs. Spatial analyses are conducted at a 100-m resolution. The contribution of each grid point to the overall conservation strategy is quantified by means of a multiple objective analysis. A two-tiered algorithm first defines and maps environmental and cost criteria. Then it performs, for each cell available for conservation, an analysis of which would be its connectivity to the already-conserved neighboring gridpoints. Once the grid point with the greatest contribution is selected, its cost is subtracted from the total available funding and the search for the next best alternative is carried on until all available resources are completely allocated. We argue that this spatial analysis could provide decision-makers with an additional tool for the conservation of highly threatened, mountain environments.

Keywords:

Conservation, mountains, sustainable development, decision-making.



Fertility In Soils Cultivated With Parsley In The Municipality Of Nova Friburgo - RJ, Brazil

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Abstract:

Due to the considerable socioeconomic importance of the production of parsley in the mountainous region of the state of Rio

de Janeiro, the objective was to evaluate the fertility in soils cultivated with this vegetable in the municipality of Nova Friburgo. We selected 14 family farms under which soil samples were collected at a depth of 0,00-0,20 m for determination of pH, organic matter, P, K, Ca+Mg and Al, according to the methodology proposed by Embrapa (2011). The data were submitted to descriptive statistical analysis and the results compared with the values established for the state of Rio de Janeiro according to Freire et al. (2013). The results revealed that the pH ranged from 4,77 to 6,55, presenting half of the properties evaluated values considered strongly acid and the other half values considered moderately acidic. The organic matter content varied between 21,98 and 81,78 g.kg⁻¹, presenting medium and high content, respectively 51,7% and 42,9% of the evaluated properties. The exchangeable contents of Ca+Mg in the soil varied from 2,95 to 16,23 Cmoc.dm⁻³, presenting 64,3%, 28,6% and 7,1% of the Ca+Mg content properties, respectively classified as medium, high and very high. The contents of P and K ranged from 63,7 to 714,7 Cmolc.dm⁻³, and 122,0 to 514,5 Cmolc.dm⁻³, respectively. 100% of the evaluated properties presented P and K content considered as very high. The high levels identified can lead to future nutritional imbalances affecting the development of plants and the consequent productivity of the area, in addition to possible environmental contamination.

Keywords:

Agriculture; mountainous region; *Petroselinum sativum*.



Heavy Metals In Soils Cultivated With Lettuce In The Municipality Of Nova Friburgo-RJ, Brazil

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Abstract:

The municipality of Nova Friburgo is one of the main producers and suppliers of lettuce for the metropolitan region of Rio de Janeiro (RJ). The objective of the present study was to quantify the pseudototals contents of Cr, Co, Cd and Ni in soils cultivated with lettuce in the municipality of Nova Friburgo. Soil samples were collected at depth of 0,00-0,20 m in 18 family production properties, with heavy metals being determined using the 3050B method (USEPA, 1996). The results were submitted to descriptive statistical analysis and the results were compared with the guideline values recommended by CONAMA (2009) and the Quality Reference Values (VRQs) for the mountainous region of the state of Rio de Janeiro established by Matos (2016). The maximum content of Cr, Co, Cd and Ni verified in the soil of the evaluated properties was 34,39; 7,79; 0,51 and 29,64 mg.kg⁻¹, respectively. In all evaluated properties, the contents of both metals are below the Prevention Value recommended by CONAMA (2009) (Cr: 75; Co: 25; Cd: 1,3 and Ni: 30 mg.kg⁻¹). However, when the contents were reclassified according to the VRQs determined by Matos (2016) (Cr: 43; Co: 11; Cd: 0,05 and Ni: 17 mg.kg⁻¹), it was found that 5,6 and 88,9% of the properties for Ni and Cd respectively, presented values above that established. No property presented Co and Cr content above the VRQ's determined for the mountainous region. Although the values found are below the one recommended by CONAMA, it is necessary constant monitoring of the arable soils, as a consequence of the high contribution of agrochemicals.

Keywords:

Mountainous region; ground pollution; *Lactuca sativa* L.



Mountain Biodiversity and the Sustainable

Development Goals: Knowledge for Synergistic Action

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Abstract:

The formulation and implementation of effective policies and management approaches to safeguard the natural assets underpinning human wellbeing in mountains requires a thorough understanding of the interactions between nature and people particular to mountain social-ecological systems. This involves understanding the specific challenges associated with the sustainable management and conservation of mountain biodiversity (including SDG 15.4) in the context of competing development goals, limited resources, complex governance structures, and a harsh biophysical environment. Here we report on our progress towards improving our understanding of these interactions and challenges at local to global scale; of the geographic, cultural, social, economic, and biological factors underlying them; and of the biodiversity-related opportunities that exist for sustainable development in mountains. Data acquisition on the states and trends in social-ecological mountain systems broadly follows the conceptual framework of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) and combines a literature review with participatory workshops, field surveys, and online questionnaires. Interactions between SDG targets are evaluated using recently developed statistical and consultation-based methods. We hope that this mountain-specific comparative assessment of interactions amongst SDG targets based on an analysis of the states and trends in biodiversity, ecosystem services, human wellbeing, and their drivers will contribute to identifying economically and ecologically efficient, socially acceptable, and politically feasible pathways towards sustainable development.

Keywords:

biodiversity, sustainable development goals, mountains.



Chemical Attributes Of The Soil In Areas Of Different Systems Of Use And Management In The Serra Da Mantiqueira Serra - Maria Da Fé, MG

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Abstract:

Brazilian soils are mostly acidic and concentrated with toxic aluminum species (Al^{3+}), which limit the availability of nutrients and affect the development of crops. However, management practices promote a significant contribution to the neutralization of Al^{3+} , improving soil quality. The objective of this study was to evaluate the pH as well as Ca^{2+} , Mg^{2+} and Al^{3+} levels at depths of 0-5, 5-10 and 10-20 cm in different systems of land use and management, implemented at distinct times in the municipality of Maria da Fé - MG, as follows: Native forest (M) and pasture with Capim Gordura - 6 years (CG) under biodynamic management, and pasture with Brachiaria - 15 years old (B) under organic management. The evaluated attributes were analyzed according to Donagemma et al. (2011). The results were submitted to analysis of variance with application of the F test and the mean values, when significant, were compared with each other by the Tukey test at 5% of probability using the SISVAR statistical program (FERREIRA, 2008). Among the evaluated systems, the pH varied from 4,7 to 5,6, $Ca^{2+} + Mg^{2+}$ content of 1,75 to 3,75 cmolc kg⁻¹, and Al^{3+} reached values that reached 0,3 cmolc kg⁻¹. In the CG and B management

systems, higher levels of Ca^{2+} + Mg^{2+} and a lower Al^{3+} content were observed and, consequently, a higher pH value when compared to the M area, thus indicating improvement in the chemical quality (acidity) of the soil managed under conservation systems evaluated.

Keywords:

biodynamic, organic, sortive complex.



Cabin, Manganese, Lead And Cobalt In Areas Under Conservasionist Management In Serra Da Mantiqueira - Maria Da Fé, MG

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Abstract:

Heavy metals can be absorbed by plants, which are part of human and animal food, giving high potential for toxicity to humans. The objective of the present study was to determine the levels of Cd, Mn, Pb and Co in the depths of 0-5, 5-10, 10-20 and 20-40 cm in different types of use and conservation management, namely: Native forest (M) and pasture with Fat Grass (CG) under biodynamic management, and pasture with Brachiaria (B) under organic management. The samples were digested according to USEPA 3050B (1996) and the levels determined by atomic absorption spectrometry. The results were submitted to analysis of variance with F test and mean values, when significant, were compared by the Tukey test at 5% of probability using the SISVAR

statistical program (FERREIRA, 2008). The levels of Cd, Mn and Co were higher at depths of 0-5 and 5-10 cm in all areas. The Pb contents were larger at depths 10-20 and 20-40 cm in area M and 20-40 cm in area CG. When compared to each other, the Mn was identified as the metal with higher concentrations in all areas and depths. However, it is noteworthy that none of the values found on both metals was higher than the Quality Reference Values (VRQ) established for the state of Minas Gerais - Normative Deliberation No. 116 (COPAM 2011), thus showing that the different systems of use and management studied did not compromise the quality of the soil in relation to the metals analyzed.

Keywords : heavy metals, soil contamination, toxicity.



Granulometric Fractionation Of Organic Matter In Areas Under Conservasionist Management In Serra Da Mantiqueira- Maria Da Fé, MG

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Abstract:

Conservation management systems contribute to increase soil organic matter (SOM). The stratification of organic matter, through fractionation techniques, can act as an indicator of soil quality, one of which is granulometric fractionation. Through this technique, it is possible to quantify the organic matter present in the sand size (COp) and to which clay and silt fractions (Coam) are associated. The objective was determine COp and Coam, in the depths of 0-5 and 5-10 cm, in areas of: native forest (M), Olival (O) and pasture

with Fat Grass (CG) under biodynamic management and pasture with Brachiaria (B) under organic management. The mean values, when significant, were compared by the Tukey test at 5%, using the SISVAR program (FERREIRA, 2008). The values were determined according to Cambardella & Elliot (1992) and submitted to analysis of variance with the F test. The values of CO_p were lower than those of CO_{am} in all areas and depths. At depth of 0-5 cm, area M showed the highest values of CO_p and CO_{am}, with the other systems presenting lower values and statistically equal for both parameters. At the depth of 5-10 cm, the highest values of CO_p were verified in areas M and CG. However, at the same depth, the M, O and B areas had statistically higher and equal values of CO, differing only from the CG area. In this way, it was verified that the evaluated conservation systems contributed to the maintenance of the SOM content, increasing the sustainability of agricultural systems.

Keywords:

sustainability, humic substances, biodynamic management



Environmental Conservation And Economic Activities In The Brazilian Mountains - Study In The Mountain Region Of The Rio De Janeiro State

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Abstract:

Environmental legislation in Brazil was elaborated in an autocratic way, without taking the precautions of socializing knowledge and generating alternatives that allow the necessary changes to be made. It results in conflict with the agricultural practices of a large

portion of family farmers located in ecologically sensitive territories, such as the mountain environments located in the Atlantic Rain Forest biome. Many agricultural areas, where there are economic activities in the mountains, are in Permanent Preservation Areas - PPA and Legal Reserve, and need to comply with specific legislation. In the mountain region of the Rio de Janeiro state the vegetables' production is made by family production systems with low sustainability, supported by strong insertion in the capitalist economy and, therefore, with elements of business mode of production. In order to increase the sustainability of local mountain family production systems it is important to promote actions that aim at the agroecological transition, by rescuing and strengthening of practices, strategies and consumption patterns. This study makes a history rescue of environmental conservation in Brazil, with emphasis on the Rio de Janeiro state, and characterizes, in this context, the economic activities in the hills of its Mountain Region.

Keywords:

Atlantic Rain Forest, mountain farming, economic activities.



Soil Invertebrate Macrofauna In Cultivation Of Black Oats In The Municipality Of Nova Friburgo, RJ

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Abstract:

After the environmental disaster, in January 2011, in the municipality of Nova Friburgo, RJ, many farmers adhered to the use

of black oats, due to the adaptation of agro-environmental conditions and various benefits to the soil. The objective of the study was to evaluate the invertebrate macrofauna in areas of black oat cultivation with and without fertilization. The selected areas at the highest part of the landscape were: Area 1 - unfertilized oats; Area 2 - fertilized oats with formulated NPK 4-14-8 (1 Mg ha⁻¹), and forest area - Atlantic Forest fragment with no record of anthropogenic action. Sampling was carried out with the removal of a soil monolith of 25x25 cm and 10 cm depth, with five replications per area. After the identification and counting of individuals were calculated the density of individuals m², richness, Pielou and Shannon diversity indexes. The area 2 presented higher density of individuals, in relation to Area 1. Richeness values were the same in cultivated areas with oats. On the other hand, Area1 presented the highest indexes of Shannon and Pielou. The higher occurrence of the Oligochaeta and Formicidae groups reflected in the values of the ecological indexes in Area 2. The forest area presented expressive density and richness, but lower values of ecological indexes. The cultivation of black oats favored the diversity and uniformity of the different groups of invertebrate macrofauna. The balance of the diversity of macrofauna organisms favors various processes that benefit the system stability and the biological processes of the soil.

Keywords:

Soil conservation, cover plant, soil fauna.



Social Representation of Sustainability for producers of artisanal cheese in a mountain region in the city of Alagoa - South of Minas Gerais / Brazil

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Abstract:

The objective of this work is to know the social representation of sustainability for artisanal cheese producers in the city of Alagoa, in the south of the state of Minas Gerais, on the border with Rio de Janeiro, near the State Park of Serra do Papagaio, in the Serra da Mantiqueira region, Brazil. Among the artisanal cheese producing areas in the country, the highlands of the State of Minas Gerais stand out for the production of family base adapted to the mountainous relief. Qualitative research has great relevance in understanding the socio-environmental relationship in the mountain context. This study shows the results of the methodological strategy of the Discourse of the Collective Subject (DSC). This is the production and analysis of first-person speeches. The interviewees are family-based farmers who have the main source of income in artisanal cheese. The results, presented in the form of speeches, show that the producers point to sustainability as the subsistence of food for the family and the production of food for livestock; They seek to conserve natural resources such as water and soil in properties and recognize that artisan cheese produced from sustainable production has more quality and more value for the consumer. However, in view of the results obtained, it is verified that the producers are isolated in their practices and do not observe the reflexes of their actions in the preservation or conservation of the mountain ecosystem.

