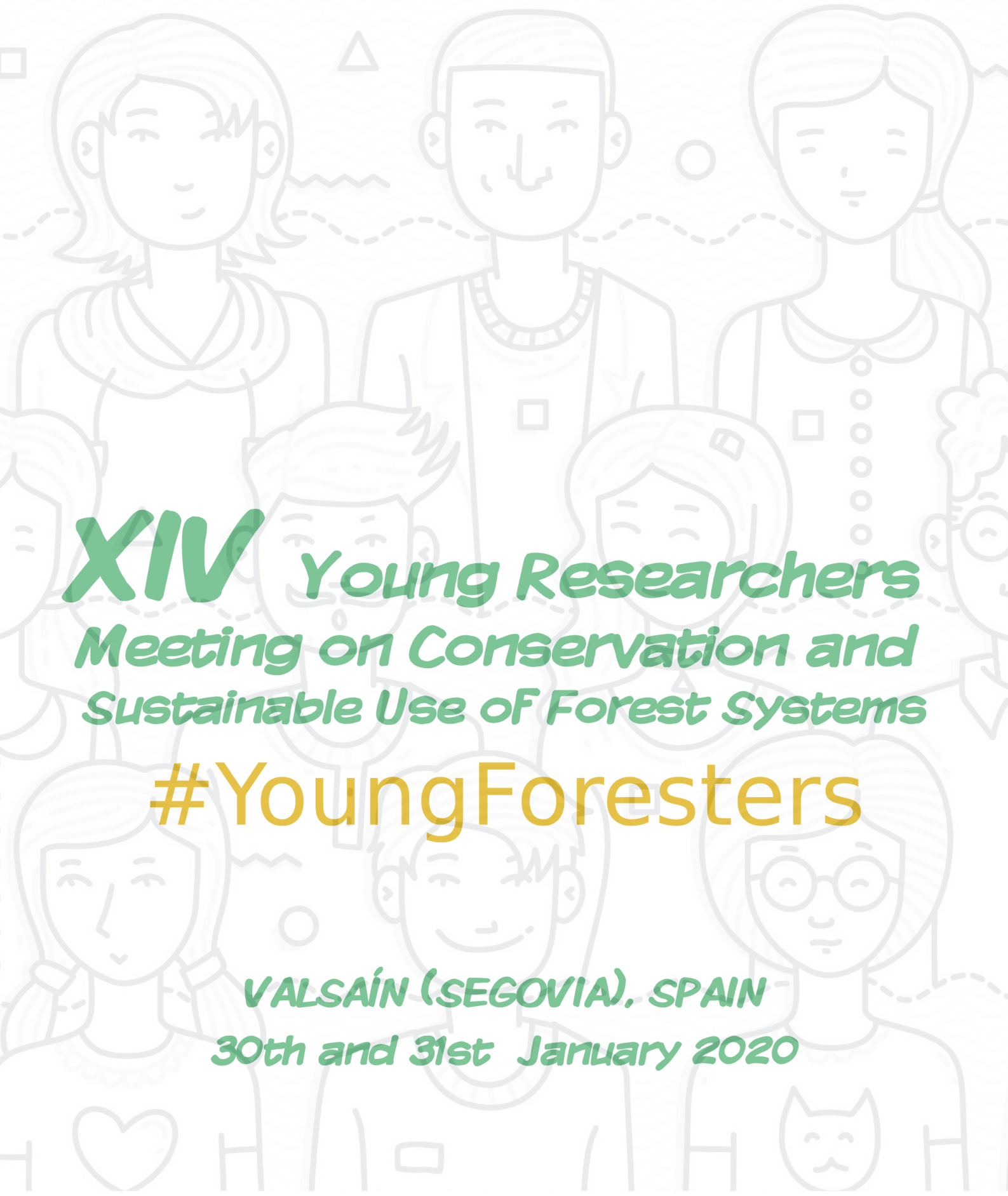

XIV Young Researchers Meeting on Conservation and Sustainable Use of Forest Systems

#YoungForesters

VALSAÍN (SEGOVIA), SPAIN

30th and 31st January 2020

Universidad de Valladolid

INIA Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria

MEDfOR Mediterranean Forestry and Natural Resources Management

Co-funded by the Erasmus+ Programme of the European Union

CENEAM centro nacional de educación ambiental

iuFOR Instituto Universitario de Investigación GESTIÓN FORESTAL SOSTENIBLE

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PREFACE

After fourteen years of fruitful networking and ideas exchange between junior and senior researchers, the Young Foresters meeting has become a landmark of our activity fostering scientific ideas exchange and concentrating our energy and devoting time to meet jointly students from different master (professional, DATAFOREST and MEDFOR) and Conservation and Sustainable Use of Forest Systems PhD program.

During these annual meeting students present and discuss their hypothesis and findings with colleagues, professors and researchers from University of Valladolid and beyond.

As in previous editions, Professor Fouad Mounir, from École Nationale Forestière d'Ingénieurs-ENFI (Morocco) will join us to deliver talks and discuss with our students their research advances and goals. Additionally, Prof. Alejandro Dezzotti from Universidad del Comahue (Argentina) will deliver a plenary talk to our students and researchers.

These fourteen editions represent the oldest, not only in Spain but also in Europe, master and PhD students meeting and it is a reference for the dissemination of forest scientific work. Young Foresters meeting allows us to establish new synergies and network and will feed our scientific activity. In this edition 65 students from 18 countries (as diverse as Nepal, Brazil, Austria, Colombia, Iran, Ethiopia, Nigeria, Ghana, Syria, Bangladesh, Pakistan, Palestine, Canada, United States, Russia, Turkey, Portugal or Spain among others) will participate. The wide geographic distribution of the participants along with the diverse ecosystems studied, allow us to cover main forestry topics.

As every year since the last decade, we have had the cooperation of the Director and staff of the National Environmental Education Center (CENEAM) in Valsaín, which, again, hosted us in their facilities. The University of Valladolid and the Erasmus Mundus (through the MEDFOR consortium) have collaborated to make this event a success.

Also, I would like to acknowledge professors and students who coordinated and managed the meeting for their hard work which is reflected in the quality of the organization. Finally, as in other opportunities, I hope that this conference will serve to guide and enrich our students and nourish their future careers.

I wish you a nice and fruitful time in Valsaín.

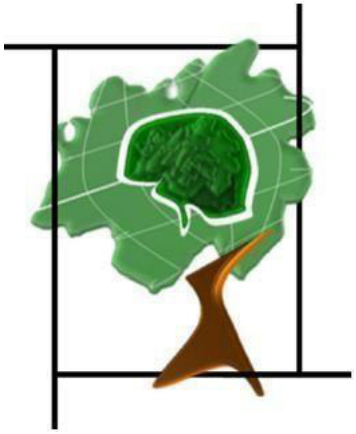
Prof. Dr. Felipe Bravo
Director
Sustainable Forest Management Research Institute, Universidad de Valladolid-INIA

XIVth YOUNG RESEARCHERS MEETING ON CONSERVATION AND SUSTAINABLE USE OF FOREST SYSTEMS_2020

This XIVth Edition of the Meeting on Conservation and Sustainable Use of Forest System is an academic activity addressed to young researchers from different master's and PhD programs of the University of Valladolid and of the Erasmus Mundus Master in Mediterranean Forestry and Natural Resources-MEDfOR. Again, it has been entirely organized and managed by students of the iuFOR (University Research Institute on Sustainable Forest Management).

A digital edition of the complete Abstract Book will be available at the web page of the Institute.
http://sostenible.palencia.uva.es/

Valsaín – Spain 30th and 31st January 2020



PROGRAM

THURSDAY 30TH JANUARY

08:00 DEPARTURE FROM PALENCIA CAMPUS

08:30 DEPARTURE FROM VALLADOLID

10:00-11:00 REGISTRATION & COFFEE

11:00-12:00 OPENING ACT & WELCOME CONFERENCE

Felipe Bravo, Director of IuFOR
Mónica Moraleda, CENEAM
Marta Pardos, *INIA-CIFOR*

Welcome conference: Alejandro Dezzotti *(Universidad Nacional del Comahue, Argentina). Ecological sustainability of silviculture at management unit scale: rationale, methodology and case study*

12:00-13:15 SESSION I

Chairpersons: **Sevillano, Ignacio & Segur, Miguel**

Ramsauer, Julia. *The role of bird seed dispersers in landscape scale forest species distribution patterns: Viscum album in Mediterranean pine forests*

Matei, Petruta Mihaela. *Hygienization and control of Diplodia seriata fungus in vine pruning waste composting*

Alcântara-Costa, Juliana. *Evapotranspiration evaluation in semiarid forests using sebal*

İslam, Md. Rafikul. *Common allometric equations for estimating stand-level carbon stocks of trees in Bangladesh*

Piquer, Marina. *Effects of thinning in litterfall dynamics of a pine-oak mixed forest in central Spain*

LeBlanc, Hannah. *Billion-dollar chickens: the impacts and economic implications of cattle grazing on sage-grouse habitat in the American west*

13:15-15:00 LUNCH AND ACCOMODATION

15:00-16:00 SESSION II

Chairpersons: **Askarieh, Ali & Ramsauer, Julia**

Cudjoe, Eric. *Tree allocation in temperate mixed forest*

Mohammad, Hiba. *Inventory of land degradation in the Syrian coastal area: preliminary results*