Keywords:

Mountain Conservation, Sustainability, artisan cheese production.



Fast Diagnosis Of Soil Structure As A Field

Indicator Of Pastures Degradation Stages

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Abstract:

Extensive livestock intensifies soil degradation in Middle Valley of Paraíba do Sul mainly by overgrazing and fire. Besides, region rugged relief contributes to erosion of slope and soil loss jeopardizing sustainable development in region. Hence, a strategy to reduce the panorama is to facilitate diagnosis by farmers of current stage of degradation in order to achieve soil and water conservative management practices. In this way Fast Diagnosis of Soil Structure (hereafter simple DRES) reveals as a field tool to ranking soil structure quality, where lower values mean worse structure. This work aims to confirm visual classification of pastures degradation stages using DRES tool and mean weight diameter (MWD) as validation methods. Experimental site farms are located in Valença-RJ and the soil of all studied farms are classified as Cambisols. Four stages of pasture degradation were visually defined as: N1-light, N2-moderate, N3-severe, and N4-very severe, considering forage cover, weed vegetation and soil exposure. Three repetitions of each treatment were selected, and soil samples were taken in 0.0-0.2 m for DRES tools and MWD calculations. The results show that MWD and DRES are efficient to confirm pasture degradation stages established by visual parameters. Lower DRES values (N3= 2.7, N4= 2.4) were associated to occurrence of smaller aggregates and weak soil structure, in contrast to N1 and N2. Positive correlation was obtained between the DRES values and MWD ($r= 0.44$, $p= 0.006$). Thus, DRES is as a feasible field tool to assess soil structure quality in pasture, capable to distinguish

degradation levels.

Keywords:

Soil aggregation, physical quality, DRES.



Production of dry mass and decomposition of black oat straw in the area of vegetable production

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Abstract:

The production of vegetables in conventional system with plowing, harrowing and use of rotary hoes in the direction of the slope of the hillsides, associated to the absence of cover plants expose the soil to the negative impacts of water erosion and consequently to the physical, chemical and biological degradation. The cultivation of winter cover plants like black oats (*Avena strigosa*) may be an alternative to mitigate soil degradation and improve physical, chemical and biological attributes over time, as well as to increase the productivity of vegetables. The objective of this work was to evaluate the dry mass production and the decomposition rate of black oat straw cultivated in fallow land under pasture for 5 years. The experiment was developed in the locality of Serra Velha, Barracão dos Mendes watersheds, Nova Friburgo, RJ. The sowing of oats was carried out in May 2015 and the desiccation in August. After that, the dry mass accumulation and straw collection were evaluated to evaluate the decomposition using litterbags that were distributed in the area. The gathering of the litterbags were carried out at 30, 60, 90, 120 and 150 days after their distribution in the field. The dry mass production was 8.06 Mg ha⁻¹. The decomposition was 32.8, 41, 51, 62 and 70.4% at 30, 60,

90, 120 and 150 days, respectively. Black oat cultivation in autumn / winter is an alternative to promote soil protection and minimize its degradation in vegetable growing areas in the Fluminense mountainous region.

Keywords:

No-tillage, mountain farming, vegetables.



Landscape conservation in a spatial arena: Prioritizing conservation areas in mountains through ecological mapping

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Abstract:

Concept of an integrated landscape approach has been envisioned in recent years for ecological and developmental outcomes. Mountainous landscapes like the Indian Himalayan Region are unique in terms of biodiversity and economic outputs. With current advent of development, sustainable strategies in mountainous landscapes require dynamic decision support. This can be achieved through ecological mapping of landscape attributes. In mountainous areas where intensive sampling becomes difficult, such an approach provides extensive but informative insights on biodiversity as well as developmental subjects. Our study aimed to generate ecological information of a montane landscape in a spatial domain. The objective was to generate topographical base layers and suitable habitat areas for some key mammal species. Our study area was Askot landscape (~4500 km²) in Western Himalayas in Uttarakhand, India; a zone of

convergence between Western Himalaya, Central Himalaya and Tibetan Plateau. We initially generated base layers of the landscape and followed a field exercise using gradient directed transects, vantage point counts and trail walks for a period of five years. Habitat suitability modeling was done for 9 species – Snow leopard, Blue sheep, Himalayan tahr, Common leopard, Red fox, Indian muntjac, Himalayan goral, Himalayan black bear and Indian crested porcupine using nine variables by maximum entropy model using software Maxent ver. 3.3.3k. Maps were generated showing habitat suitability of mammals across the entire landscape. Overlap map of suitable areas revealed an area of about 1500 km² as conservation priority area. This helped to identify ecological hotspot areas for the purpose of conservation and management.

Keywords:

Ecological mapping, Habitat suitability, Western Himalaya, Askot landscape, Maxent.



Characterization of milk production systems in family farms, producing artisanal cheese, in the Serra da Mantiqueira region

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Abstract:

Artisanal production in the state of Minas Gerais is characterized by its simplicity and location, dispersion between collages and values, surviving the pressures of modernization on production processes, not only by adherence to traditions, but also by the

isolation of rural properties. Growers of milk and artisanal products as the main activity generating employment and income. What is an identification of the milk production system is a fundamental step for the standardization and control of artisanal milk production, the objective of this work was the characterization of milk production systems adopted in two municipalities of the region. For this, 22 producers from Alagoas and 11 from Carvalhos submitted to the application of a filter, after prior consent. Most of the properties of Alagoa (86%) and Oaks (70%) have up to 30 ha. In both states, 82% of the herds made up of 30 cows, dry or lactating, largely crossbred. The production is a daily average of lactating cow in 14 liters in Alagoas and 10 liters in Oaks in two daily milks. In 2015, the average annual production of artisanal cheese per producer in Alagoa was 7,581 kg and in Oaks of 6,892 kg. It verified that the systems of milk production of the countries more supplied produce reflexes without volume of production of artisanal handicraft.

Keywords:

mountain conservation, sustainability, artisan cheese production.



Tourism, Ecocultural Heritage, Resilience And Landscapes Dynamics In Border Mountains Of The Iberian Central Mountain Range

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Abstract:

The border of central Portugal with Castylla y Leon and Extremadura in Spain, combines ecocultural resources of great value. These should be articulated in a complementary way in an

integrated territorial vision, reinforcing a wider market that, due to the differences and proximity, allow the construction of a composite tourist product.

The perceptions of the past, associated with the constraints and barriers that these spaces represent, have been attenuated and present at the present time a greater relationship, through the approximations generated by the physical and technological communication routes, as well as by the forms of formal and informal cooperation developed.

These territories, in addition to their natural value, represent their own ways of life, with systems of agricultural and forestry use, revealing a sustainable appropriation of the physical elements and their resources, allowing the construction of landscapes and ecosystems of ecoculture relevance, associated to the cultural heritage existing. At present, new opportunities are emerging as a result of tourism demand and its condition as international spaces of circulation. Mountain border areas, due to their patrimonial value and resources, require the coordination of efforts between the management entities and the various touristic actors.

Keywords:

Tourism, heritage, Mountain, Policies and Territorial Cohesion.



Prioritization of sub-basins for restoration of ecosystems in areas susceptible to soil loss and water quality in the mountainous regions of the Piabanha basin – Areal city, Rio de Janeiro/Brazil

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Abstract:

The research was to prioritize sub-basins susceptible to environmental degradation in a mountainous region in the area of contribution of the small Hydroelectric Power Station located in Areal city, Rio de Janeiro/Brazil, in order to contribute to territorial management and decision-making on restoration of ecosystems in mountain regions for soil protection and water quality. Ecosystem services are determinant factors in the quality of the river basins and the resilience potential of the landscapes, so it is a region with high eco-hydrological importance and several environmental fragilities that are aggravated by the extreme climatic events recurrent in the mountainous regions in Brazil. These are some of the values that guide applied research in support of attempting to improve practice. Therefore, to carry out the analyzes were obtained database of the digital elevation model of the USGS Explorer SRTM with resolution of 30 meters and the vector data of the RJ25 IBGE/Brazil Project. Initially were identified 9 sub-basins of the third order and extracted 9 morphometric parameters. These variables were correlated through the Weighted Sum Analysis technique, with the attribution of values in pesos to each variable. In this way, it was possible to generate a hierarchical model, classification and spatialization of the sub-basins at levels of risk of soil and water degradation in mappings. From the results it was possible to demonstrate the potential of geoprocessing for decision making on the application of resources for functional improvements in mountain landscapes.

Keywords:

Management of basins; Multi-criteria analysis; Restoration Ecology.



Agroforestry Systems for Landscape Restoration:

the case of Rio de Janeiro State, Brazil

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Abstract:

Anthropogenic activities are the main drivers of habitat loss and fragmentation, negatively impacting biodiversity and society. Forest Landscape Restoration (FLR) aims to reverse this scenario by aligning strategies to restore ecological functionality of natural ecosystems and to improve human quality of life. This study aimed to analyze the potential of Agroforestry systems (AFS) for FLR in Rio de Janeiro state, a mountainous region in a human-dominated landscape. We combined literature review, interviews with key stakeholders, focus group and participatory observation: 128 experiences were mapped, of which 18 were visited, and in six of them participatory socio-environmental diagnosis was carried out. Data about the AFS objectives and the species composition were collected, along with stakeholders' perceptions about them. Different types of AFS were observed, with different species, designs and management strategies, which subsidized a discussion about the role of different AFS in the restorative continuum. According to the stakeholders, the main benefits of AFS are: quality and diversification of food production, soil recovery, combination between reforestation and production, sustainability of the system and the sense of (re)connection with nature. Challenges include: access to knowledge and labor, inputs and markets, as well as legal insecurity in managing forests and in land tenure, which restricts long-term investments. Results point to necessity of increasing dialogue among different actors: the integration of environmental and agricultural policies is fundamental for scaling-up FLR, so that forest gain contributes for improving human quality of life, and not only to reflect the reduction of agricultural activity and rural exodus.

Keywords:

Integral ecological restoration, socioecological systems, forest transition.



Mountain landscape and its potential to enhance value added of mountain products

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Abstract:

Mountain landscape encompasses a rich amalgamation of natural, artificial and cultural elements. Nature features include altitude, soil and relief, vegetation, fauna, humidity, climate and water streams, textures, sounds and scents. Artificial features embrace paths, roads, bridges and buildings. As for culture, highlights go to peculiar techniques of farming, animal raising, hunting, land and water use, and the savoir faire embedded in typical modes of production and processing. Also part of mountain cultural landscape figures a diversified assemblage of art expression, ranging from music, poems, beliefs, and the entire mountain way of life which shapes human activity in mountain territories. For thousands of years, mountains landscapes have inspired mankind fostering feelings ranging from fear to admiration, from connection to gods and devils, serving as sites for sacrifices and festivities. In modern times, mountains are frequently a dreamed place for nature appreciation, vacation and leisure time, not to mention for health reinvigoration and spiritual retreats. While mountains are a much celebrated landscape with a distinctive identity, mountain products enhance and reflect mountain territorial identity. They may benefit from both physical elements of mountainous scenery, as well as from the human perception of this

attractive territory, especially if their production processes follow sustainable principals. Building on their favorable origins, mountain products can differentiate themselves from the similar ones lacking such a distinctive background. The aim of this research is to identify and examine a set of mountain products that are using their origin to enhance their value added, while following sustainability principles.

Keywords:

mountain products, landscape, sustainable development.



Emeralds in Colombia: Searching for Sustainable Development in the Andeans

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Abstract:

This paper analyzes the key transformations in mining regions in the Andean region of Colombia dominated by Artisanal and Small-Mining (ASM) during the resource exploitation process. It aims to understand the political economy underpinnings of the transformation of ASM mining regions in the mountains and offer policy alternatives to mitigate the negative effects of ASM while improving many of the positive aspects of the ASM, particularly the income opportunities and potential for local economic development. Many regions of ASM mining suffers with conflicts, lack of law enforcement and low level of services that lead to several social and environmental problems. The research is based on the case of a colored gem mining region, the production of emeralds in Muzo, Boyaca Department in the Colombian Andeans (Cordillera Oriental).

The formalization of the mining activities seem to offer the solution for conflicts common in ASM mining regions, mainly due to the establishment of clarity in property rights, as well as bringing improvements in the local environment, labor conditions in the mines and tax collection. However, the formalization process in mining sector can also concentrate economic benefits to certain economic agents of the mining economy and weakening the local economy. This, in turn, can lead to a process of unemployment and reduction in local wealth, and potentially contribute to other informal activities in other sectors.

Keywords:

Colombia, Andes, Emeralds, Informal sector, mining, sustainable development, CSR.



Community Re-Organizing for Sustainable Development of Mountainous Rural Community: A Case from Rural Toyota, Japan

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Abstract:

Japan is a mountainous country, with about 70% of its land being hilly and mountainous. In recent decades, however, its sustainability has become a matter of serious concern, as the Japanese society is faced with a shrinking and aging population. This hollowing out of the population in rural areas, particularly mountainous rural areas, with numerous vacant buildings and unused land and infrastructure poses one of the major challenges for both the central and regional governments, as it puts pressures on the economy and social services of the country. Under these demographic crises, government and civil society have considered various alternative

approaches to promote economic and social revitalization in mountainous rural areas. For example, by engaging local communities, and by providing employment and generating additional income to the owners and workers, some mountainous rural areas have witnessed some innovative initiatives, such as local small businesses, that contribute to the wellbeing and the livelihood network of their community by leveraging local resources.

This study focuses on an innovative community revitalization model linking the community's local resources—social, financial, natural and human—which has been explored in Asahi District of Toyota City, Japan, a small, depopulated mountainous rural community incorporated into the City in 2005. The study analyzes the key characteristics of the community revitalization model and the evolving process of its development and implementation by re-organizing community, and examines its social and economic effects on the local community. This study uses a case study approach and analyzes the case based on a series of interviews and participatory observation of eight local small business (LSB) projects in the community, carried out during the fieldwork conducted in October 2016.

Keywords:

mountainous rural areas, community, mountainous rural areas, local resources, sustainability.

16 - Responses of natural disasters to climate change and disaster risk reduction

Risk analysis of dammed lakes induced by the 2017 Ms6.9 Milin Earthquake in the Yarlung Tsangpo gorge

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Abstract:

On November 18, 2017 (Beijing time 6:34), a Ms6.9 earthquake happened in the Yarlung Tsangpo gorge in the Minlin county of Tibet Autonomous Region. The earthquake triggered numerous rock falls, avalanches, and landslides on the both sides of the gorge, and hence increased massive loose materials at the gorge's hillslopes. Recent satellite images show that the induced mass movement resulted in nine temporary dams and three big dammed lakes in the Tsangpo river. The basic parameters of the dams and lakes were interpreted with satellite images before and after the earthquake. It is found that there are three catchments highly prone to debris flow hazards near the lakes' block locations. Large-scale debris-flow events will occur very likely triggered by melting snow and rainstorms in the spring or summer time. Based on GIS analysis and numerical simulation, we evaluate the height increment of the dams, and the depth and volume of the lakes caused by future debris-flow events under different return periods. At the 20 years return period, the lakes have no big influence on the upstream and downstream villages. If the magnitude of debris flows exceeds 13 Mm³, the risk of the dammed lakes will increase greatly. The instant outburst floods could affect some towns downstream of the Yarlung Tsangpo.

Keywords:

risk assessment, dammed lake, Yarlung Tsangpo.



Natural Disaster Management: calculation of the Global Flood Map for the city of Areal/Rio de Janeiro-Brazil for use in territorial management and decision making

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Abstract:

The analysis of areas susceptible to flooding has been important for municipal environmental management. For this reason, the objective of this research consisted in the mapping of flood risk areas to the municipality of Areal/Rio de Janeiro-Brazil. Embedded in the dynamics of the landscape, the shape of the relief, occupation and managed of the territory reflects in the quality of the hydrographic basins, which influences in a significant way in the flow of the waters. Considering the areas of contribution, the study area concentrates water from two of the main rivers of the hydrographic region, the Piabanha and the Rio Preto Rivers. Both are born in regions of mountains that have social, hydrological and ecological importance based on ecosystem services. On the other hand, there are risks in periods of intense rains and concentrated in the fragile relief. The analysis of these aspects demanded the geospatial database of Project RJ25 IBGE. From these data the Hydrologically Consistent Digital Terrain Model was generated in a Geographic Information System environment. Being used in the

elaboration of the maps of factors of altimetry, declivity and land use. These data were correlated with the Analytic Hierarchy Process method, which consists in assigning a scale of importance among the criteria. The analysis allowed the elaboration of the global flood map with the lowest (11.85%), low (27.50%), medium (37.30%), high (19.45%) and high (3.80%). However, with the detail of the built area, the flood risk presents a value of 94.32% between high and high risk.

Keywords:

flood, natural disaster, gis.



Disaster risk perception and risk governance in the mountainous regions. Study case of the State of Rio de Janeiro

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Abstract:

The catastrophe of 2011 in the State of Rio de Janeiro created unquantifiable material losses. Even with the available technologies, established programs and measures for disaster prevention, the population, local governmental and non-governmental institutions were not prepared for this event. This work aims to evaluate the disaster risk reduction (DRR) measures of the civil society and public power living or working for risk reduction at a local level. With a framework based on risk governance, perception and management of the civil society (population living in risk areas) and the institutions working around them are considered and analyzed from a multidisciplinary perspective. The core of the study case is in

Nova Friburgo municipality. Through 391 quantitative questionnaires, 26 semi-structured qualitative interviews, 11 focus groups and 3 workshops, we reveal the institutional arrangement, the perception of the population, the participatory mechanisms and the connections of communication and power. The main factors for disaster risk governance according to peer-reviewed literature are explored through a quantitative literature review. Based on the results, four main factors are further explored for our local case. An institutional arrangement is presented and analyzed comparatively to the perceptions of the workers. Local perception is revealed using descriptive statistics, factor analysis and regression on the survey results. Participation is determined in institutional processes through Fung's triangle of participation. Communication and power connections are finally analyzed through all previously described processes. Factors like trust, decision making, and perception are especially difficult to address in a dynamic environment like the case of Rio de Janeiro State. Lack of trust on the institutions working for disaster risk and a mostly top-down, centralized system that does not enforce participation, creates polarization and only few communication and meeting points between the civil society and public power.

Keywords:

Risk Governance, Dynamic Environments, IRGC, Communication, Disaster Risk Reduction, stakeholder involvement.



Early forecasting method of Glacial Lake Outburst Floods based on temperature and rainfall index

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Abstract:

Glacial lake outburst floods (GLOFs) are serious disasters in glacial areas. At present, glaciers are retreating while glacial lake area and the outburst risk increases due to the global warming. Therefore, the research of early warning method of GLOFs is important to prevent and reduce the disasters. This paper provides an early warning method using the temperature and rainfall as indices. The daily growth rate of positive antecedent accumulative temperature and the antecedent thirty days accumulative precipitation are calculated for 21 events of GLOF before 2010, based on data from the 21 meteorological stations nearby. The result shows that all the events are above the curve, $TV = -0.192RDC + 2.018$, which can be taken as the early warning threshold curve. This has been verified by the GLOF events in the Ranzeaco glacial lake on 05-07-2012.

Keywords:

temperature; rainfall; glacial lake outburst floods; early warning.



Rock slides combined with rock avalanches: the Entupido Creek, Serra da Mantiqueira, Brazil

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Abstract:

Rock landslides are a gravitational mass movement that lose their cohesion by friction between blocks. In some circumstances, these

phenomena can be associated with rock avalanches. The rupture surface occurs through the interconnection of pre-existing fractures with intact rock fragments. These large rock slides can generate such an intense fragmentation of the material that give rise to avalanches. These materials can reach a very large mobility. This work aims to discuss the landslide event occurred on 2011 November 15th, in Queluz municipality, south-eastern Brazil. The estimated volume of detached rock is 100,000 m³. The Entupido creek have a very embedded “V”-shaped valley, with 2.200 m of relief amplitude. In the sliding scar area, two families of joints with high persistence form blocks facing to the slope, with angles of up to 30°. The frequent presence of rock bridge breaks is verified. After the rock slide, the resulting avalanche flowed about 600 m downslope. The presence of blocks in fresh rock faces is a consequence of rock shocks and viscous flow of the debris material with practically no water. The material was changed to an avalanche due to dissipation of energy, with the deposition of the blocks in the talweg. the near future model such flows so that we can construct maps of susceptibility for these phenomena in the different Brazilian highlands.

Keywords:

rockslides; avalanches; landslides.



Where do mountain researchers publish? Comparison analysis on three SCI-indexed mountain journals

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Abstract:

With the recognition of the importance that mountains have played in the earth eco-system and in people's daily life, mountain research is gradually becoming hot. Where do mountain researchers publish their papers and what are the unique features of the three SCI-indexed mountain journals(Arctic Antarctic and Alpine Research, Mountain Research and Development, Journal of Mountain Science)? We analyzed the three journals' developing trends, subject preference, key report topics, major author source and institution source, author cooperation relationship by using data from Clarivate's Web of Science and Journal Citation Reports and from web search. The results can be used to guide mountain researchers to choose the suitable journal to publish.

Keywords:

Mountain science journals; bibliographic analysis; Journal of Mountain Science; Mountain Research and Development; Comparison analysis.



Characteristics of earthquake induced landslides

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Abstract:

Earthquake may cause large amounts of slope instabilities which may increase the loss in human lives and properties. The characteristics of earthquake induced landslides are related to the features of the earthquake itself and topographical and geological conditions of the earthquake-hit area. The earthquake induced landslides in the 2015 Gorkha earthquake in Nepal and 2008 Wenchuan earthquake in China will be introduced and compared to

tell the difference between the landslides included by different earthquakes. Furthermore, earthquake may also damage the structure of rock and soil mass by reducing its strength and increase its permeability. Post-earthquake precipitation and creep deformation may cause instability of slopes damaged by earthquake. Laboratory tests on model slopes damaged by seismic effects which are subject to rainfall infiltration will be introduced. Several case histories of post-earthquake landslides will also be presented to discuss the characteristics of this kind of landslides.

Keywords:

Earthquake induced landslides, Gorkha earthquake, Wenchuan earthquake, geological conditions.

17 - Rural landscape and ecosystem services provision

A multivariate study on water quality in a mountainous watershed in Minas Gerais state

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Abstract:

The Belisário District, located in the municipality of Muriaé (MG), has 100% of its territory within protected areas. However, the local population has experienced the effects of rain reduction and water springs depletion. Despite the influence of global factors associated to climatic change, water scarcity in Belisário has also been associated to local anthropic factors (e.g.; patterns of land use and land cover change which influence the maintenance of the hydrological cycle mainly by the removal of the pristine forest). The main goal of this research was to determine the leading factors controlling the availability and quality of water resources in the headwaters of the Rio Fumaça drainage basin. In order to achieve this goal, this research employed land use and land cover analysis, individual interviews with farmers, and water samples analysis from the Rio Fumaça and its main tributaries. The land use and cover classification using ArcGIS indicated that pastures dominated the landscape, occupying approximately 40% of the studied area. Meanwhile, the forest fragments cover at least 25,3% the studied area. The water samples analysis indicated that agriculture, cattle raising and the precarious sanitation conditions in urbanized areas are responsible for the enrichment of dissolved elements – mainly Ca, Mg, K, N – and for the elevated counts for coliforms. Finally, elevated turbidity values suggest that the substitution of native forest for agriculture has caused the acceleration of the erosive processes at the Rio Fumaça's watersheds. As a result, all the

studied tributaries had their original courses impacted by anthropic activities, and this factor affected water resources both in terms of quality and quantity.

Keywords:

Water quality, land use, Belisário District.



Water and Forests Producers: experience and expectations

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Abstract:

The Payment for Environmental Services have stood out as important tools for sustainable water resources management. The project “Water and Forests Producers” was implemented in 2009 in the city of Rio Claro-RJ with the resources collected due to water use in the Hydrographic Region II–Guandu. Those resources were deliberated for this use by the Hydrographic Basin Committee Guandu. The project’s objectives are to increase the potential for generating ecosystem services and to contribute to the environmental adequacy of rural properties.

The project is developed in the sub-basins of the Alto Piraí, Médio Piraí and Represa Ribeirão das Lajes. It presents significant hydrological importance, since the region contributes approximately with 11% to the water volume of the Guandu system, which is the main water supply source for the Metropolitan Region of Rio de Janeiro.

Currently, the project has 74 rural properties participating, which

are responsible for the conservation of 4,098.07 hectares of Atlantic Forest and for the restoration of 506.74 hectares of anthropized areas.

From a hydrological point of view, it is expected that the project will contribute to the maintenance of environmental services provided by forests and that the restoration of forest cover will promote the improvement of water quality and regulation of water flow in medium and long-term scenarios.

From the ecological point of view, it is expected that the forest restoration will connect the fragments of Atlantic Forest that remains in the region, favoring the conservation of biodiversity and of all its benefits.

Keywords:

Payment for Environmental Services; Hydrological Environmental Services; Atlantic Forest.



Water PES in Brazil: gaps and recommendations in the monitoring

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Abstract:

Hydrological ecosystem services are defined as the benefits offered by freshwater and terrestrial ecosystems. As a way to mitigate negative impacts in the hydrological ecosystem and encourage conservation, methods of financial compensation to farms have been applied around the world. Up to mid-2009 there

were about 150 Payment for Ecosystem Services (PES) initiatives in Latin America. In Brazil, the most well-known water PES is the Water Producer Program of the National Water Agency (ANA). The strategy of water PES projects is based in restoration for water supply. Previous studies indicated that water PES monitoring is carried out on a case-by-case basis, with no standardization of methods, indicators and frequency. This study investigated the main water PES in progress in Brazil, evaluating the situation of its monitoring, under the socioeconomic and environmental aspects. Data were collected from the literature, as well as an interview with decision-makers related to the monitoring of the 6 water PES (Water Conservative – MG, Oásis Brumadinho – MG, Water Producer Camboriú – SC, Water Producer Pipiripau – DF, Water and Forest Producers Guandu – RJ). The main gaps and recommendations were related to: baseline, information/data, indicators, methods, equipment and analysis, human resources, areas and monitoring points. Interviewees recognize the importance of water PES monitoring in Brazil and report that there was a progress in the implementation of them. In addition, specific features of mountain regions must be taken into account when it is intended to monitor the water PSE is in the landscape.