Valbuena, Pilar. *Social media analysis and text mining on twitter: the Spanish forestry sector case study*

Amin, Huma. *The potential of the flora from different regions of Pakistan in phytoremediation*

Beck, Ricardo. *Role of Diptera (flies) in forest systems*

16:00-16:30 COFFEE BREAK

16:30- 17:45 SESSION III

Chairpersons: **Cudjoe, Eric & Vázquez, Aitor**

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Husein, Duaa. *Correlation between Circadian rhythms and environmental factors as an indicator for plants adaptation to climate changes*

Perez, David. *Use of high-resolution images for silt estimation in sediment dams*

Ogundipe O. Christianah. *Modelling height-diameter relationship and volume of Nauclea diderrichii (de Wild. and T. Durand) Merr. stands in Omo forest reserve, Nigeria*

Segur, Miguel. *Preliminary results, Bolivia´s Amazonian protected areas baseline for the Amazon sustainable landscapes (phase II) program*

Becvar, Lia Albuquerque. *What to do to create bioeconomy*

18:00 DEPARTURE TO SEGOVIA

18:00 - 22:30 TAPAS, DRINKS & VISIT TO SEGOVIA

22:30 BACK TO VALSAÍN

FRIDAY 31ST JANUARY

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Vázquez, Aitor. *Wildlife census in two forests of Pontevedra (SW of Galicia, Spain) and comparison of census methods*

Wojcik, Matthew. *Hawai'i: verdant paradise or ecological tragedy?*

Aloi, Francesco. *Diversity of Phytophthora in watercourses of protected natural areas of Sicily*

Badalzadeheaghdam, Elham. *A collaboration from agriculture to forestry: the effect of adjuvants on perfomance of herbicides in corn*

Kore, Worku Emanda. *Suitability modelling for silvopastoral production in Abaya district using GIS and remote sensing*

10:00-11:00 ROUND TABLE & DISCUSSION ON PhD at UVa

Chairperson: Felipe Bravo (President of PhD Commission-UVa)
Carmen Camarero, Director of School of Doctorate UVa
PhD Experiences at UVA: Ruth Martín / Cristina Zamora/ Sara Uzquiano

11:00-11:30 COFFEE BREAK

11:30-13:00 SESSION V

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Getino, Marina. *Effect of pine-oak mixed forest on soil carbon and leaf litter accumulation*

Simoes, Frederico. *Classification of plant phytophysionomy at Fazenda verde in the state of Mato Grosso - Brazil*

Zamora, Cristina. *Pine pitch canker (PPC): pathways of pathogen spread and prevention and control measures*

Uzquiano, Sara. *Diagnosis for wind power in Central America face to climate change*

Slobodchikova, Viktoriya. *Drought effect on the wood cell formation*

Sánchez, Tamara. *Fungal metagenomic analyses in Castanea sativa trees affected by Cryphonectria parasitica and Quercus ilex trees affected by Phytophthora cinnamomi to enhance the biological resilience*

Roque. G. N. S, Maria Teresa. *Planning permaculture interventions for fire prevention in headwater systems….What?*

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13:00-15:00 LUNCH & GROUP PICTURES

15:00-16:00 SESSION VI

Chairpersons: **Getino, Marina & Sánchez, Tamara**

Muñoz Cerro, Elena. *Can native shrubs and herbivory improve soil properties in reclaimed open-cast coal mines?*

Martín Sanz, Ruth C. *Insights into Pinus halepensis integrated phenotype*

Franco Manchón, Iván. *Food security and environmental conservation through the sustainable use of fungi in Ethiopia*

Ayalew, Dessalegn Worku. *Reforestation planning based on future climate change: a case study in ribb catchment, Ethiopia*

16:00-17:00 CLOSING ACT & AWARDS

Oscar Martínez Sacristán, Vice Chancellor for Research, Innovation and Transfer

Carmen Camarero, Director of School of Doctorate Uva

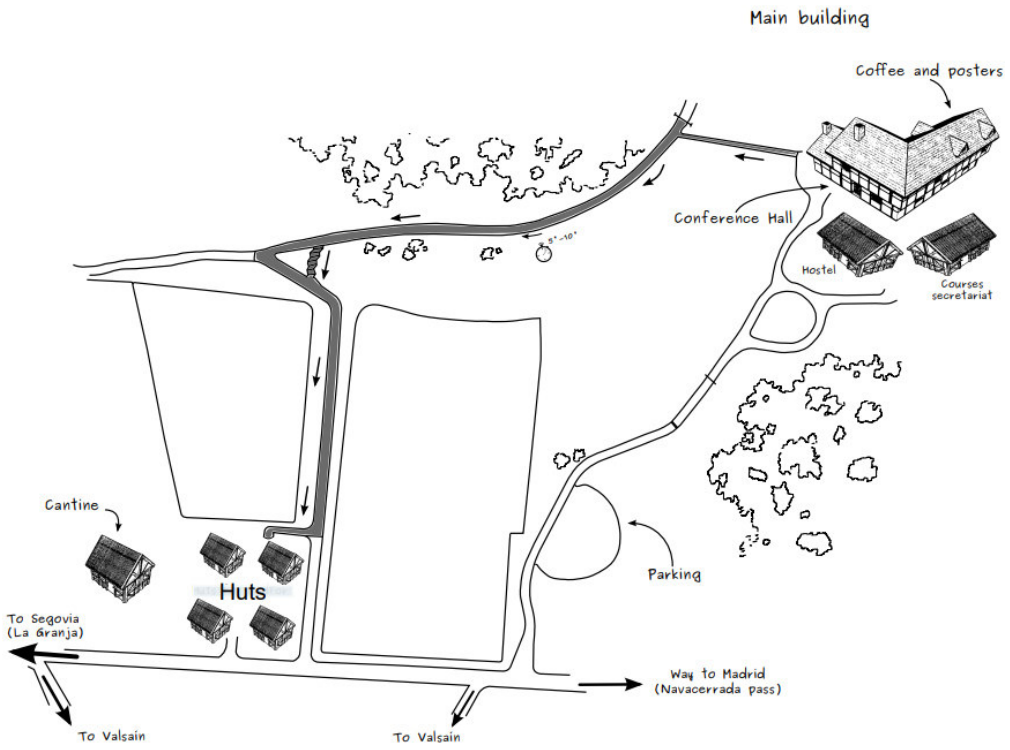
Elena Hidalgo

José Reque

17:00-17:30 FINAL COFFEE BREAK

18:00 BUS BACK TO VALLADOLID (19:30) AND PALENCIA (20:00)

NB: THE BUS WILL MAKE A QUICK STOP AT SEGOVIA TRAIN STATION FOR PARTICIPANTS GOING TO MADRID



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WELCOME CONFERENCE

Ecological sustainability of silviculture at management unit scale: rationale, methodology and case study

Dr. Alejandro Dezzotti[1]

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adezzotti@gmail.com

Keywords: ecological indicators, biological diversity, species density, point-intercept method, Principal Component Analysis

Biological diversity is a key indicator of an environmental sound management of forest stands. However, an operational problem is that abundance, needed for diversity metrics, is difficult to estimate for clonal plants. Statistics based in occupancy, *i.e.*, the number of localities that an organism of a certain taxon and with particular attributes occurred, is an appropriate approach. This methodology can also evaluate simultaneously other relevant variables as tree regeneration, and soil and aerial covers. This is illustrated with a case study aimed to assess the sustainability of a *Pinus ponderosa* afforestation, located at ~38°W and 71°S. The univariate and multivariate analyses were based in the compositional and functional diversity and species density of plants, along gradients of vegetation and land use. We identified 13 natural and anthropogenic vegetation units, comprising degraded areas, steppes, meadows and forests, three structural classes of stands and 150 plant species. Within these natural and anthropogenic habitats, diversity maintenance in plantation requires silvicultural prescriptions at stand and landscape level, directed to reduce both, canopy cover and homogeneity. While such a management may represent a plantation with a lower timber production, it would exhibit larger ecosystem and aesthetic values increasing the possibility of economically support by society.

SESSION I

The role of bird seed dispersers in landscape scale forest species distribution patterns: *viscum album* in mediterranean pine forests

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Keywords: frugivory, biodiversity indicators, landscape structure, Iberian Peninsula, ecosystem services

Seed dispersal by birds plays a crucial role in structuring landscape dynamics and supporting biodiversity. This animal-plant mutualism has been mostly studied in small scale extents, while the knowledge of landscape-wide processes and their applications is still scarce and problematic. In this study, we developed a set of general bird seed dispersal indicators based on winter bird species distribution models (SDMs) of bird dispersers to investigate, whether these indicators are able to explain the distribution patterns of *Viscum album* (European mistletoe) on its main host tree species in Catalonia, Spain. We used generalized linear models to predict V. album distribution based on climatic conditions, bird seed dispersal indicators, and habitat preferences of birds. Results showed that bird seed dispersal indicators contributed to explain the distribution of the mistletoe, with this contribution showing a clear trend towards bird dispersal being a landscape scale rather than a local process. Additionally, habitat preferences of dispersers regarding nutrient rich habitats provided an additional factor behind the distribution of the mistletoe. Our approach, by developing dispersal indicators based on bird SDMs and using them to predict large scale plant species distribution, helped to shade light on the complexity of processes underlying effective seed dispersal over large spatial scales. This approach could be applied to different study systems and aid the understanding of the ecological processes behind seed dispersal patterns at large spatial scales, thus guiding biodiversity management at the landscape scale in a more efficient way.