Keywords:

Indicators, interviews, decision-makers.



Can agroforestry systems meet the principles of forest landscape restoration?

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Abstract:

Ecological restoration supposes intentional human intervention on altered ecosystems to trigger, facilitate or even accelerate natural ecological succession. As a strategy to promote large scale restoration emerges the concept of Forest Landscape Restoration (FLR), allowing the reestablishment of environmental services, and welfare and new possibilities of incomes to local stakeholders, particularly landowners. The new Brazilian Federal Law on environment protection (12651/2012) has brought some changes on legal issues for protected areas, like the necessary environmental regulation of rural properties, especially by the restoration of permanent preservation areas and legal reserve. Family farming has special benefits for legal compliance, as the permission to use agroforest systems for the environmental regulation in small rural properties. In this study we analyze the contribution of Agroforestry Systems (AF) to Forest Landscape Restoration, by evaluating how AF may meet the ten principles of FLR recommended by the *Global Partnership on Forest and Landscape Restoration*. Principles are suggested to be widely integrated, as those referring to restoration governance, negotiation, the definition of common concern issues and the clear assignment of rights and responsibilities of stakeholders in the process. The analysis of some agroforestry systems evidenced organizational gaps to foster FLR, as the lack of experience with networking and the need of investments on rural extension and advisory services. Monitoring processes may gather information on forest landscape restoration, and support the creation of public policies to allow the expansion of agroforestry systems across Brazilian rural landscape, and benefit both conservation and production.

Keywords:

Agroforestry, Forest Restoration, Family farming.



Collective construction of multifunctional landscapes based on ecological intensification

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Abstract:

At the landscape scale, agrobiodiversity supports water quality and mitigation of greenhouse gas emissions, pollination and pest control, and protection of nearby wildland ecosystems. Ecological intensification promotes high and reliable agricultural production, but with a strong role for agrobiodiversity and biological processes. Participatory agrobiodiversity research has occurred for 10 years at Guapi-Macacu river watershed (Rio de Janeiro). The results represent an important knowledge on native tree and shrub species and adaptive management practices. The known species has multiple uses, such as food, fiber and soil nutrition. This proposal is based on diversification of agricultural systems with the use of locally recognized biodiversity. We have the following aims: 1. Design and test resilient agricultural systems based on local biodiversity; 2. Increase food security rescuing traditional menus based on local biodiversity; 3. Study the environmental services of ecological intensification evaluating the presence of biological control agents, pollinators and seed dispersers (bees, wasps and birds). The results of this work are important to the adequacy of a climate change and the biodiversity conservation, mainly in the following aspects: Making the biodiversity a concrete resource from the viewpoint of the production unit and acquire greater proximity of food sovereignty; Promoting the autonomy to the producers in the technological choice that better suits local needs, increasing the capacity of the family to react to changes Support the implementation of public policies in order to collaborate with the agroecological transition process, recovering the resilience of degraded landscapes.

Keywords:

agrobiodiversity, family farming, resilience.



The Economics of Ecosystems & Biodiversity (TEEB) initiative in the Paraíba do Sul River Basin (SP)

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Abstract:

The Economics of Ecosystems & Biodiversity (TEEB) is a global initiative to mainstream the values of biodiversity and ecosystem services into decision-making. Here we show the first TEEB study case executed in Brazil, more specifically in the São Paulo area of the Paraíba do Sul River Basin. This region encompasses three mountain chains (Serra do Mar, Serra da Mantiqueira and Serra da Bocaina) located in deforested and highly fragmented biome of Brazilian Atlantic Forest, which plays an essential role in the provision of water Ecosystem Services (ES). We will present refined land use maps of the area and valuation of ecosystem services for three alternative scenarios: (i) business as usual (no restoration), (ii) Forest Code compliance, (iii) Forest Code Compliance under CRA market. These scenarios were constructed after socioeconomic surveys with the local population, associated with literature review on land use history and main rural economic activities, and ecological valuation of ES. As expected, the first scenario was the most expensive for restoration and the worst for ES provision; the second and third scenarios had similar ES provisions, while the third scenario had higher effective-cost. 55% of the municipalities modeled to received restoration had low management capacity to

implement sustainable public policies. Lack of qualified human resources (65%) and government support (50%) were pointed out as barriers to more sustainable land use. The project indicates direct applications in decision making towards reconciling rural productivity with forest restoration and biodiversity conservation, while indicating ways to a more sustainable productive practices.

Keywords:

Ecosystem Services, Modelling, Socioeconomic.

18 - Addressing land use dynamics and global change in the Andes: Research priorities for the sustainable management of mountain landscapes

Woody vegetation change in the tropical Andes: 2001-2014

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Abstract:

The interactions between climate change and land use decisions are dictating the distribution of flora and fauna around the world. Tropical mountains are particularly vulnerable because they often have a high population density, a long history of agriculture, and species with limited spatial and altitudinal distributions. Here we evaluated the change in distribution of woody vegetation in the tropical Andes of South America above 1000 m for the period 2001 to 2014. For the analyses we created annual land cover/land use maps using MODIS satellite data, calculated the cover of woody vegetation in 9,274 115.47 km² hexagons, and determined if there was a significant 14-year linear trend within each hexagon. Of the 1,358 significant hexagons, 498 had a deforestation trend and 860 had a reforestation trend. There was an overall net gain of ~500,000 ha within the study region, but deforestation dominated the 1000-1499 m elevation zone and reforestation dominated about 1500 m. At the country scale, Argentina and Venezuela had net losses of woody vegetation, while Colombia, Ecuador, Peru, and

Bolivia all had net gains in woody vegetation above 1000 m. Expert validation of clusters of deforestation and reforestation confirmed 81%, could not be evaluated 13%, and found contradictory information in 6% of the clusters. The most important transitions were deforestation at lower elevations for cattle pastures, reforestation of abandoned pastures, and shrub encroachment into highland grasslands. Expert opinion confirmed these trends, but some areas of reforestation were also associated with new coffee, cacao, coca, pine or eucalyptus plantations.

Keywords:

Andes, land change, climate, vegetation.



Megaherbivores transition along an Andean elevational gradient

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Abstract:

Historically, herbivory by large native mammals was replaced by domestic livestock. The Andes is not exception: following the European arrival, large herbivores communities (mostly camelids and deer) were largely replaced by sheep, cattle, goats, horses and donkeys. Due to current trends towards human population urbanization and dis-intensification of agricultural marginal areas, this trend could be reversing in different regions, with important ecological consequences. Here, we describe the patterns along the elevational gradient of subtropical mountains of northwest Argentina. In lowland montane forests, tree communities show an

expansion of herbivory-sensitive species, likely due to the low herbivores density resulting both from decreasing livestock (cattle) pressure and a slow recovery from past defaunation (e.g. Mazama deer, Tayassu peccaries). In middle elevation tree-grasses ecotones, decreasing sheep density without rapid recovery of native fauna, implies a higher availability of fine fuels and resulting increase in fire frequency. In high elevation Puna desserts, decreasing livestock is being rapidly replaced by expansion of native camelids. These specific change could have consequences for both herbivory and predation; which begins to be reflected in Puma-livestock conflicts. Overall, this diversity of “megaherbivory transitions” resembles the well studied processes of “forest transition” as a mayor land change resulting from socioeconomic modernization, and we discuss the variety of socioecological drivers and consequences.

Keywords:

Megaherbivory, land use change, Puna, Yungas.



The peatlands of the Argentinean Puna, its relation with the anthropic use

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Abstract:

In the Argentine Puna (a very arid high elevation subtropical plateau), biodiversity and productivity is concentrated on peatbogs. We analysed the phenology of peatbogs plant productivity based on NDVI dynamics derived from Modis satellite images during the 21st

century, particularly focussing on inter-annual stability/variability in relation to different geographic features and potential land use. We found a strong positive correlation between peatbog size and phenological stability. When we controlled for peatbog size, we found that peatbogs nearby populated areas had more interannual ndvi variability than isolated and remote peatbogs, suggesting that intensive grazing decreases the functional stability of these ecosystems. Field-based records indicated that water table depth fluctuates seasonally in the order of 10-20 cm, with lower level during the summer rainy season, likely due to higher evapotranspiration during this time of the year, as well as time-lags related to the size of the peatbogs watershed. Heavily grazed peatbogs showed higher spatial variability of the water table and this can have an effect over vegetation. We discuss the implications of these results in relation to current trends in climate (aridization), livestock density (decreasing), and other increasing human impacts (mining, tourism).

Keywords:

Puna, Functional stability, Anthropic use.



Sustainable management of Andean forest landscapes in a context of climate change: priorities for knowledge generation

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Abstract:

Andean forest landscapes (AFL) harbor a unique assemblage of biological communities and diverse livelihoods that are especially

sensitive to the combined effects of climate and land use and land cover change. Agendas focused on the attainment of sustainable mountain development and the promotion of synergies between mitigation and adaptation in the Andes face important knowledge gaps, especially related to the social-environmental interactions and their implications for the provision of ecosystem services such as water regulation. Using a collaborative approach by a group of 48 researchers from different disciplines in the social and natural sciences, a research agenda was generated to guide research efforts in Andean forest landscapes in the next 15 years. The priorities were organized in system knowledge, aimed at understanding social and ecological dynamics and their outcomes, target knowledge aimed at promoting common visions of sustainability, and transformational knowledge related to desired transformations of the systems studied. The main research priorities were related to the study of impacts of global environmental change on the structure and function of AFL and their ability to provide key ecosystem services, socioeconomic drivers of environmental change and its impacts, potential of governance systems to facilitate effective responses at local to regional scales, and the implementation of ecosystem restoration at broader scales. Defining AFL as complex social-ecosystem systems, should facilitate developing the collaborative arrangements needed to fill these knowledge gaps and to establish links to relevant policy making processes.

Keywords:

Andean forests, global environmental change, knowledge generation, research agenda, social-ecological systems.



Trees, land and water: A synthesis of knowledge on the relationships between woody plants, land use and hydrological processes in the Andes

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Abstract:

In the Andean region, there is currently a growing interest in the use of trees to restore degraded areas through afforestation, reforestation or agroforestry initiatives. In addition to the economic benefits that these interventions can generate, particularly in the case of commercial plantations with exotic trees, one of the main arguments supporting these actions is the recovery of the water provision and regulation functions of ecosystems. However, the relationship between tree cover and water is complex, and may have positive or negative effects on the ecological functions of watersheds, depending on diverse factors such as species, geographic context, land uses, and management practices. In this study, we compiled and synthesized the existing literature - including scientific data and local knowledge - on the relationships between woody plants, land use and hydrologic processes in the Andes. Even though there still remain important knowledge gaps on the role of forests and trees in the hydrology of Andean watersheds, especially regarding the combined impacts of land use and land cover change, our review enabled us to formulate key recommendations that can inform degraded land restoration practices and policies in the Andean region.

Keywords:

water; hydrology; forests; agroforestry; land use; Andes.



Governance For The Conservation Of A Traditional Landscape In The Peruvian Andes: The Study Case

Of The Potato Park

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Abstract:

There is evidence that local governance influences the conservation of biodiversity. The Peruvian Andes are a center of agrobiodiversity and endemic species. The Potato Park is an association of four indigenous Quechua communities which conserves 1345 native potato varieties through landscape conservation. In order to analyze the structure of the governance system of the Potato Park, it was applied a mixed qualitative methodology which included: participatory timelines; semi-structured interviews; participant observation and review of documents of the organization. Fieldwork was carried out between May and August of 2017. The study area is located in the district of Pisac, Cuzco, Peru, between 3400 and 4600 meters of altitude. The results show a strong relationship between the Potato Park, the local non-governmental organization and the International Potato Center. Transformation processes in land tenure, communal organization, climatic characteristics, agricultural practices, rules of access to resources and use of biodiversity, influenced the consolidation of the Potato Park as well as its current state. Ostrom design principles were evaluated. They are all present in the organization, but fulfils partially those related to rules' congruence, collective choice arrangements, monitors' accountability and gradual sanctions. The latter are considered indispensable for good governance according to previous studies. It is concluded that the Potato Park is an adaptive institution in transformation and it shows a progress in the management and conservation of agrobiodiversity. However, it should work towards the improvement of its internal communication systems and the strengthening of the local leadership, in order to be sustained over time.

Keywords:

governance, agrobiodiversity, Quechua communities, common-pool resources.