Hygienization and control of *Diplodia seriata* fungus in vine pruning waste composting

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*Presenting author

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Keywords: biodigester, composting, grapevine disease, laying hen manure, vine pruning waste

After the ban on sodium arsenite, waste management alternatives to the prevalent burning method, such as the hygienization and biodegradation in solid phase by composting, are required for the pruned material from grapevines affected by various fungi. In this work the dynamics of a fungus associated with vine decay (*Diplodia seriata*) during the composting process of a mixture of laying hen manure and vine pruning waste (2:1 w/w) have been investigated in an open pile and a discontinuous closed biodigester. Through the optimization of the various physical–chemical parameters, hygienization of the infected waste materials was attained, yielding class-A organo-mineral fertilizers. Nevertheless, important differences in the efficiency of each system were observed: whereas in the open pile it took 10 days to control *D. seriata* and 35 additional composting days to achieve full inactivation, in the discontinuous biodigester the fungus was entirely inactivated within the first 3–7 days. Finally, the impact of seasonal variability was assessed and summer temperatures shown to have greater significance in the open pile.

Evapotranspiration evaluation in semiarid forests using sebal

Alcântara Costa, J.[1]*, Navarro Hevia, J.[2], Gomes Costa, A.[1], de Araújo, J.C.[1]

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Keywords: hydrology, remote sensing, radiation balance, Caatinga, Pinus pinea L.

Evapotranspiration (ET) plays an important role in water resources planning and management. ET is particularly addressed in semiarid regions. The use of remote sensing techniques based on the satellite images have been proved useful at large scales in forest areas. The aim of the study is to evaluate the spatial and temporal actual ET patterns in semiarid forests in Brazil (Aiuaba - CE) and Spain (Valladolid - VA) using the SEBAL method. Both are important forest areas that present low precipitations rates and high atmospheric water demand. In the Brazilian region there is the Caatinga biome, while in the forest in Valladolid there are Pine-woodlands as the main vegetation. We worked with two Landsat 5 (08/1995) and two Landsat 8 (07/2018) images. For the validation, in Caatinga we used the Penman-Monteith equation and crop coefficient developed for the area of study by the water balance method. For the Pine forest, besides Penman Monteith, we used the pan evaporation data from meteorological stations and crop coefficient from the literature. ET presented similar rates within the areas, ranging from zero to eight, because this is the period of the year with the lowest soil moisture in both areas. Temporal evaluations were verified in some areas of the study areas, both of which presented higher spatial uniformity of ET in the 2018 images. We believe this is due to the temporal effect on forest restoration. Our results can be used in hydrological modelling and in the understanding of evapotranspiration patterns in both zones.

Common allometric equations for estimating stand-level carbon stocks of trees in Bangladesh

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Keywords: aboveground biomass, belowground biomass, wood density, three-variable allometric models, climate change mitigation

Estimation of stand level carbon stocks per unit area of forests or woodlands is of great importance considering global climate change scenarios. In this study, we intend to develop allometric models to predict stand-level carbon stocks of different tree species common in plantations and natural patches in different forest of Bangladesh using some easily measurable stand variables. Results show that the allometric models having three-variables, such as stand basal area (BA), mean tree height (Hmean) or dominant tree height (Hdom) and wood density (WD) of tree species or even a combined variable with multiplication of those three variables can yield high precision estimates of stand-level carbon stocks having less than 2% mean prediction errors (MPEs). The mean tree height can be replaced by stand maximum/dominant tree height when data on height of all individual trees are not available. Our work also has implications on the use of allometric equations in estimation of stand-level carbon stocks in a cost and time effective way and these models can be useful to estimate country-level carbon stock rapidly through statistically validated methods and can help in achievement of full carbon mitigation potential requirements in Bangladesh.

Effects of thinning in litterfall dynamics of a pine-oak mixed forest in central Spain

Piquer-Doblas, M.[1]*, del Río, M.[2,3], Ruiz-Peinado, R.[2,3], Bravo-Oviedo, A.[1,3]

[1]*Department of Biogeography and Global Change. National Museum of Natural Sciences-Spanish National Research Council (MNCN-CSIC)*

[2]*Department of Silviculture and Forest Systems Management, INIA-CIFOR, Madrid, Spain*

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Keywords: Pinus pinaster, Quercus pyrenaica, SPEI, forest management, post-disturbance effects

Litterfall constitutes the most important organic matter source in forested ecosystems. This input has a major role in nutrient cycling, humus formation and soil structure. Litterfall equilibrium is therefore essential for forest ecology, but it is sensitive to forest natural and human-induced disturbances. In our study, we assess the impact of different thinning intensities in a Mediterranean pine-oak forest (*Pinus pinaster* and *Quercus pyrenaica*) located in Montes de Toledo, central Spain. Three thinning intensities were stablished in the study site: removal of 25% of basal area (light thinning), removal of 45% of basal area (heavy thinning), and control plots with no thinning. We analyse changes in litterfall dynamics during 4 years after thinning (2010-2014), focusing on changes in litterfall production at two temporal scales: monthly and seasonal. Linear mixed models were performed to evaluate the relationship between thinning and litterfall dynamics, exploring also the importance of factors like drought intensity, tree species identity and season. We found that both light and heavy thinning reduce litterfall production in these forest stands in both species compared with the control stands. This reduction exists in monthly and seasonal litterfall. Climate has also an influence in the amount of litterfall produced, specially drought periods for *Pinus pinaster*. Changes in litterfall seasonality due to thinning were also detected for the pine.

Billion dollar chickens: the impacts and economic implications of cattle grazing on sage-grouse habitat in the American West

LeBlanc, H.[1]*, Conway, C.[2,3], Meyers, M.[3], Launchbaugh, K.[3], Musil, D.[4], Makela, P.[5], Roberts, S.[4]

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Keywords: wildlife, habitat, livestock, conservation, management

Greater sage-grouse (Centrocercus urophasianus) are a ground-dwelling bird that are an important indicator species for the sage-steppe habitat of the American West. Their population is currently less than 10% of its historical range largely due to human use activities that have fragmented and altered the natural habitat. Despite the severe population decline, sage-grouse have never been federally protected under the Endangered Species Act (ESA) because of the billions of dollars worth of economic impact this would have on the energy and cattle industry. The Grouse & Grazing Project was created in order to provide experimental data for the direct impact of cattle-grazing on sage-grouse habitat features, nest selection and brood survival. The 10-year long Before-After-Control-Impact (BACI) study is joint-funded through the University of Idaho and the Idaho Fish and Wildlife Department, and is currently in year 5. Preliminary data supports that sage-grouse select nest sites with higher percentages of shrub cover, and that successful nests are associated with higher grasses and forbs. Cattle grazing may affect vegetation structure and nest concealment from predators as well as available food for hatchlings. Understanding the factors impacting sage-grouse populations is essential for evaluating the efficacy of potential conservation and management plans for the sage-steppe ecosystem.

SESSION II

Tree Biomass Allocation in Temperate Mixed Forests

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Keywords: Scots pine, Sessile oak, allometry, aboveground biomass, biomass allocation

Mixed forest is one of the best ways of managing the forest to face the recent environmental issues such as climate change. Some of the essential reasons behind mixed forests are provision of higher productivity, higher temporal stability, lower risk of biotic and abiotic disturbances and a more diverse portfolio of ecosystem services from forests. Therefore, one of the key landmarks in sustainable resource management is the estimations of forest carbon stocks. This presents a hefty challenge to do in mixed forests as it has been showed that stand productivity can be benefited by mixtures. The research work was mainly focused on identifying how the stand mixture affects allometric relationships and tree biomass allocation. Triplet approach of monospecific and mixed stands of *Pinus sylvestris* L. and *Quercus petraea* (Matts.) Lieb. in Northern Spain was adapted. We fitted 4 different height-diameter models for monospecific and mixed forests for Scots pine and Sessile oak species. The Korf curve for height-diameter models performed better than Power equation, Meyer equation and Naslunds equation, as the lowest AIC and highest R^2 obtained suggested. In addition, there was no variation of height-diameter relationships for oak trees in monospecific or mixed stands. However, an extensive difference in the monospecific and mixed stands for Scots pine was found. Dirichlet regression was used to fit biomass models using diameter at breast height (dbh) and total height (ht) as independent predictors for both species. Moreover, the total aboveground biomass of trees growing in mixtures was not significantly different from trees growing in monospecific stands. Also, the biomass proportion of different tree components in mixed stands was like that of monospecific stands. The results illustrate clearly that there was no difference in both monospecific and mixed stands for both species studied. Therefore, the biomass allometric models developed from monospecific stands can be used to predict tree biomass in mixed stands of the study mixture without any significant bias.