19 - Sustainable territorial development in arid mountains? Paths and current challenges

Streamflow variations across the Dry Andes during the instrumental era

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Abstract:

The rivers originating in the Dry Andes constitute a crucial natural resource and support numerous ecosystems, human populations and a large number of socio-economic activities throughout north-central Chile, western Argentina and southwestern Bolivia. However, the temporal variations in surface runoff in this extensive mountainous region have not yet been assessed comprehensively to identify areas with common hydroclimatic patterns of variability during the instrumental era (early 20th century – present). Here we will identify the main modes of hydroclimatic variability across the Dry Andes using an up-to-date database of mean monthly streamflow records from Chile, Bolivia and Argentina. The extreme dry conditions reported since 2010 in central Chile and central-western Argentina are clearly evident in the two main modes of variability, which also show long-term trends towards drier conditions since the early 20th century. In contrast, the rivers in northwestern Argentina and southeastern Bolivia show positive trends that reflect wetter hydroclimatic conditions in recent years/decades. Variations in the El Niño – Southern Oscillation and in the Pacific Decadal Oscillation show strong positive correlations with those observed in rivers in north-central Chile and central-western Argentina. In contrast, the South Atlantic Ocean Dipole

Index is weakly associated with the monthly variations of rivers with a monsoonal regime in northwestern Argentina and southeastern Bolivia. The analyses provide relevant new results to better understand the Andean hydroclimatic system on a local and regional scale, and can help improve the management of the mountain water resources in these Andean basins.

Keywords:

Andes, streamflow, temporal variations.



Between Protection And Exploitation. Nature Conservation Policies In The Argentinean Arid Andes: Mendoza And San Juan, 1990-2015

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Abstract:

We propose to investigate nature conservation policies in two federal states of the Argentine Republic, which exercise territorial sovereignty over a wide shared region of the Arid Andes, recently opened to the global mining frontier. In effect, the beginning of the 90s marks a turning point due to the deregulation of macro-economic and territorial policies. This will set in motion processes of integration to the world market.

In this context, we carry out a comparative study over the nature of conservation policies in both provinces. Firstly, the conservation regimes are investigated in aspects such as development, administration, extension, location of protected areas, categories and management plans, restrictions on the use of resources,

among other aspects. Then, from the case study approach, four protected areas located in cordillera and pre-cordillera areas are analyzed and compared. In Mendoza, “Villavicencio nature reserve” and “Laguna del Diamante natural reserve” and in San Juan, those of “El Leoncito National Park” and “San Guillermo Biosphere Reserve”.

Some preliminary results reveals contrasting nature conservation policies between the two provinces. While in Mendoza the development of an extensive protection system under the jurisdiction of the Provincial State is verified, in San Juan, the conservation system is, to a large extent, under national jurisdiction that manages parks that have not prevented the development of large-scale projects mining exploitation in areas of influence.

Keywords:

Nature Conservation Policies.



Strengthening of the Peasant Farmer for Sustainable Territorial Development in the Province of Mendoza, Argentina

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Abstract:

In the province of Mendoza, central-western region of Argentina, the historical occupation of the territory runs through the presence of indigenous populations. The Huarpes Milcayac used water from the melting of accumulated snow in the Andes Mountains that

flowed through the rivers to irrigate their lands, which were affected by great periods of drought. The ideals of progress and civilization, brought with the European colonization process, practically led the indigenous people to extinction or to be relegated the more arid areas. Water access, a key developmental issue, especially in those environments, has become conflictive, with the appropriation and management of water resources accentuating the concentration of land and income in the region. Currently, local agriculture is linked to large agricultural productions that generate foreign exchange through exports, with an increasing decreased participation of small and medium-sized production. However, a more systemic economic analysis makes possible the perception that peasant agriculture has been invisible, especially in its importance for local development. The horticulture of Mendoza, located in its “green belt” (Guaymallén and Maipú), is carried out by an expressive number of small and medium peasant farmers, and is destined to local and neighbouring provinces supply. Social organizations such as the *Unión de los Trabajadores Rurales Sin Tierra* (UST) are present supporting social and political organization, fundamental in articulating peasant demands in public actions, especially those related to access to land and water, and support to market access.

Keywords:

Agroecology, social organization, systemic analysis.



Territorial policies in the Central Andes: border security, economic integration and environmental regulation in a cross-border context between Chile and Argentina

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Abstract:

At the end of the 20th century, notable legislation was passed to promote economic integration of the “Central Andes”, whose watershed had historically served to delimit these two countries. If until those years geopolitics of separation and internal security dominated in border areas, since the 1990s they were to be replaced by others related to the spatial logic of global exchange.

The Central Andes appear as a vast source of valued “natural resources” (energy, land, minerals, water, landscapes, etc.) and as a new space for the articulation and circulation of goods. The “Mining Integration Treaty”, signed between the two countries, is the most complete expression of this process. At the same time, from different social and political spheres, emerged discourses concerned with environmental problems and legislative responses to the regulation and protection of nature.

State action will be intermediated by government levels that administer relative quotas of sovereignty in tension with non-state social actors. The governmental impulses to reinforce their insertion in the global market, implied disputes with other ways of valuing the territories, not only the previous nationalist vision, but also local and regional powers that reorganized their forms of resistance.

The work aims to build a research agenda around security, integration and conservation policies, the implementation of which does not seem to be linear but rather uninterrupted in the time and space.

Keywords:

border security, economic integration and environmental regulation.



Land and water grabbing in the oases of Mendoza (Argentina): A hydrosocial perspective

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Abstract:

Our abstract proposal is built upon a political-ecological study of land and water grabbing in the oases of Mendoza. In this semi-arid region, water used for the irrigation of oases developed on the foothills is provided by snowmelt water from the Andes and conducted through dense irrigation networks who have been at the core of a winegrowing and winemaking historical production model. From the 1990s onwards, with the integration of these irrigated spaces into the globalization of the agrifood system, Mendoza's oases are arousing great interest by foreign investors, equipped with state-of-the-art irrigation technology. In the actual context of loosely regulated groundwater management, this technology allows newcomers to conquer new spaces by pumping groundwater and become independent from the tedious traditional water management. We consider that the strategies of localization of these new enterprises, well integrated within the export sector and who are gradually climbing the foothills to settle in the upper oasis lands, deserve closer attention. Indeed, in view of the fact that the water rights of these new producers are less likely to be cut back in drought situation, there is legitimate concern over the consequences of the melting of glaciers as a global process on downstream water supplies.

As the theoretical entry of that study we will consider a number of analytical tools inspired by the field of political ecology of water that can help throw light on the socio-environmental processes and the uneven political power relations that affect these flows of water.

Keywords:

Water-Land Grabbing, Groundwater, Foothills, Agribusiness.



Land Use and Land Cover Change (LULCC) in Mendoza and Tunuyán River basins. 1986-2018. (Mendoza-Argentina)

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Abstract:

Due to advancement in the area of Remote Sensing and GIS spatial analysis techniques, it has become possible to evaluate before and after scenarios of a landscape.

In Mendoza, although numerous studies have been carried out on LULCC (Land Use/Land Cover), these are based on very different theoretical and methodological assumptions, making comparison and monitoring difficult. Also, these proposals generally require software and paid satellite imagery, making it difficult to replicate.

The present study aims at detecting and analyze the Land-Use/ Land-Cover change and drivers in Mendoza and Tunuyán river basins between 1986 and 2018 using multispectral satellite imagery; to develop an open source/public tool for land use change monitoring; to correlate LULCC dynamic and water (in)security issues and to enhance science-policy dialogues in Planning. We have a particular interest in the advance or retraction of the agricultural frontier in historical terms.

Some outstanding methodological considerations were adapting the legend to Land Cover Classification System (FAO) and National Land Cover Database (USGS) to the regional reality. Also compare our results with existing Land Use Classification from other sources.

The preliminary results make a difference in the total cropland between 1986 and 2018, which was around 12,000 ha. This growth has been concentrated in the western foothills, while in the east there is a contraction and abandonment of crops. In addition to analyzing all the remaining years, it is planned to add the Google engine software and other types of satellite images to the study.

Keywords:

Land Use, Land Cover Change, Remote Sensing and GIS.



Water resources scenarios in the Aconcagua River basin: territorial distribution of the water crisis

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Abstract:

During the last decade, Central Chile has experienced one of the most critical episodes of water scarcity in the instrumental record. This situation has been caused by multiple factors, among climate change and the progressive rainfall decrease, local geographic factors, exponential development of the agro-export sector, mining and a regulatory framework (Código de Aguas) with a strong extractivist and mercantile bias. As a result, a water scarcity zones declaratory prevailed throughout the country (p.e.: at the beginning of 2018, 61 communes, from 346 in total, were labeled in that

condition). The Aconcagua River basin is representative of this scenario, which combines the lack of rainfall with the rise of zero degrees isotherm and temperature, in addition to a strong pressure from the agro-export sector (avocados and citrus mainly) and mining, over the superficial and groundwater resources. Considering this condition, the present investigation seek to analyze how the water resources of the Aconcagua River basin, contributed mainly by the Andes mountain range, are related to the territorial distribution of water scarcity at the commune level. In order to deconstruct the water supply inputs, natural tracers (major ions and stable isotopes) were used to define the relative importance for each water supply component (glacier, snow, rain and groundwater). Finally, the effects of the different water sources weight were linked to the variability of the resources in the mountain range and how their changing proportion affect the supply-demand imbalances in the water shortage declaratory zones.

Keywords:

Water Scarcity, Andes, Natural tracers, Hydrology



Adaptive governance of the bio-geoheritage in the South-Central Andes, Chile

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Abstract:

Geodiversity is an especially relevant aspect of the South-Central Andes and the Atacama Desert, because of the exceptional physical features of this recent and geologically active zone. In the

search for appropriate and applied concepts for the conservation at the landscape scale, the geoheritage approach has to integrate nowadays the values of biodiversity and cultural diversity, turning towards the novel concept of bio-geoheritage. This portion of the Andes encompass the Atacama Desert, recognized as the most arid worldwide, rich in archeological sites, historic indigenous routes, geoglyphs as well as geomorphological features like lava flows, pyroclastic deposits, channels and mesas. Linked through biologic features like high altitude bogs (“bofedales” and “yaretales”) and the highest forests on earth (queñoales). The concept of bio-geoheritage has emerged to connect the biodiversity, landscape and cultural diversity as a valuable and holistic subject, but the methodologies to evaluate the potential bio-geoheritage of sites are still not widely applied in Chile. As a preliminary study in the South-Central Andes in northern Chile, we report here around 200 sites with different aspects concerning several bio-, geo- or cultural integrated aspects. But the real challenge is to build a governance scheme that assures the social recognition and conservation of this heritage. We design such a scheme: sites are selected in a participatory framework, taking account of recent processes like social (migration) and physical (climatic) changes. Our proposal is based on an adaptive model of governance that relates current conservation figures with emergent ones (biosphere reserves) and current planning instruments at different decision-taking levels.

Keywords:

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Socio-environmental conflicts and technical discussion over fracking in Mendoza

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Abstract:

This work aims to analyse the conflict over the hydraulic fracturing (fracking) in Mendoza province, Argentina.

Fracking is a recent technique in the exploitation of unconventional hydrocarbons in Argentina. The public knowledge about the “discovery” of the so-called “most important source of energy” of the country, Vaca Muerta deposit, in Neuquén province, put the topic in scene. Vaca Muerta exploitation has generated conflicts between the companies and indigenous communities. In another province, Rio Negro, the unconventional oil exploitation in an agricultural region was rejected by some social groups and neighbours. In this context, several towns and the provinces of Entre Ríos and Santa Fe have passed acts in order to forbid this type of hydrocarbons projects.

In Mendoza, the conflict over fracking rose hastily in last months. The first unconventional oil exploitation in Malargüe, in the south of this province, was denounced to have contaminated ground water. The government of Mendoza has defaulted on environmental requirements and is trying to advance the unconventional exploitation quickly, while undermining the rising social protests.

This paper tackles three topics about this conflict: the organization of the resistance against fracking, the discussion about technical information, and the compliance -or not- of the environmental legislation and administrative process necessary for this type of exploitation. This research is based on administrative documents, reports of the companies, and alternative reports, among others.

We consider that these forms to drive hydraulic fracturing and attack the resistances, on the side of the government, have decreased the quality of democracy and the environmental justice.

Keywords:

Fracking, Mendoza, Resistencia, Justicia Ambiental.



Producing oasis, transferring vulnerability

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Abstract:

In this article we propose to investigate the process of production and transfer of vulnerabilities that takes place in the oasis of the Uco Valley, its particularities and its relation with the transformations of the new productive model that since the end of the 90's to the Nowadays, the oasis has been expanding with a new relationship with water, land and technologies.

In particular, we will focus on the phenomenon of extraordinary runoff that descends from the Central Andes on the foothills of Uco Valley, a phenomenon that we noticed from fieldwork in the context of studies on climate change and vulnerability in the study area.

Keywords:

Oasis - Vulnerability - Uco Valley.