Inventory of land degradation in the Syrian coastal area: preliminary results

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Keywords: monitoring, soil degradation, erosion, coastal management, remote sensing

From the Mediterranean to the Syrian Badia, Syria was covered with forests and trees for decades ago (32.5 of the Syria territory in the last century), but gradually deteriorated to less than 3% due to frequent drought spells, wildfires, and transgression of land and forest sites. The soil in the coastal region of Syria is characterized by a fragile nature due to the joint effects of human activities and natural factors. Because of this, it has been negatively affected and deteriorated to a large extent. Among the significant factors which influence soil degradation are high population density, intensive agriculture, heavy industry, transportation, and urban expansion. Unsustainable management of natural and agricultural resources is accelerating soil degradation. The strategic objective of this inventory is to support the implementation of the strategy and national action plan to combat desertification related to the UNCCD. The project includes three main programs: land degradation, land capability, and public participatory program. The period of implementation extends three years. The significant expected results are identification and prioritization of erosion hot spots, assessment and inventory of currently applied remedial measures, evaluation and list of possible preventive measures, and capacity building in programmes - related fields.

Social media analysis and Text mining on Twitter: the Spanish forestry sector case study

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*Presenting author

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Keywords: text mining, social media, forestry

There has always been a concern in the Spanish forestry about its poor visibility and especially about the lack of understanding by society of what we do within our profession. And the same has happened to me, as well as to known people. Lately this passivity in carrying out communication activities by the online forestry sector is changing, especially by people within the forest fire sector, not only with its activity in social networks and blogs, but also talking to the press and conveying a clear and understandable message for everyone. However, although these actions are always defined in the plans, they often fail to be implemented, since communication is usually considered as something secondary in which to cut if necessary. And this is due to a lack of strategic vision of the objectives to be achieved with it. In social networks this dynamic is changing, especially with those mentioned above, especially in the microblogging network "Twitter". In order to analyse this activity, there has been selected a list of 350 accounts of the Spanish forestry sector, and a complete analysis of text messages and interactions has been accomplished.

The potential of the flora from different regions of Pakistan in phytoremediation

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Keywords: phytoremediation, soil contaminants, tree, heavy metals, uptake

The soil and water quality is greatly affected by the environmental pollution due to increasing trend of urbanization and industrialization. In many developing countries, including Pakistan, the situation is more alarming as no preventive measures are still taken to tackle the this environmental pollution .Although in developed countries, many techniques are used to remediate the environment including phytoremediation. Phytoremediation, the use of plants to decontaminate soil and water by taking up heavy metals, shows considerable promise as a eco-friendly , low-cost technique and has received much attention in recent years. However, the application of this technique is limited due to low biomass of hyper-accumulators and plants with long growing seasons required. Therefore, to maximize phytoextraction efficiency, it is important to select a fast-growing and high-biomass plant with high uptake of heavy metals Pakistan has a great diversity of plants that could be used for the remediation of environmental pollutants. We studied the use of flora for phytoremediation and about 30 plant species were studied for this purpose. The purpose of this study was to investigate the potential of different plant species for phytoremediation and their comparison to other countries to relate future perspectives.

Role of Diptera (flies) in forest systems

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Keywords: Diptera, Hermetia illucens, ecosystem services, decomposers, pollination

Biodiversity of insects is threatened worldwide. Rates of decline that may lead to the extinction of 40% of the world's insect species over the next few decades. Pollinators play a crucial role in ecosystems by facilitating plant reproduction. They provide an essential ecosystem service, being responsible for at least 35% of global crop-based food production. Given the recent substantial losses of pollinators induced by habitat loss, it would be prudent to improve our understanding of different pollinators alternatives as the flies from the Diptera order. The analysis of pollen-transport shows that Seventy-one families of Diptera contain flower-visitors and Diptera are regular visitors to at least 555 plant species, which include over 100 cultivated plant species comprising important crops, such as mango, oil seed rape, onion and cocoa. As decomposers, the larvae of the *Hermetia illucens*, order Diptera, play a master service supporting the nutrient cycling and soil formation. They can degrade organic matter with material degradation up to 70 % or reduced the manure by 50%. Approximately 45,000 larvae will consume 24 kg of swine manure in 14 days.

SESSION III

Morphological and physiological responses of *Fagus sylvatica* and *Quercus robur* seedlings to light availability

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Keywords: European beech, pedunculate oak, underplanting, growth, physiology

This study was an attempt to provide information on species suitability for underplanting of two important trees in European forestry: pedunculate oak (*Quercus robur* L.) and European beech (*Fagus sylvatica* L.). To determine the morphological, physiological and growth responses of these two species to different light conditions, beech and oak seedlings previously grown at full light for two years were covered by shading nets that provide different shade levels (62%, 51% or 28% of full light) or continued to be exposed to full light. Both oak and beech displayed similar acclimation in response to shade for most of the traits investigated. At the plant level, seedling acclimation to shade included higher biomass allocation to above than below-ground parts and greater energy investment on height than diameter growth. At the leaf level, seedlings grown under shade reduced their leaf thickness and photosynthetic rates per unit area and increased their efficiency of the photosystem II and specific leaf area. This increase in specific leaf area seems to be one mechanism that allows seedlings to perform well under shade conditions. Despite the greater growth at full light, the results of this study suggest that beech and oak seedlings would be able to acclimate and perform well if underplanted below overstories that reduce the available light to as low as 28% of full light.

Correlation between circadian rhythms and environmental factors as an indicator for plants adaptation to climate changes

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Keywords: circadian rhythms, chlorophyll fluorescence, climate, adaptation, wild barley

The east Mediterranean region is a challenging environment, particularly sensitive to climate changes, due to its climate heterogeneity with altitude gradients and microclimates in addition to that the region witnessed massive changes in human culture that affected the landscape and ecosystem function and caused climate shifts. in this time of accelerated global climate change Anticipation to predictable environmental conditions is a key mechanism for understanding the response and the adaptation of plants for the environmental changes. The circadian clock is a molecular mechanism that maintains ~24-hour cycles, and therefore allows organisms to predict and adapt to daily and seasonal changes in their environment. This mechanism is especially important to plants from the annual plants to the forests woodland, as they are non-motile and depend on sunlight as an energy source, in plants, the circadian system controls a plethora of processes, such as photosynthesis, photoprotection, stomatal opening, gases exchange and photoperiodic development. In our work we used chlorophyll fluorescence to measure Circadian rhythms in wild plants which revealed another aspects of the clock regulation especially in the environmental level, as we used this tool to study a Barley 1K (B1K) collection, one of the few collections of wild-barley that comes directly from the wild from different geographical areas of the east Mediterranean, the results showing correlation between the circadian rhythms and the environmental factors such as temperature and annual rainfall, which can be an index to study the effect of climate change on plant species and the adaptation mechanisms.

Use of high-resolution images for silt estimation in sediment dams

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Keywords: UAV, remote sensing, digital elevation model, erosion, badlands

The objective of this work was to evaluate the measurement of sediment fed into sediment dams using high resolution images. For this, a high precision topographic survey was carried out on dam an unmanned aerial vehicle, generating high resolution images converted to digital elevation models (DEM) during different seasons, July 2018 and July 2019. For the acquisition of the high-resolution images operated an unmanned aerial vehicle (UAV) model DJI Phantom 4 Pro. The sensor attached to the UAV to capture the images was a 20 megapixel camera having three channels in the visible spectrum, set at a focal length of 20 mm. The flight was performed at 80 m height in lines with 75% front and side overlap. The Smarthphone application for flight planning and image acquisition was Drone Deploy®. The digital images with spatial resolution of 0.02 meters / pixel allowed an economic and accurate survey of the sedimentation volume in a dam due to the difference between MDEs in two period. The dam analyzed presented a sedimentation area and volume of 46.0 m² and 0.98 Mg. With the images it was possible to remotely identify both the catchment area of a watershed and the sedimentation area in a sediment dam in a better way than with conventional survey methods.

Modelling height-diameter relationship and volume of *Nauclea diderrichii* (De Wild. and T. Durand) Merr. stands in Omo forest reserve, Nigeria

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Keywords: allometric-equations, hardwood species, tropical forest, dbh, total heights

Stand height and volume models are reliable tools for obtaining information on the growth and yield of the forests. However, this tool has not been efficiently utilized both in planted and natural forests in Nigeria. Therefore, this study modelled height-diameter relationship as well as tree volume for *Nauclea diderrichii* stands in Omo Forest Reserve, Nigeria. Data were collected from 36 sample plots of size 25m X 25m. The total number of trees encountered during the study was 964 trees with mean Dbh and height of 33.75cm and 22.69m respectively. Ten height-diameter and volume models each were fitted using regression analyses. The Adjusted coefficient of determination (Adjusted R^2) and root mean square error (RMSE) were used to evaluate the developed models. The height-diameter equation of $h = -1.754 + 6.968\, lnd$, performed best and was selected for height prediction using dbh. Furthermore, the volume equation of $lnv = -1.114 + 0.000044 d^2 h$ was selected as best fitted equation, using dbh and height as the predictors. The predicted height gotten from the equation above was used for fitting the volume equations. The models were validated with data obtained from independent sample plots and were found to be efficient for estimating height and volume for *Nauclea diderrichii* stands in Omo Forest Reserve.

Preliminary results, Bolivia´s Amazonian protected areas baseline for the Amazon sustainable landscapes (phase ii) program

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Keywords: Bolivian Amazon, deforestation, forest cover loss, protected areas

In a project formulation context, reliable (or otherwise applicable) data on Amazonian deforestation proceeds from three main sources. This work presents results from the verification of the first of these three sources, Google-supported Global Forest Watch (Hansen et al. 2012), and its use for project formulation purposes, namely, to establish a baseline. Our previously-unpublished results show overall high, but diminishing loss of forest cover in ten objects of interest: six National Parks, three RAMSAR sites and one subnational protected area for the period 2009-2018.

What to do to creat bioeconomy

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Keywords: skills, produts, inovation, market, trend

The forest industry is an intelligent environment to work with because of the large amount of service and goods that come from the forest. It also creates most of the jobs where peoples live. The bioeconomy market generates an economy to a specific market and target audience, and it still has room to grow. The young foresters have a whole new market to follow and develop. The bioeconomy is the future because it enables the extraction of goods from the forest in a sustainable and innovative approach, instead of using fossil fuel. Our current economy is based on reuse, recycle, and repair from a linear economy, and now is time to learn new skills and innovate ourselves to a new reality. Forest is not only the timber because it has much more to offer, and once we need to be renewable, we must learn how it operates and work towards the new market trend to adapt. The technical forestry knowledge is necessary, but also business, social, communication, and creativity skills, among others. The bioeconomy industry is innovative in most of its aspects, from the material to the people who are work on its sector.

SESSION IV

Wildfire census in two forests of Pontevedra (SW of Galicia, Spain) and comparison of census methods

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Keywords: Oryctolagus cuniculus, Vulpes vulpes, Sus scrofa, Capreolus capreolus, hunting

Hunting was anactivity which contribute to human evolution, and over the years his human use changes completely. The practice of that activity without control suposed great problems to some wild species, like the case of *Tetrao urogallus cantabricus* in the North of Spain. To prevent that problem, some estimation wildlife population methods start to be used and improved. This study estimates the populations of some hunt species (*Oryctolagus cuniculus, Vulpes Vulpes, Sus scrofa, Capreolus capreolus*) on two galician forests, comparing the methodologies used for each specie to know which is better to that case. Moreover, we compare which natural factors affect the most to the presence of the species at the study area.This study doesn't show clear results about species population, so more investigation about the optimal census methodologyfor each specie is needed in order to estimate their wild population and suggest wildlife management techniques.

HAWAI'I: Verdant Paradise or Ecological Tragedy?

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Keywords: biodiversity, invasive species, endemism, plantation agriculture, preservation

The earth is host to a series of extremely remote archipelagos; each having developed its own unique ecosystems due to geographic isolation. The US State of Hawai'i is an example of one of these island groups – a dizzying array of volcanoes, culturally significant flora and fauna and unique biomes. Significant settlements appeared in the islands roughly 1,000 years ago. Since their appearance, humans have had a massive impact on forest structure and local biodiversity. Introduced animals devastated native animal populations and deforestation of huge tracts of forest land to make grazing pastures and to create pineapple and sugarcane plantations by later generations contributed to a catastrophic loss of species. In addition, invasive plant species have ravaged Hawaiian forests. Many people travel to Hawai'i as tourists and see a lush, verdant, tropical paradise, but few realize that much of what they see does not belong in Hawai'i at all. Using data provided by the State of Hawai'i and relevant research institutions, my aim is to expose this reality, to explore the effects of Hawai'i's susceptibility to these detrimental anthropogenic factors and to discuss the mitigation of these effects so that restoration efforts in the islands will be fruitful.

Diversity of *Phytophthora* in watercourses of protected natural areas of Sicily

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Keywords: pathogens, river systems, baiting, ITS region, ecological diversity

The aim of this study was to investigate the ecological diversity of *Phytophthora* populations in rivers and streams of nine Protected Natural Areas in eastern Sicilian and their association with natural riparian vegetation. Preliminary results were recently published by Jung *et al.* in 2019. *Phytophthora* species were isolated from waterways by *in situ* leaf baiting rafts. Isolates were identified by sequence analysis of internal transcribed spacer (ITS) regions of ribosomal DNA (rDNA) and the diversity of Phytophthora populations was expressed as Shannon Diversity Index (SDI), Shannon Evenness Index (SEI) and Richness (R). The watercourses examined included both rivers, such as Alcantara, Anapo and Fiumefreddo, and streams with a torrential water regime, such as Sciambro, a seasonal short-lived stream originating from the melting of the snows of Mount Etna at over 1,600 m a.s.l. and crossing a single-tree-species forest of black pine (*Pinus nigra*). Primarily aquatic species, including *P. frigida*, *P. gonapodyides*, *P. hydropatica*, *P. lacustris* and *P. thermophila*, which are regarded as opportunistic pathogens, but also soilborne and airborne primary pathogens, including *P. ˣcambivora*, *P. citrophthora*, *P.* sp. "kelmania", *P. multivora*, *P. plurivora*, *P. polonica* and *P. pseudocryptogea* were recoverd. High SDI, SEI, and R values and a significant proportion of exotic species were found in *Phytophthora* populations of most river systems, particularly in those with a previous history of cropping activity, while naturalized ecosystems showed a lower diversity. The highest SDI value was found in the Fiumefreddo river, a short permanent watercourse in a recently established, small natural reserve near the sea, while only *P. gonapodydes* was recovered from Sciambro.

A collaboration from agriculture to forestry: the effect of adjuvants on perfomance of herbicides in corn

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Keywords: Nicosulfuron, forest soil, additives, dose reduction

The use of herbicides in forestry is increased in recent years in order to increase the wood production. For many forest managers, herbicide application is a popular option and more cost-effective than other available alternative measures. Some pesticides are persistent and could affect the soil in the long-term if agricultural land is later transformed to forest. Due to these effects with use of adjuvants we can reduce the amount of herbicides also increased the effect of them, Herbicide treatment in forestry is generally based on the experiences in intensive agricultural production. In order to study the effect of some adjuvants on herbicide Nicosulfuron efficiency on agronomical traits of maize and some weeds density and biomass, a field experiment was conducted in research field of Miyaneh (Iran), based on randomized complete design with three replications. Treatments included T1: atrazine, T2: Nicosulfuron + volck oil, T3: Nicosulfuron +ammonium nitrate, T4: Nicosulfuron + Ammonium sulfate, T5: Nicosulfuron +Citogate, T6: Nicosulfuron and T7: control. Results showed that the effect of herbicide and adjuvants application was significant on maize grain yield. Among different adjuvants, Ammonium sulfate was more effective on studied traits than other adjuvants. Furthermore, the treatments had significant effect on *Amaranthus retroflexus* density and dry weight. Results showed that Nicosulfuron +Ammonium sulfate had the least *Amaranthus retroflexus* density and dry weight.

Suitability modelling for silvopastoral production in Abaya district using GIS and remote sensing

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Keywords: Multi Criteria Evaluation, Landsat image, ArcGIS, Mixed research method, survey

Ethiopia has a huge potential for livestock production for local use and export purpose. However, production was constrained by imbalanced ways of suitable integration with natural resources. The present study aims to identify suitable land and factors affecting livestock production at Abaya using GIS and RS. Mixed research method was applied, a survey of 201 household heads, and observation. Land use land cover (LULC) analysis was made from Landsat image 8 of the 2017 to determine LULC, soil classification, slope and rainfall to run the suitability and the model was run in ArcGIS by using Multi Criteria Evaluation. The suitability model result showed that 11%, 9%, and 9% of the district are classified as highly suitable for production of goats, cattle and sheep, respectively. Whereas, 27%, 73% and 73% of the land were found to be moderately suitable while the remaining were least suitable land for the same group of livestock. Feeding ground and feed shortage, and credit service are identified as a priority facing factor. The result showed the district has optimally suitable land and potential rivers for silvopastoral production. The study results are helpful for decision making in the selection of suitable sites for the future livestock production.

SESSION V

Effect of pine-oak mixed forest on soil carbon and leaf litter accumulation

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Keywords: C Stock, SOM, Mixed forest, Pinus sylvestris, Quercus petraea

Within the framework of a global climate crisis soils constitute a valuable tool to combat climate change. Soil organic matter (SOM) represents the largest C reservoir on earth, containing more C than the vegetation and the atmosphere combined. Talking about forest soils, the main C inputs came from leaf litter and plant roots decomposition. Thus, it is reasonable to believe that C accumulation dynamics may vary depending on tree species composition. In this study we assess soil C sequestration potential of mixed stands of Pine-Oak (*Pinus sylvestris-Quercus sp*.) versus its monocultures. To this end, a total of 6 soils pits, of at least 40 cm depth, were dug within 2 experimental triplets. Each triplet was formed by two monospecific (Pine or Oak) plots and a mixed one (Pine+Oak). Soil horizons were identified and collected, making up a total of 15 soil samples. Litterfall was also collected at each point, using a 25*25cm quadrant, and then separated into three fractions: fresh fraction (FsL), fragmented fraction (FgL) and humified fraction (HmL). All fractions were dried and weighed to calculate total biomass. Soil samples were analysed for easily oxidable C content following the method established by Walkley & Black, and C stock in the soil profile was calculated. With this study we want to answer the following questions: Does mixed stands storage more C than monoespecific ones? Is C distribution along soil profile affected by stand type? Are there any differences in leaf litter accumulation and decomposition?