20 - Value-adding strategies from postharvest to fork: challenges and opportunities of small food and beverages production in mountain environments

Short Selling Circuits of Organic Products: The Case of Nova Friburgo

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Abstract:

The present study aims at confirming the hypothesis that the development of organic agriculture in Rio de Janeiro is the result of strategies of producers and technicians organized in the Participatory Guarantee System (PGS) using short selling circuits to increase the offer of organic products in the Capital and in the interior of the State of Rio de Janeiro. The objective of this work is to present the current scenario of the short selling circuit market accessed by the members of the Friburgo group of the Participatory Guarantee System (PGS) of the Association of Organic Farmers of the State of Rio de Janeiro (ABIO). The methodology used was a case study with the systematization and analysis of part of the secondary data collected by PESAGRO-RIO and the primary data obtained at meetings of the ABIO Friburgo PGS group, conversations with farmers, interviews and monthly observations in market places. The results present the history of organic agriculture in the municipality of Nova Friburgo in addition to the profile of the organic producers that are members of the ABIO PGS group, the main short selling circuits accessed, the offer and prices of organic products throughout 2016 and the nonconformities found at

marketing places. It is concluded that organic farmers and technicians, when organized in groups and organizations focused on organic quality assurance and alternative food networks, access a variety of marketing channels, short selling circuits and local and regional circuits, providing a diversified offer of healthy products to the population.

Keywords:

Organic agriculture. Local food systems. Participatory Guarantee System.



Challenges And Opportunities Of Small Organic Agroindustries In The Context Of The Participatory Guaranty System Of The Rio de Janeiro Biological Farmers Association (SPG-ABIO)

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Abstract:

Small agro-industries can create opportunities for small-scale organic farmers by harnessing quality food, with no trade standard, as well as adding value and diversifying supply. However, the reality of this sector within the scope of the Participatory Guaranty System of the Rio de Janeiro Biological Farmers Association (SPG-ABIO), in a universe of approximately 600 farmers, is that only 8% are food processors, with only 1 % dedicated to food of animal origin. This is mainly due to tensions between Brazilian sanitary standards and the artisanal foods manufacture. In the scope of the SPG-ABIO it is

observed that 67% of the processors are also producers of raw material, evidencing the potential of this value-adding strategy, however 47% of the processing units are not legalized. The organic agroindustries are located 70% in rural areas and 74% in mountainous municipalities and could be enhanced in the context of the sustainable rural development of the mountain environments. However, it is verified that only 28% of SPG-ABIO organic agroindustries are family farming enterprises, evidencing greater difficulties of this sector. Despite the National Health Surveillance Agency (ANVISA) having in 2011 inserted as strategic axis the social development focused on the eradication of extreme poverty and progress in the formalization of economic activities related to products and services subject to health surveillance, and with the publication in 2013 of specific regulation for individual microentrepreneurs, family farming enterprises and solidarity economic enterprise, its regulation is still incipient, and little has contributed to the productive inclusion of small producers.

Keywords:

small agroindustries, organic agriculture, participatory guarantee system.



Socialization of technical knowledge for aggregation of value in organic agriculture

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Abstract:

The metropolitan region of the city of Rio de Janeiro is the second

largest consumer of organic products in Brazil. In this region there are 46 initiatives of direct sale of products in natura or processed, either in fairs or in networks that involve consumers and farmers. Researchers at Embrapa Agroindústria de Alimentos and technicians linked to the project “Socialization of knowledge and technological development focused on agroecology and organic production in the state of Rio de Janeiro”, financed by the Carlos Chagas Filho Foundation - FAPERJ, in a partnership with the Association of Organic Farmers of the State of Rio de Janeiro - ABIO, carried out diagnoses to survey demands that aim to minimize difficulties related to the post-harvest stage in the municipalities of Petrópolis and Teresópolis. In the group of producers of Petrópolis, the main difficulty was the aspects related to the in natura production, involving the harvesting, the transportation and the exposition of the products. It was held at Fazendinha Agroecológica Km 47, an activity that included farmers from other regions of the State of Rio de Janeiro, where researchers discussed the best practices from harvest, post-harvest to transportation and product exposition. In Teresópolis, many producers add value to their primary production from processing and, therefore, opted for activities that guided them on good processing practices with the realization of two workshops in a processing unit for jellies and food preserves. The activities generated two publications that will contribute to a greater dissemination of this knowledge.

Keywords:

agroecology, post-harvest, family farming.

21 - Art in Nature - Projects in Mountain Regions

Promotion of culture among members of World Famous Mountains Association: a path for further cooperation and understanding

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Abstract:

The World Famous Mountains Association (WFMA) is an organization that congregates mountains around the world that portray exceptional features related to landscape and culture, including both physical and symbolic values. Member of WFMA are committed to share knowledge and experience related to conservation, tourism promotion, and sustainable development of their sites. Cooperation and friendship, hence, constitute the basis of WFMA mission. Teamwork, however, tends to work better when mutual understanding prevails, as in these circumstances divergences can be easily solved and agreements be more straightforwardly reached. While culture reflects communities' way of life, including their values, beliefs and behaviors, it plays a key role to facilitate mutual understanding of people with different backgrounds and nationalities. Related to this, an interesting experience of mutual culture promotion arises from Lushan (China), a WFMA member. As one of the most famous mountains in China, Lushan attracts millions of tourists every year. During the summer, Lushan organizes a music festival, which includes performances made by international musicians from other members of WFMA. These initiatives have fostered mutual interest on a large range of topics, not restricted to music and arts, but also incorporating issues such as education, nature conservation, tourism, sustainable

development and even trade. This presentation will show the details and outcomes of this culture exchange between Lushan and Brazil and other countries, attempting to shed light on how it can be further expanded.

Keywords:

World Famous Mountains Association, culture, cooperation.

22 - How Much Science vs How Much Practice? Bridging 'The Sustainable Development' Chasm in Africa's Mountains

A synergistic study on the effect of concentration and temperature on Imidacloprid as an active ingredient of an insecticide mostly utilised in the Afromontane water of Maluti region by farming community.

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Abstract:

Imidacloprid is a neonicotinoid chemical which acts a systemic neurotoxin to insects. In South Africa, it is commercially available throughout the country, including the Afromontane region of the eastern Free State. A review of the literature suggests that there have been very little to no studies on the degradation of imidacloprid in terms of South African soil and water conditions, and in particular Afromontane area. Importantly, any chemicals released into soils can ultimately find their way into nearby streams or underground water sources, depending on the physical and chemical properties of these compounds. Afromontane soils not only affect the montane biota, but can also run off into streams that feed many waterbodies in the rest of South Africa; it is of utmost importance to do a synergistic study of Imidacloprid on Afromontane soils and water.

Studying Imidacloprid degradation under Afromontane soil and water conditions will provide novel data on the environmental fate of agrochemicals in such regions. All aspects of this project ultimately address the need for chemistry and pollution orientated studies in

Afromontane regions. Concentration and temperature are the parameters under investigation. Concentrations are determined by the dosage ratio prescribed on the package of the commercially available insecticide and temperature ranges are determined by the four seasons in South Africa.

Keywords:

Imidacloprid, Metabolites, Concentration, Temperature.

23 - Earth surface patterns and processes & ecological conservation for sustainable mountain development – towards scientific cooperation along the Belt and Road

Spatial variation of terrain relief and its impacts on population and economy based on raster data: a case study in West Henan Mountain Area, China

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Abstract:

In this study, West Henan Mountain Area, situated in the transitional zone from the Qinling Mountains to the Huang-Huai Plain), was selected as a case study area. DEM of 200 m resolution was used to extract the relief degree of land surface (RDLS). Integrating the 1:100, 000 land use map, statistical population data at township level and economic data of various industries at county level, raster models of spatial patterns of population and economy were formulated, and then the spatial distributions of population density and economic density at a resolution of 200 m by 200 m were produced using the models. Subsequently, statistical analysis was carried out to reveal the effects that RDLS had on population and economy based on raster data (i.e. RDLS, population density, and economic density), and the differences between the effects of RDLS and those of other terrain factors on the population and economy were also analyzed. The results showed that: (1) the RDLS in the West Henan Mountain Area was prevailed by low value, with 58.6% of the area having the RDLS lower than 0.5 (relative altitude of ≤ 250 m). Spatially, RDLS was higher in the west

and lower in the east, higher in the central part and lower in the south and the north. Moreover, there existed strong positive correlations between RDLS and altitude and slope, especially correlated with slope significantly. (2) The relationships between the statistical values and the corresponding simulated values were fitted to linear models with 0.943 and 0.909 levels of goodness-of-fit. This fitness indicated that the spatialization results reflected well the actual spatial patterns of population and economy in the study area. (3) The effect of RDLS on population and economy is stronger than that of other terrain factors. RDLS had a good logarithmic fit with population density and economic density, with 0.911 and 0.874 goodness-of-fit, respectively. Specifically, 88.65% of the total population lived in the areas where RDLS was less than 0.5 and 88.03% of the gross regional production was distributed in the areas where RDLS was less than 0.3. It can be clearly seen that economic development was more inclined to agglomerate in areas of lower RDLS values compared with population distribution.

Keywords:

relief degree of land surface (RDLS); population and economy; land use; spatialization; grid; West Henan Mountain Area



The geographical spatial features and mountain development of Hu Line intersection zone

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Abstract:

Professor Hu Huanyong proposed 'Hu Line' to divide the population density of China in 1935. After a hundred years of

historical changes, the rule described by this line is still of practical significance. To examine this demographic boundary line, we found that Hu Line is determined by the geographical spatial integrity and diversity of China. Among which, the climate type, mountainous landscape and location conditions are the dominant factors. The intersection zone of Hu Line is the transition zone of the mountain to the plain, featuring a significant difference in geographical spatial features. With economic development and urbanization process, the developed traffic network system compressed the space distance, also led to the human activities intensity continuous increasing in the mountainous area of the Hu Line. The living function space represented by the urban space is obviously increasing, and the multi-function agglomeration and nesting of land are obvious, which leads to a diversity of change in man-land relationship in Hu Line intersection zone. Through the interpretation and analysis of multi-period, multi-source and multi-attribute data, this paper reveals the change of land use in the southern end of the Hu Line intersection zone, and explains the spatial-temporal process and driving factors of the man-land relationship. In the future, Hu Line intersection zone will be a key area for China's rural revitalization, an important area for ecological industry development, and an irreplaceable ecological recreation and health and pension space. The connection between Hu Line intersection area and city will increase increasingly.

Keywords:

Hu Line; mountain area; geographical space



Using environmental heterogeneity to identify Yunnan Priority Conservation Areas

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Abstract:

Yunnan in China is one of the most bio diverse regions in the world. While, many studies pointed out that obvious conservation gaps existed in present Yunnan's natural reserve system, which needs urgent optimization under rapid changing environment. By exploring the relationships of 17 environmental heterogeneity (EH) measures and two biodiversity indices (Plant-diversity Index, PI; Animal-diversity Index, AI) of 20 national and 12 provincial natural reserves in Yunnan, this study found climate heterogeneity measures explained the two biodiversity indices more effective than soil and topographic heterogeneity measures. By using Akaike information criterion, we constructed the optimal EH measures interpretation models for PI and AI. PI can be interpreted by Annual Precipitation and Precipitation of Coldest Quarter ($R^2=0.527$, $P=0.001$), and AI by Temperature Annual Range and Coefficient of Variation of Precipitation Seasonality ($R^2=0.296$, $P=0.002$). Using the interpretation models, we calculated and identified the grids (11km * 11km) in Yunnan with high PI (>1.02) as potential Plant Priority Conservation Areas (PPCAs) and high AI (>1.03) as potential Animal Priority Conservation Areas (APCAs). Viewing from their spatial patterns, PPCAs and APCAs presented not only higher overlapping, but also certain irreplaceability and complementarity. Their spatially merged PCAs (MPCAs) has better conservation efficiency and ecological representativeness than the individual one. This EH measures-based MPCAs showed highly consistent with other Yunnan PCAs studies. By overlaying these MPCAs with existing Yunnan natural reserve system, we identified the conservation gaps in Yunnan and then proposed the strategies to optimize existing Yunnan natural reserve system.

Keywords:

environmental heterogeneity; priority conservation areas; Yunnan



Function zoning of territorial space based on resource and environment carrying capacity in Karst Mountain Areas

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Abstract:

The research of resource and environment carrying capacity (RECC) is a scientific basis of sustainable development between human and environment. It is instructive to the optimization of territorial space and construction of ecological civilization. Taking Guangnan County, a typical karst mountain area as the study area, the RECC is evaluated by comprehensive fuzzy evaluation model and the function zone of territorial space is divided by function zones method. The results showed that: 1) it's feasible to establish the "resource-environment-social economy" indicator system based on the special environmental factors (e.g. rocky desertification, soil erosion, geological hazard and karst collapse) and social factors (e.g. accessibility, urbanization rate and economic level), and evaluate the RECC by comprehensive fuzzy evaluation model; 2) the RECC is divided into five grades. The non-carrying regions have the biggest area, accounting for 48.76% of the total area, the low-carrying and moderate-carrying regions account for 16.53% and 25.47% respectively, and the high-carrying and ideal-carrying regions account for 8.40% and 0.84% respectively. The area of low carrying capacity is large, mainly due to the influence of slope, rock desertification and karst collapse; 3) by determining the carrying status of human activities, the study area are divided into five function zones (i.e. eco-protection zone, eco-buffer zone, farming zone, urban-rural development zone and residential zone). The function zoning is in line with the reality of Guangnan County. It explores a new approach of function zoning based on RECC and guides territorial development and management significantly in the karst

mountain areas in the future.