Classification of plant phytophysiognomy at Fazenda Verde in the state of Mato Grosso – Brazil

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Keywords: forest, savanna, Legal Reserve, RADAMBRASIL, biodiversity

The state of Mato Grosso in Brazil contains a great diversity of plant communities. The government official maps of typologies that represent this diversity were created with large-scale sampling and a low quantity of sample units, leading to deficiencies in their classification of typologies. In order for maps to be accurate, the accomplishment of studies "in situ" that identify plant communities are essential for the confirmation of the veracity the typology classifications. Species composition was evaluated in the 5,800 hectare Fazenda Verde property in Mato Grosso in order to rectify the classification by RADAMBRASIL of this property as areas of ecological tension and in contacts between savanna vegetation types and seasonal forest. The sampling promoted on the property resulted in basal area values of 15.81 m²/ha, density of 751 individuals per hectare, variable canopy from 7 to 20 meters, vegetation coverage well above 75% and maximum IVI of 37,971. The tree species *Sacoglottis guianensis*, *Caraipa densifolia*, *Ochthocosmus brasiliensis* and *Maprounea guianensis* are species indicative of forest typology**.** These species composed the greatest area in the study site, meaning that the ‘‘in situ’’ evaluation of present species confirms the typology declared by IBGE as Always Green Seasonal Submontane Forest.

Pine pitch canker (PPC): pathways of pathogen spread and prevention and control measures

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Keywords: Fusarium circinatum, invasive species, environmentally friendly management, mycovirus, RNA-Seq

Fusarium circinatum is the causal agent of pine pitch canker (PPC) disease, one of the most devastating forest diseases worldwide. On mature trees, the most common symptoms of PPC include resin bleeding, resinous cankers, wilting of needles and dieback. In nurseries the main symptoms are yellowish needles, and wilting of foliage and shoots. At least 60 species of *Pinus* along with *Pseudotsuga menziesii* are known to be susceptible. Since the first record of PPC in 1945 in the South-Eastern United States, the disease has spread to different regions of North, Central and South America, South Africa, Asia and more recently to Spain and Portugal. Long-distance spread occurs mainly through the movement of infected seeds whereas at regional level, the movement of seedlings, substrates, or containers may play an important role in fungal dispersal. Invasion of nurseries takes place via infected seeds and further spread can occur by planting contaminated seedlings, especially due to the possibility of infected plants remaining symptomless. Once established, *F. circinatum* spreads by rain, wind, and insects. The natural spread of the pathogen is limited due to the short dispersal distances of the spores and the fairly short flight distances of disseminating insects. Eradication of the disease may be feasible only if its entry is detected at a very early stage. An effective science-based forest management program is important for prevention and control of PPC.

Diagnosis for wind power in Central America face to climate change

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Keywords: renewable resource, energy, MERRA, WPD, bootstrapping

Face to climate change, renewable resources are the most promising mitigation solution for energy production, within this concern wind power resource is the one for which the technology is among the most mature and cheap of all renewable resources, nevertheless a diagnosis of wind power is needed to maximize its benefits and minimize the environmental impact. The goal of this study is to reconstruct and characterized wind resource in the continental and offshore Central America. Data have been taken from the Modern-Era Retrospective Analysis for Research and Application (MERRA) and used to study the Wind Power Density (WPD) - mean, coefficient of variation and availability - at 100 m height for three decades: 1980-1989, 1993-2994 and 2009-2018 during January-February-March. Finally, we have studied the differences in WPD mean and availability between decades. Preliminary results show a decreasing of WPD between 1980 and 2009 but a slight increasing in the last decade. Median of WPD has been calculated for summary representation and we have applied bootstrapping method to create 1000 synthetic years to study the significance of the distribution tendency we have found between decades.

Drought effect on the wood cell formation

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Keywords: climate change, drought, tree rings, cell formation

Climate affects wood formation with consequences for the functioning and survival of trees. Since tree-rings tissues (i.e., earlywood and latewood) are formed at different time in the season, the impact of climate change might differently affect their functions. In this study I investigated how summer drought affected the annual ring structure of *Pinus sylvestris L.* from a forest steppe zone in Southern Siberia. In particular, climate-growth relationships over a 50-year period was used to identify the timing of climatic signal of early-, transition-, and late-wood tracheid's diameters. For comparison the research of *Pinus sylvestris L.* reaction to drought in the Mediterranean climate was considered. Studies in the both regions (Siberian and Mediterranean) revealed that water availability was the factor most limiting growth during the period of ring formation. Studies showed that, firstly, drought can noticeably shorten the period of wood formation, secondly, trees form larger cells (large lumen and thin walls) for more efficient water transportation.

Fungal metagenomic analyses in *Castanea sativa* trees affected by *Cryphonectria parasitica* to enhance the biological resilience

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Keywords: Chestnut blight, canker, Mediterranean forests, fungal biodiversity, Next Generation Sequencing

Castanea sativa is an important tree species in Mediterranean forests. Chestnut trees are usually planted for timber and fruit production. Due to the presence of the fungus *Cryphonectria parasitica,* which is included in the UICN list of 100 of the World's Worst Invasive Alien Species, the profitability of the chestnut growing areas has been reduced. *C. parasitica* is the most important pathogen of Castanea species and the causal agent of the chestnut blight. The most visible symptoms of the fungal infection are cankers, which usually present orange-coloured pustules and surround the stem causing the death of the distal parts of the tree. Other symptoms that can be observed are wilting and yellowing of the foliage. *C. parasitica* requires open wounds or growth cracks in the bark to infect the host. One of the purposes of LIFE MycoRestore Project is to increase the biological resilience of Mediterranean forests threatened by climate change and invasive pathogens. It is hypothesized that endophytic community of healthy trees could provide defences against *C. parasitica*. Therefore, a comparison of fungal assemblages from trees with different degree of damage would allow to identify those fungi potential candidates to be applied as biological control agents. So, metagenomic and culturomic studies will be carried out to unravel the mycobiome present in trees (soil, wood, bark, twigs and leaves) infected by *C. parasitica* showing different degree of damages. For that, three chestnut healthy plots and three highly damaged plots located in Western Spain were sampled. Fungal communities will be studied with the aim to know the fungal assemblages associated to the different status of tree health. The obtained results will be useful to characterize the fungal interactions, including antagonism, for the future management of the disease.

Fungal metagenomic analyses in *Quercus ilex* trees affected by *Phytophthora cinnamomi* to identify potential biological control agents

Bocos, I.T.[1,2], Sánchez, T.[1,2*], Zamora-Ballesteros, C.[1,2], Martín-Pinto, P.[1,2], Santos, M.[1,2], Martín-García, J.[1,2], Díez, J.J.[1,2]

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Keywords: invasive alien species, resilience, Mediterranean forests, environmental sampling, climate change

Phytophthora cinnamomi is an oomycete causing Holm Oak Decline, at present one of the most devastating diseases for *Quercus ilex*. Common symptoms are yellowing and wilting of leaves, dieback of the crowns, decrease in production of acorns, damping off of young seedlings and tarry exudates from the bark. The host range of this soil-borne pathogen is very wide and it is already present in much of the EPPO region. The long-distance spread is likely to have come from infected nursery seedlings and also by movement of soil infested with chlamydospores. One of the aims of the LIFE MycoRestore Project is to test diverse mycological resources and forest management practices to foster the biological resilience of mediterranean forests threatened by invasive alien species in a framework of climate change. For that purpose, samples of soil, wood, bark, twigs and leaves of 30 trees (15 healthy and 15 highly damaged) in an affected holm oak stand in Western Spain have been collected. Fungal communities will be studied by checking the morphological characteristics of the isolates obtained and metagenomic analyses. It is expected that fungal assemblages will vary according to the degree of damage caused by *P. cinnamomi*, which will allow us to identify those fungi able to act as an antagonistic agent or elicit defence response against pathogens.

Planning permaculture interventions for fire prevention in Headwater systems … What?

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Keywords: landscape, GIS, soil, water, forest

Wildfires in Portugal - and its social, ecological and economic impacts - are increasingly more relevant. Lack of adequate landscape planning and climate change trends worsen this scenery. The drought factor also makes assuring groundwater recharge and rivers basins' ecological flow foremost goals. Headwater systems(HS) are a strategic component of the landscape to address these issues. Permaculture is globally emerging as a bottom-up framework for simultaneously improving ecosystems resilience and human self-sufficiency. This work aims to contribute with a case-study for planning permaculture interventions at the landscape level, in the HS burnt in 2018 in Monchique area, that would prevent both wildfires spread and soil and water degradation by ameliorating the local micro-climate and watershed catchment, increasing soil moisture and air humidity, creating wind barriers and promoting water infiltration, soil stabilization and biodiversity conservation. GIS software was crucial for the assessment of necessary characteristics such as slopes, HS, vegetation suitability, land use and climate conditions; much of this data coming from EPIC WebGIS providing useful national maps. These were applied in a model to propose which areas, and in which way, should be intervened. Earthworks such as dams and swales, but also vegetation changes are some of the proposed measures.

SESSION VI

Can native shrubs and herbivory improve soil properties in reclaimed open-cast coal mines?

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Keywords: shrub cover, herbivory pressure, Sub-Mediterranean climate, soil improvement, coal wastes

Previous studies have shown that native shrubs have a nurse effect over oak seedlings establishment in stressful and degraded environments (reclaimed open-cast coal mines in Northern Spain). Nurse shrubs can promote soil fertility (i.e. direct facilitation), and reduce herbivory (i.e. indirect facilitation). The aim of this study is to assess whether native shrubs and herbivory improve soil parameters. Soil properties were measured under four different treatments, combining the influence of nurse shrubs (under shrubs and open sites) and herbivores exclusion (fenced plots and non-fenced plots). Electrical conductivity (EC), potassium (K^+), cation exchangeable capacity (CEC), and C/N ratio were significantly higher under shrubs than in open sites, whereas nitrogen (N) was higher under shrubs but only in non-fenced plots. Grazing exclusion significantly decreased available phosphorous (avP), and increased calcium (Ca^{++}) only in open sites. Herbivory increased sand and soil organic matter (SOM), and decreased clay and sodium (Na^+) but only under shrubs. We found a positive effect of shrubs and herbivory on soil fertility. Additionally, herbivory modifies textural soil parameters. Therefore, native shrubs and herbivory could have a key role in reforestation of coal mines.

Insights into *Pinus halepensis* integrated phenotype

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Keywords: adaptive variation, life-history theory, Mediterranean environment, phenotypic integration, trade-offs

All organisms must optimize resources devoted to each vital function and since available resources are limited, any investment in one function implies a reduction of available resources for other functions, originating evolutionary trade-offs. Most studies analyzing these trade-offs are focused on short-lived species and barely consider fire-adaptive traits. We investigated the phenotypic variability across *P. halepensis* populations for different adaptive traits including fire defence-related, growth and reproductive traits. Our objective was to identify trade-offs and ecotypic patterns among *P. halepensis* populations. We measured phenotypic traits of 17 *P. halepensis* populations in two contrasting sites of a common garden experiment and used environmental and natural fire frequency data. Our results showed correlations between traits related to growth, reproduction, and fire tolerance at the population level, as well as relationships between the ecogeographic variables and the adaptive phenotypes. Phenotypic variability found in studied life-history traits of this species was largely the result of phenotypic plasticity, but with apparent ecotypic trends for most traits, while GxE interaction was greater in vegetative growth traits than in reproductive or fire-adaptive ones. Our study suggests that local adaptation in *P. halepensis* is supported by the correlation between eco-geographical variables and integrated phenotypes.

Food security and environmental conservation through the sustainable use of fungi in Ethiopia: SustFUNGI_ET

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Keywords: cooperation, Ethiopia, NTFP´s, sustainable, mushrooms

SustFUNGI_ET is a cooperation project financed by the Spanish Cooperation Agency (AECID), and in which the University of Valladolid, INIA, ID–Forest and EEFRI participate. The main objective of the project is the improvement of food security and the quality of life of the rural population giving value to the mycological resource by facilitating access to it to the rural population. To achieve that goal, the first work is to make an integrated diagnosis of the mycological resource. An ecological study by sporocarp sampling and a socio-economic analysis studying the traditional knowledge of the rural people. With the species identified in the inventories, and the technical knowledge of the partners of these fungal species present in each of the work areas, a training is prepared for the technicians, scientists, rural population and nature guides. Once the training is finished, it is established a sustainable mycological resource management plan based on the selection of the most interesting edible species. Finally, some demonstrative actions were carried out with local population. As a way to finish the project, is of utmost importance to communicate sensitize and disseminate the results by different ways.

Reforestation planning based on future climate change: a case study in *Ribb* catchment, Ethiopia

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Keywords: forecast, time horizons, plantation, plant species, catchment

Climate change is becoming more prominent global issue with the degree of severity varying spatially. Catchment scale reforestation program based on forecasted climatic condition of a specific area is an effective way in selection of an adoptive tree species to promote climate change resilient forest. However, it is not commonly practiced currently. In this study, future temperature and rainfall is projected in *Ribb* catchment, Ethiopia to recommend appropriate tree species for afforestation program in the catchment. Representative Concentration Pathway (RCP4.5 and RCP8.5) scenarios temperature and rainfall data were generated through bias correction of Regional Climate Model (RCM) projection data. Future trend analysis was carried out on three time horizons: 2020s (2011-2040), 2050s (2041-2070) and 2080s (2071-2098) with period data (1976-2005) as a reference. Mean annual minimum temperature increased by 2.45 ^{0}c at RCP4.5 and 4.64 ^{0}c at RCP8.5 scenarios and maximum temperature increased by 2.41 ^{0}c and 5.15 ^{0}c at RCP4.5 and RCP8.5 scenarios, respectively, for 2080s from the reference period. But mean annual future precipitation changes showed decreasing trend. Higher future temperatures and low rainfall requires plantation of highly water use efficient tree species in *Ribb* catchment.

SHORT SCIENTIFIC COMMUNICATION CONTEST

PRESENTED IN CASA JUNCO (PALENCIA)

January 25th 2020

Earth quake of forest tree ring in Pakistan 2005

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Keywords: secondary effect, debris movement, Paleosesimic, geological investigation, flucatuations

Ground shaking cause a major disturbance agent in forests because strong earthquake shaking breaks branches and tree crowns, damages root systems, and causes trees to fall amongst closely growing neighbours. Earthquakes also affect trees by secondary effects such as the generation of landslides and debris movement on slopes and fans, as well as aggradation and liquefaction in valley and swamp areas. Forests not only preserve an earthquake signal in their forest age structure (reflecting tree mortality and subsequent regeneration) but also in the tree ring patterns of the trees that survive the event. Potentially the analysis of tree ring patterns provides a possible method to narrow down the dates of inferred prehistoric earthquake events where paleoseismic trenching and related geological investigations demonstrate earthquake occurrence. The norther area of the Pakistan are densely forested region that has experienced one large earthquakes in the twenty-first century. This was in 2005 M 7.6 earthquake, followed almost 30 years later by the Potentially the area offers an opportunity to carefully assess the nature and variability of tree ring impacts from large earthquakes in Pakistan terrain. The study sites the earthquakes of 2005 resulted in clearly, relatively easily distinguishable pulses of impact on tree growth that stand out amongst the normal fluctuations from climatic factors.

Combretum-terminalia vegetation accumulates more carbon stocks in the soil than the biomass along the elevation ranges of dryland ecosystem in southern Ethiopia

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Keywords: litter, nested, soil organic carbon, tropics, woodland

Dryland ecosystems including Combretum-Terminalia vegetation cover a wider area in the tropics. These resources are believed to greatly contribute for climate change mitigation in dryland ecosystems. Therefore, the objective of this study was to investigate biomass and soil carbon stocks of Combretum-Terminalia vegetation along the elevation ranges. A total of 60 nested sample plots of 20 m X 20 m were laid systematically along lower, middle and higher elevation ranges, representing 20 plots for each elevation. Within each nested sample plot inventory of woody species, litter and soil samples (0–15, 15–30 cm layers) were collected. The total carbon stocks (biomass plus soil) significantly ($p < 0.05$) differed among the three studied elevation ranges. The biomass carbon stocks were not significantly different between middle and higher elevations but both of them significantly ($p < 0.05$) differed from lower elevation, and also showed a decreasing trend from lower to higher elevations. However, inconsistence trends were observed for soil organic carbon and litter along the elevation ranges. It was concluded that woodland ecosystem has a potential to accumulate higher carbon stocks in the soil than the biomass and significantly vary along elevations.

Phytoremediation as a solution for natural purifier of polluted wetland: a case study of Belai *Beel*, Bangladesh

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Keywords: heavy metal, agro-forestry, biodiversity, key stakeholders, degradation

Bangladesh has a large aerial extent of wetlands for its unique deltaic characteristics. Unfortunately, from the last few decades these wetlands are being polluted. At present, soil and water contaminated with heavy metal is the most alarming environmental and socio- economic problem. Belai *Beel* is a privately owned wetland located in Gazipur district- some 30 km north of the capital city, Dhaka. The major problems related to this wetland are degradation of the *Beel* due to over-exploitation, illegal encroachment and pollution. A comprehensive landuse analysis through the application of GIS and laboratory analysis (Heavy Metal- Pb, Cr, Cu, Cd and Zn) of *Beel* soil and water was done in this study. Direct field investigation, Questionnaire survey, key informant interviews were also conducted. The laboratory results suggest that the *Beel* is to a certain extent polluted. One of the solutions for this issue could be the introduction of agro-forestry in the polluted area. The application of Phytoremediation in the study area, a plant based technology, which can help to reduce the pollution level of the contaminated soil and water naturally. This could protect the *Beel* from degradation as well as could enhance the biodiversity of the area. This could also create an economic opportunity for the local people.