Keywords:

Karst mountain areas; resource and environmental carrying capacity; territorial space; function zoning; Yunnan province



Risk management modes for rural communities in ethnic minority areas relocated by geological hazards in Wenchuan seismic area: empirical analysis of two ethnic minority communities in Ngawa Tibetan and Qiang Autonomous Prefecture, Sichuan, China

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Abstract:

Disaster risk management of rural communities, mitigation strategy for ethnic minorities and vulnerable and poverty-stricken groups, preventive community relocation are all important subjects in the Sendai Framework for Disaster Risk Reduction 2015-2030. The Framework stresses that only long-term and sustained attention towards the health and livelihood of the people can truly mitigate the negative impact of disaster risks. Few studies have been conducted in the aforementioned perspective on disaster management for rural communities in ethnic minority areas in

China. With the example of two typical ethnic minority communities in Ngawa Tibetan and Qiang Autonomous Prefecture in the Wenchuan seismic area, we analyze and compare the relocation modes of risk management for rural ethnic minority communities threatened by geological hazards and their influence factors. The results indicate that the current modes of risk management have gradually incorporated disaster risk mitigation into the process of community development, whose difference stems from the change in the structure of livelihood capital after relocation and the heterogeneity of livelihood strategy adjustments guided by risks; this mode of livelihood adjustment guided by risks has an important effect on the development of disaster resistance of communities and individual farming households; in order to strengthen disaster risk management, it is necessary to provide beneficial system supply and policy support in consideration of the particularity of ethnic minority areas for such sectors as risk management systems and mechanisms, mass prediction and disaster prevention, land administration, public infrastructure construction, especially Internet plus disaster prevention and mitigation, and green, new livelihood development.

Keywords:

relocation; ethnic minority areas; rural community disaster risk management; poverty; geological hazards



The response of forest dynamics to hydrothermal change in Funiu Mountain

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Abstract:

In this study, the HJ-1 satellite data were used to extract forest cover types in the Funiu Mountain region, and the S-G filtering algorithm was used to reconstruct the MODIS EVI time-series data from 2000 to 2013. Combined with the temperature with precipitation of the same study period, the response of different forest types to hydrothermal condition changes was analyzed based on the linear regression, correlation analysis, and ANUSPLIN interpolation. The results showed that: (1) the region of Funiu Mountain boasts high forest coverage, and mean EVI reached 0.48, which also showed a gradually ascending trend in recent 14 years. (2) There was an increasing trend in temperature in this region during the past 14 years. The increasing rate of temperature departure was about $0.27^{\circ}\text{C}/10\text{a}$, and the precipitation percentage displayed an ascending trend as well despite of fluctuations. (3) The correlation between EVI and temperature, and precipitation differed noticeably in different forest types. (4) Generally speaking, the response lag in the mountain towards temperature and precipitation was not obvious, with half-a-month lag in evergreen deciduous mixed forest in some regions.

Keywords:

lag phase; forest vegetation; hydrothermal condition; EVI; Funiu Mountain



A preliminary study about the thermal environment dynamics in the mountainous area affected by the 2008 WenChuan Earthquake

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Abstract:

Ten years have past for the 2008 Wenchuan earthquake. The significant changes induced by this big earthquake greatly influence the eco-environment of this region. Vegetation coverage in the mountainous area experiences tremendous changes due to the shaking effect of the earthquake that many vegetation covered areas became barren. This fact greatly influences the local thermal environment and provides a good environment for the development of other geo-hazards, including landslide and debris flow. To effectively understand the dynamics of the local thermal environment, time series of land surface temperature data acquired from MODIS/Terra satellite were acquired for this area to get the temporal information about the changes in LST. The annual information of land surface temperature was captured by the annual temperature cycle model. Associated with the vegetation information over this region, a preliminary study was conducted to understand the thermal environment and its changes, which will be helpful in future studies to analyze the impacts from the earthquake.

Keywords:

Land surface temperature; MODIS; earthquake; thermal environment



The influence of spatial patterns of canopy gaps on sapling species richness in Xishuangbanna tropical forest landscape, Southwest of China

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Abstract:

Tropical forests are highly dynamic and diverse ecosystems, but our understanding of the processes that shape the local abundance and spatial distribution patterns of the tree species within them is still rather limited. In tropical forests, the creation of canopy gaps by one or multiple tree falls is one of the main causes of disturbance and thus potentially one of the main drivers of forest dynamics. The objective of study is to address the relationships between sapling richness and spatial patterns of canopy gaps in Xishuangbanna tropical forest landscape. We assume that the spatial patterns (size, shape and arrangement) of the canopy gaps may have strongly influence on the sapling richness in the tropical forests. To achieve this objective, firstly, the map of canopy gaps was generated by using an unmanned aerial vehicle (UAV) and very high-resolution images in one 20 hectare and ten 1 hectare tropical forest plots in Xishuangbanna, which have been set up by Xishuangbanna Tropical Garden, CAS since from 2007. Based on the canopy gap map for each plot, we will survey the saplings which linking with each gap. Afterward, the sapling richness will be calculated for each canopy gap. Finally, the relationships between sapling richness and spatial patterns of canopy gaps can be addressed. The primary results would show that, the spatial patterns of canopy gaps have greatly relationships with saplings richness.

Keywords:

tropical forest landscape; canopy gaps; biodiversity; spatial patterns; remotely piloted vehicles; unmanned aircraft systems; UAS



The conservation of biodiversity and ecosystem services in the mountains of China: scientific ground

and strategies in application

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Abstract:

The mountainous regions of temperate China are facing the threat of increasing aridity arising from the global climate warming. This leads to the degradation of natural ecosystems, intensified by human disturbances, and the pressure on the sustainability of agricultural systems. However, in the long history of land exploitation within this region, local residents have accumulated abundant indigenous knowledge and strategies of land management to deal with climate variability. Using the method of questionnaire survey, we investigated twelve villages in four provinces in North and Northwest China, and collected about 400 copies of response on a set of 100 questions, which were designed to focus on four topics: 1) the perception of climate change; 2) the agricultural strategies in dealing with the disasters of drought, forest fire, crop diseases; 3) living strategies in dealing with the natural disasters; 4) policy implemented by the government in last ten years for climatic disasters. We found unexpectedly that, rural residents can percept climate change at the ten year scale. The farmers have inherited rich experiences in dealing with climate disasters, including strategies of water resource management, species change in crop plantation, economic and social strategies in dealing with the failing of agricultural production. Moreover, we found that the government policy plays a significant role in disaster prediction and depress the economic loss of families in the stage of climate change related natural disasters.

Keywords:

climate change; land management; resilience; sustainability; strategies



The soil-plant relationship in alpine grassland ecosystem – which root traits determine nitrogen uptake by alpine plant species on the Tibetan Plateau?

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Abstract:

N is one of the most important limiting factors influencing plant growth and reproduction in alpine ecosystems. However, in situ observations of the effects of root traits on N absorption by alpine plant species are still lacking. We investigated the rates of N uptake and the effect of root characteristics in ten common herbaceous plant species using a ^{15}N isotope tracer technique and the root systems of plants growing in a semi-arid steppe environment on the Tibetan Plateau. Our objective was to determine the root traits (root biomass, volume, surface area, average diameter, length, specific root length and specific root area) that make the largest contribution to the total uptake of N ($^{15}\text{N}\text{-NO}_3^-$, $^{15}\text{N}\text{-NH}_4^+$ or $^{15}\text{N}\text{-glycine}$) by alpine plant species. Monocotyledonous species had higher absorption rates for $^{15}\text{N}\text{-NO}_3^-$, $^{15}\text{N}\text{-NH}_4^+$, $^{15}\text{N}\text{-glycine}$ and total ^{15}N than dicotyledonous species ($P < 0.05$). The root biomass, volume, surface area and average diameter were negatively correlated with the absorption capacity for $^{15}\text{N}\text{-NO}_3^-$, $^{15}\text{N}\text{-NH}_4^+$ and total ^{15}N across the ten alpine plant species. However, the specific root length and the specific root area had significantly positive effects on the uptake of N. In contrast with traditional views on the uptake of N, the N uptake rate was not improved by a larger root volume or root surface area for these alpine plant species in a high-altitude ecosystem. Root morphological traits had greater impacts on N absorption than traits related to the root system size in alpine herbaceous plants.

Keywords:

nitrogen absorption; root morphology; alpine plant



Effectiveness of nature reserves in protecting biodiversity in China's mountains

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Abstract:

China is a country with mega biodiversity. It has experience long history of intensive human activity in the plain area, leaving mountainous areas as the hotspots of extant biodiversity. To protect its biodiversity, China's has setup ca 2700 nature reserves up to the late 2014. The fulfill of the conservation target in China depends largely on the effectiveness of these nature reserves. Here, we evaluated the effectiveness of the ca 1000 national and provincial nature reserves in representing threatened species, reducing deforestation and in adapting to the future climate change, using high resolution distribution of 3244 threatened plants and ~1000 threatened vertebrate animals, high resolution land cover data from different periods, together with projection of climate based on different Representative Concentration Pathways (RCP) scenarios. We found that the, on average, national and provincial nature reserves covered ca one fourth of the distribution areas of the threatened species. However, ca 10% of these threatened species were not covered by either national or provincial nature reserves. We also found that these nature reserves have effectively reduced deforestation. On the Tibetan Plateau, range shifts of the endemic seed plants on We for the first time shift significantly upward. Species tend to move into the protected areas under climate change. We proposed that nature reserves specifically designed for threatened plants and animals need to be established in South

China, especially in the Yunnan, Guizhou, Guangxi, Xinjiang Hainan, and Zhejiang Provinces.

Keywords:

nature reserves; effectiveness; biological conservation



Phenological shifts across elevations on typical temperate mountains in North China during the last two decades

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Abstract:

Numerous studies have demonstrated pronounced plant phenological changes along horizontal belts northward in mid-latitude of northern hemisphere. The uniform advances in spring and corresponding delay in autumn were proved by both ground observations and remotely sensed data in temperate regions. However, little is known about phenological shifts and their characteristics along altitudinal gradients on typical mountains in China due to the lack of related ground observation data. In this context, we conducted experiments by application of remote sensing technique based on a time series of Moderate Resolution Imaging Spectroradiometer (MODIS) 500m 8-days NDVI, which was produced and corrected by Liu and Liu (2013). We aimed to analyze phenological distributions of different community types across elevations, together with the time series shifts of vegetation phenology for each community on Mountain Taibai (33°-34.5°N,

107°-108°E), the highest summit of Qinling Range, from year 2000 to 2017. Our preliminary results show that: (1) Generally, the starting time for spring phenophases for all three vegetation types, namely, sub-alpine meadow, evergreen needleleaved forest, and broadleaved deciduous forest advanced during the study period, and the advanced pixels accounted for 62.0%, 61.3% and 76.6% of the total pixels for each vegetation type respectively. (2) While the ending time for autumn phenophases for over half of the total pixels for sub-alpine meadow and broadleaved delayed during last two decades, with delayed pixels accounting for 55.4% and 61.3% of the total pixels respectively. The shifts of autumn phenology for evergreen needleleaved forest were very complicated. (3) Trends for advanced spring phenophases increased significantly with altitude for sub-alpine meadow and broadleaved deciduous forest, and it was the same for the delayed fall phenological trends along with altitude for the above two vegetation types. Both spring and fall shift trends for evergreen needleleaved forest need further consideration.

Keywords:

phenology; vegetation; global change; remote sensing



Evaluation of geopolitical influence under the background of climate change

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Abstract:

Climate change has surpassed the category of pure environment problem and become a focal issue in international relations in

current world. As one of the most important driving forces of geopolitical evolution, climate change has had profound influence on division and restructuration of international relations. How to enhance and evaluate the geopolitical influence under the background of climate change is not only a major challenge for all governments but also an important scientific problem needs to solve. This study attempts to construct an index evaluation system based on seven indicators, which are classified into four categories — economic influence, carbon emission influence, diplomatic influence, technological influence. Then we use the method of factor analysis to extract three main factors — sci-tech strength factor, carbon emission factor, and climate change impact factor — and calculate the comprehensive score of sample countries' geopolitical influence. This evaluation system is used to assess the geopolitical influence under the background of climate change in 40 sample countries. Our preliminary results show that: (1) The contributions of sci-tech strength factor, carbon emission factor, and climate change impact factor contribution to the comprehensive score is 39.5%, 33.0% and 14.4% respectively, which indicates that sci-tech strength factor has the greatest contribution. (2) The ranking of the comprehensive score shows that, countries with higher impact scores include EU countries, USA, Canada, Japan, Australia and the BRICS countries. The OPEC countries and some other peripheral countries such as Chile, Colombia, and New Zealand, received low scores.

Keywords:

climate change; geopolitics; influence; index evaluation

24 - Methodological strategies to construction of territorial identities applied to mountain zones in a social innovation perspective

Title of paper: Cuencas Vivas: integrating cultural knowledge and environmental values for the conservation of watersheds and mountain ecosystems. Cordón del Plata, Potrerillos, Mendoza, Argentina

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Abstract:

Cordón del Plata (5,300 masl) is part of the Andes Front Range and represents one of the main sources of water supply in the Mendoza River basin. In its margin sits the Villa de Potrerillos (1,900 masl) with a permanent population of approximately 2000 habitants. Since the construction of the Potrerillos Reservoir (year 2001) the tourist activity increased in the area, as well as the socio-environmental problems and the need to conserve the territory. In 2011, Cordón del Plata Provincial Park and Potrerillos Protected Municipal Environmental Area were created, which, together with the Perilago, make up a mosaic of management units with few articulations, where the local community has little participation. Since 2016, the "Cuencas Vivas" Project has been developed, as an experience of extension and intersectoral

articulation for the integral and participatory conservation of water. During the 2016 and 2017 cycles, workshops and a course aimed at young people of the Potrerillos Secondary School were organized, consisting of 6 modules from the perspective of Popular Education: Environmental Problems, Protected Areas, Water Resources, Sustainable Tourism, Environmental Interpretation, Social Communication. The course was concluded with the construction of an interpretative path in order to offer visitors a reflective journey and an opportunity to enhance the figure of young local guides and environmental promoters. Complementary, books are made with the contents and emerging of the course, promoting a dialogue of cultural and environmental knowledge. An intersectoral work team has been created, among academic, municipal management, conservation, technical and community actors. It is expected to replicate the experience in other territories, promoting intersectoral collaboration for the conservation of watersheds and protected areas, with the participation of the community and in particular young people, putting their attention in value in management spaces.

Keywords:

water; participatory conservation; protected areas



Networks and reciprocity in rural areas: ties that come together through organic (biological) agriculture

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Abstract:

This study seeks, through Rural Web methodology, to debate over new ruralities, new actors in rural areas and transformations arising in those territories. The main objective is to contribute with the rise of new ties among actors and with their networks, enhancing local attributes, whether related to environment, social capital, novelty production, their ability to relate independently to markets and to build new relationships with different types of institutions. This discussion arises from a socioeconomic context that denies and marginalizes small differences, and values large productive groups whether they are from the primary or secondary sector. This *strategic development option* has established benefits on a national scale while being responsible for deterioration of communities, practices, cultures, customs, among other particularities. However, even on the sidelines of what was (or still is) considered as development, different ways of understanding society do not disappear and gain strength from the 1980s when, in the context of agriculture, an alternative model to conventional food production wins more adepts. It is within this context that the organic agricultural activity presents itself as a potential model of social innovation when considering the occupation of rural spaces – mainly in mountain areas – bringing new actors to rural spaces and allowing the integration between traditional and new, providing (among innumerable possibilities of interaction) the emergence of new networks.

Keywords:

networks; organic agriculture; rural web methodology



Agroecological practices in the Serrana Region of the state of Rio de Janeiro: participatory knowledge building for sustainability

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Abstract:

Agroecological practices in the Serrana Region of the state of Rio de Janeiro: participatory knowledge building for sustainability. This work aims to evaluate participatory process of knowledge construction involving technicians and family farmers, in the Serrana Region of the state of Rio de Janeiro. Initially, the actions were based on the elaboration of a management plan for the agricultural production family units, based on the tool of the Rural Environmental Cadaster (CAR), when, from the characterization and typification of the production systems, productive and environmental issues, in order to arrive together at sustainable alternative solutions appropriate to the socioeconomic reality of the families involved. The IDEA (Agricultural Durability Indicators) method was used to evaluate agricultural practices in three dimensions: "agro-environmental", "socio-territorial" and "economic". The application occurred in 16 reference units, eight in the municipality of Petropolis and eight in the municipality of Nova Friburgo, including 8 productive units in an organic system and 8 units in a conventional system. It was possible to verify the dimensions in which sustainability was presented in the different systems, making it possible to contribute to the construction of viable alternatives with potential for replication in other mountain regions.

Keywords:

agroecological practices; rural environmental cadaster (CAR); IDEA (*Indicadores da Durabilidade das Explorações Agrícolas*)

25 - Open Session

Mountains of India: constructing and reinforcing the peripheral

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Abstract:

In 2012, at a meeting of Indian mountainous states, the Gangtok Declaration (IMI 2012) was passed, stating that: "...the mountain states in India have not received the attention due to them ...the sustainable mountain development agenda is far from even being conceptualized, though several frameworks and mechanisms have been promulgated at the national level". This expressed a long-standing concern shared by mountain peoples that mountainous regions of India, spanning about 3500 km from the western end of the Indian Himalayas to its eastern limits, have been left out of the economic and developmental advancements made by the rest of the country. Indian mountains have a long and consistent history of being othered (Bahuguna 1981, Goldstein 1981, Chaturvedi 2013, Mathur 2013). The paper hypothesizes that this otherness spills over from colloquial understandings into historical and contemporary state policies. It draws on scholarship that contends that mountain regions have been constituted into a social and political periphery (Ives and Messerli 1990, Ives 2012, Debarbieux and Rudaz 2015), and examines this in the Indian context. The paper, which is part of a larger book on the topic, aims to answer the following questions: 1. Is the Indian mountain region peripheral to India? 2. Are there policies that have contributed towards making this region peripheral? Using secondary data, policy analyses, and historical chronology of state formation, it aims to enrich the literature relating to the Indian mountain region, so that a nuanced understanding emerges of the challenges facing sustainable mountain development policy in India.

Keywords:

sustainable mountain development policy; India; Indian Himalayas; mountains as periphery



Silvicultural interventions on natural regeneration of tropical mountain forest in southern Ecuador

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Abstract:

Tropical mountain forests contain a high biodiversity and provide a variety of ecosystem services. However, they are also affected by unsustainable management, degradation and land use change. Therefore, concepts for sustainable management are urgently needed. In general, the dynamics of tropical mountain forests and the environmental and regeneration requirements of particular tree species are still little known. Information about effects of some silvicultural interventions on natural regeneration is often lacking. Thus, information about the dynamics of natural regeneration is necessary for developing guidelines for its restoration and sustainable management. In 2004, a silvicultural experiment has been installed on an area of 13 ha in the tropical mountain forest of Southern Ecuador; three intensities of intervention were evaluated. Promising individuals of selected tree species have been released from their competitors in order to investigate the effects on the natural regeneration. The aim of this study was to assess the natural regeneration dynamics in order to provide appropriate timber harvesting guidelines. The analysis is based on measurements over ten years on permanent plots. A generalized

additive mixed model was used to test the differences in ecological parameters like abundance and diversity over time between treatments.

Keywords:

silvicultural treatments; biodiversity; natural regeneration



Role of proximity and trust relations in the process of territorial governance in traditional mountain cheese value chains. Example of the artisanal serrano cheese value chain in the Campos de Cima da Serra region, Brazil

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Abstract:

In the face of an increasing withdrawal of public authorities and more spatial inequalities between regions, we are seeing today a growing interest in the concept of territorial governance through increasing participation of local population in decision and development processes. Cooperative relations among local actors seem to be a key-element of territory resilience, in which trust and proximity relationships are central. The analysis was conducted in the artisanal Serrano cheese value-chain, a traditional mountain cheese value-chain in southern Brazil. It is an informal chain; the cheese sales have become illegal; due to new consumer preferences looking for fresh cheese, and the national hygiene standards, which do not comply with small scale and artisanal production. In this context, we seek to understand the role of trust and proximities, as well as weak ties in territorial governance

processes through semi-structured interviews with local actors and a social network analysis. We observed that trust level is low except within family nucleus and for the extensionists who enjoy a high trust level from the producers. The physical isolation of the families is one of the main reasons of the overall distrust. In this sense, the creation of producer associations allowed increasing the interactions between the different actors; however, the engagement of the producers is low, and the extensionists are the central actor for the functioning of the associations. We also revealed the importance of some producers, leaders of the collective action, to link the families in order to increase trust and energize governance processes.

Keywords:

trust; proximity; territorial governance; social capital



Quantitative energy assessment of active fault influence on mountain hazards

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Abstract:

This paper devotes to build a theoretic method of quantifying the effects of active fault on mountain hazards based on seismic energy intensity of 1858 aftershock sequences of the Wenchuan Ms8.0 earthquake originated from Longmenshan Mountain fault belts, then this method is applied in Sichuan Province with 6941 earthquake events during 1970 to 2012, and inspected by the Luhuo Ms7.6 earthquake area in 1973 caused by Xianshuihe River fault belts. Spatial distribution of seismic energy intensity is calculated by the

semi-infinite half-space method; then the decay of active fault influence is determined by the distributions of mountain hazards beside the main central fault of Longmenshan Mountain and Xianshuihe River. Earthquake energy intensity revealed that earthquake energy asymmetrically decay beside the main central fault according to typical profiles in Wenchuan, Beichuan, Qingchuan and Luhuo, and its distribution can be described by Gaussian distribution in the form of: . Decays of earthquake energy intensity constitute a fundamental dynamic mechanism of uneven distribution of mountain hazards except for influence of earth surface factors, then fault-influenced range and distance can be calculated by exponential function according to the earthquake energy intensity. Novelty of the study relies in that it quantitatively assesses the active fault influence on mountain hazards using seismic energy intensity and explains the spatial effects of the influence, which is greatly superior to statistical approaches. In addition, seismic energy intensity is helpful for quick danger assessment of mountain hazard in areas lack of data.

Keywords:

active fault; earthquake energy intensity; mountain hazards; quantitative assessment



Volunteerism for community resilience in the highlands of Guatemala

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Abstract:

Every three years, the United Nations Volunteer (UNV) Program publishes a State of the World's Volunteer Report (SWVR) to

evidence the role and contribution of volunteerism to development and peace processes. The last report focused on the contribution of volunteerism to governance at different levels. The next SWVR will be launched in July 2018 and will be focused on the contribution of volunteerism to community resilience. In order to show empirical evidence in the report, a field research was carried out in 15 communities of 15 countries around the world, one of these Guatemala. The research aimed to identify the distinctive characteristics of volunteerism to the capacity of the communities to respond to shocks and stresses, and to identify the policies and structures that support or inhibit volunteerism for community resilience. The research in Guatemala was carried out in El Eden, an indigenous community located in the highlands of the department of San Marcos. Primary data was collected through focus groups discussions and key informant interviews. The emerging findings highlighted that community volunteerism is contributing to build community resilience from different angles. Within these findings key themes such as natural disasters, water, health, reforestation and infrastructures, as well as women and youth emerged to understand the contributions of volunteerism to resilience and the enabling factors that support or inhibits this contribution. The emerging findings will be part of the global report.

Keywords:

volunteerism; resilience; Guatemala



Environmental functionalities of upper montane ecosystems of the Serra do Mar of Southern Brazil

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Abstract:

Upper montane ecosystems provide environmental functionalities. Isolation by steep slopes hindered their exploitation and many of these environments present “untouched” conditions. These mature upper montane grasslands and forests feature *Inselbergs* and present geomorphology, climate and soils different from the dominant context leading to endemism. 346 vascular species were found in some typical upper montane mature forests of Southern Brazil, with 78 species being a considerable part of the tree structure. 280 taxa were list in well-preserved upper montane grasslands, being 195 contemplated in phytosociological studies. Grassland Hystosols present enormous amounts of carbon stocked by m² (about 400 ton/ha), being relevant for mitigating the effects of greenhouse gases. They are also pollutant filters, as well as store water (4000 m³/ha) and regulate water flows, many of them of important sources of public supply and of electricity. Besides mountains promote orographic rains, either trap hidden water from the clouds. The scenic beauties, tourist and environmental education potentials should be better explored. The upper montane forest-grassland transitions also serve as important sites for investigations of changes of vegetation to climate change, through C14 dating, palynological and lipid studies, among other tools of the Paleoecology. Some mature grasslands and forests have soils that have developed only a few thousand years ago, about 3000-9000 years (Igreja and Ibitiraquire mountain range summits). Despite having idea from this, we still need to broaden the scientific knowledge about the subject in order to sensitize community. Details on the data briefly presented are in the author’s publications.

Keywords:

upper montane vegetation; environmental functionalities; soil carbon; water stocks



Inselbergs – a global system of underexplored

mountains

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Abstract:

Inselbergs are old granitic/gneissic rock outcrops that rise abruptly above the surrounding landscape. They are distributed throughout temperate and tropical regions and are characterized by harsh environmental conditions (e.g. high temperatures, lack of water). The bare looking rocky slopes harbor a set of specific habitats and plant communities (e.g. cryptogammic crusts, rock pools, mats) that are clearly demarcated against their surroundings. Inselbergs form centers of diversity for plants which possess particular adaptive traits, such as carnivory (e.g. Droseraceae, Lentibulariaceae) or desiccation-tolerance. The latter group of species is also known as “resurrection plants” (incl. e.g. many ferns and grasses). In most parts of the world, inselbergs are threatened by human activities, such as quarrying, fire, and rock climbing) which is currently causing their rapid destruction.

Keywords:

centers of diversity; Droseraceae; Lentibulariaceae



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