Estimation of eucalyptus (*Eucalyptus globulus spp.)* growth using the hybrid 3pg model in Portugal

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Keyword: basal area, biomass, dominant hight, process based, volume under bark

The 3PG (physiological principle process based) model that hybridizes from process based and empirical forest growth models. *Eucalyptus globulus* is among the most economically valuable species in Portugal and estimating it's growth is indispensable for sustainable management of the resource. The current study estimates *eucalyptus globulus* growth components (dominant Hight (Hdom), basal area (G), volume under bark (Vu) and biomass (root, foliage and stem) using seedling and existing 3PG templates. Eighteen years growth data collected from five permeant plots of different spacing (5x4, 4x4, 4x3, 3x3 and 3x3(m^2) were used to evaluate the models. The 3PG output provides foliage, root and stem biomass values whereas Oliveira (2014) 3PGout+ equations (initialization for seedling and projection for existing templates) were used to estimate Hdom, G and Vu of the stand. Graphical analysis revealed both 3PG templates showed good potential to estimate Hdom and Vu for most plots confirmed both r^2>0.95 and r>0.95. some plots of Vu and foliage, root and stem biomass were over and underestimated. Existing stand templates were more efficient than seedling template to estimate biomass components. Generally, 3PG models showed good capacity to predict Hdom and G but inconsistent to illustrate biomass values.

Application of MRV methodology to quantify the emissions in the oven-furnace system in the context of "Siderurgia Sustentável" project

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Keywords: charcoal, GHG, renewable energy, climate action, steel industry

Brazil is investing in development of projects in different areas of knowledge, focusing in spread and implements the technology that provides the production of sustainable pig-iron. As an example, has the project Siderurgia Sustentável (sustainable steel industry), which developed, using the Clean Development Mechanism (CDM), a MRV methodology to measure, report and verify the activity of mitigation of methane emissions in the pig iron production that uses the vegetable charcoal. This work has the objective to apply the MRV methodology to evaluate the reduction of GHG in the pilot-plant of charcoal production, using the oven-furnace system developed by Federal University of Viçosa – Brazil, in the context of the project Siderurgia Sustentável. The data were collected in the pilot-plant of Lamim – Minas Gerais, Brazil, being used and processed with the MRV methodology, which was focused in the gravimetric yield and the utilization of burn gases furnace system. The system reached a gravimetric yield of 32.76% by the monitoring and control activity of the process. The total emission in tons of CO^2 equivalent in the base line was 3.931. The burn of methane in the system was of 65.62% in the 3rd and 4th step of the production process. Finally, the system provides the increment in gravimetric yield of 26.00% when compared with the national base line. This increase resulted in a reduction of up to 53.68% of the total equivalent CO^2 emissions, resulting in the reduction of 0.758 tons of equivalent CO^2 per tons of charcoal produced. When the furnace was used to burn the gases, reached the reduction of 73.13% of emissions, avoiding the emission of 2.875 tons of equivalent CO^2, resulting in a reduction of 1.199 tons of equivalent CO^2 per tons of charcoal produced. In this way, the system presented high efficiency in the process of production charcoal and in the reduction of GHG emissions.

Modelling stand dynamics: fitting growth and yield models

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Keywords: guide curve for site index

A model for predicting the height growth of even-aged and dominated stands in temporary was developed. Data from tree analysisof 133 treeswith 10 minimum age and 82.20 as maximum age were used for model construction. seven dynamic site equations derived with theGuide Curve method were tested, which combine compatiblesite index and height models in one common equation. All equations are base-ageinvariantand directly estimate height and site index from any height and age. The algebraic difference approach was used to derive an anamorphic base-age invariant site function that fit as a fixed base-age anamorphic site function (base age = 50 years). Comparison were done using Akaike Information Criterion (AIC) and Bayesian Information criterion to determine the best model. Among all the equations used Hossfeld IV has the best AIC statistical analysis with the smallest AIC of 704.7674 and BIC of 713.0794 which justify the equation as best model. This model is therefore recommended for height growth prediction and site classification on temporary forest tree plot.

Inventory of the world's sweetest mangos on an agroforestry plantation in the Philippines

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Keywords: Mangifera indica, Guimaras, mensuration, production estimation, management

By its production volume, mango is the most important fruit species of the Philippines along with bananas and pineapple. 'Guimaras Super Galila', officially declared as the world's sweetest mango variety, originates on the Guimaras island where the study has been conducted. The inventory of a private mango plantation was carried out in autumn 2016 by collecting data as tree heights, circuits, and GPS positions, and basic health considerations were taken into account. On this basis and by literature review, average annual fruit production was estimated to serve as a reference for the owners. Moreover, general management treatments were proposed to increase economical and environmental benefits of the area.

Spatial variability and geostatistical analysis of soil properties of agricultural fields in south-west region of Bangladesh

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Keywords: spatial Variability, semi-variogram, kriging, geo-statistical analysis, nugget/sill ratios, agricultural fields

A study was conducted to explore the spatial variability of major soil nutrients of Agricultural fields in South-West region of Bangladesh. From the study area, 40 surface soil samples were collected by a random sampling strategy using GPS. Then soil physico-chemical properties i.e., pH, EC, organic carbon, total N, soil available nutrients (P, K and S) were measured in laboratory. After data normalization, classical and geo-statistical analyses were used to describe soil properties and spatial correlation of soil characteristics. Spatial variability of soil physico-chemical properties was quantified through semi-variogram analysis and the respective surface maps were prepared through ordinary Kriging. Spherical model fits well with experimental semi-variogram of pH, EC, OM, total N, available P, K and S. Soil pH, total nitrogen (TN), available phosphorus (Av P), potassium (Av K) and sulfur (Av S) have the moderate spatial dependence, with nugget/sill ratios of 41.13% to 72.21%. The others have the strong dependence with nugget/sill ratios of less than 25%. The spatial variability of estimating soil properties varies within range of 0.0142 for Av P to 0.0383 for Av S and this model can calculate the un-sampled within neighbouring distance of about 12.65 m for Av S to 150.82 m for Total N respectively. Cross validation of kriged map shows that spatial prediction of soil nutrients using semi-variogram parameters is better than assuming mean of observed value for any un-sampled location. Therefore, it is a suitable alternative method for accurate estimation of chemical properties of soil in un-sampled positions as compared to direct measurement which has time and costs concerned.

Evaluation of conservation areas arround eucalyptus plantations in Brazil using an optmized tool in QGIS software

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Keywords: geoprocessing, SIG, water source conservation, permanent preservation areas, consolidated rural areas

The creation of methodologies that automate processes is essential in a company once in geoprocessing several activities require a series of time-consuming steps to be completed. According to the Brazilian Forest Code, permanent preservation areas – buffer zones - around rivers up to 10 meters wide must have 30 meters in order to preserve the watercourse. Consolidated Rural Areas are zones with anthropic occupation before July 22, 2008. Therefore, if the conversion of the natural state of the area into another activity occurred before this date, it will be in accordance with the law. In order to be in accordance with the law a company must assess its protected areas to verify whether its plantations are in regular or protected zones. To meet this demand an optimization model was generated with the Graphical Modeler tool in the QGIS software, in which only three entries were needed (shapes of hydrography, springs and planting areas) and the final result generates areas where there are eucalyptus plantations that should be preserved, indicating where changes must be made in the field.

Socioeconomic impact of *Vitellaria paradoxa* g. don production on rural livelihoods in Nigeria

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Keywords: Shea tree, Sub-Sahara Africa, vulnerable species, climate change, sustenance

Rural dwellers are substantially dependent on non-wood forest products provided by the surrounding ecosystems, in terms of maintaining their livelihoods. *Vitellaria paradoxa* (Shea tree) is indigenous to sub-Saharan Africa and it produces a wide vagary of products ranging from food, medicine to cosmetics in supporting rural livelihoods amongst others. However, despite the importance of Shea tree in alleviating poverty in Africa, this species has been listed as a vulnerable species in the face of changing climate. The focus of this study is to provide information on the level of contribution of this species in rural livelihoods in the study area. The study adopted the use of structured questionnaires and interviews for the data collection and subsequently analyzed using frequency and chi-square analysis. The result obtained shows that shea production contributes 55% to the people's income in the study area and that 30% are highly dependent on this species while about 43% are moderately dependent on this natural resource. The chi-square analysis further shows that the level of dependency of these people is a function of their socioeconomic characteristics. The importance of this species to the rural people's livelihood sustenance cannot be downplayed, hence, the need for adaptation strategy for sustainability.

Operating steps of *Fraxinus angustifolia* in Turkey: the example of industrial plantation in terms of Süleymaniye territory

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Keywords: ash, cleaning, digging, economic functions, tillage

Turkey' s total forest land is 22 342 935 million hectares and it covers 28.6 per cent of Turkey' s surface. Turkey' s forest mainly includes tree species such as pine, oak, cedar, fir, eastern spruce, juniper, cypress, beech, hornbeam, ash etc. When those tree species generate forests, natural forest lands provide not only ecological functions for people such as storing carbon dioxide in foliage, water, mineral circulation, protection of soil and recreation but also the sources of providing economic function in industrial plantations. This paper is going to explain that both indicating how to do the operation steps of ash tree and how supplying of the economic functions in industrial plantations which include ash trees. There are four tree species which naturally grow in Turkey as follows *Fraxinus excelsior* L. (Common Ash), *Fraxinus angustifolia* or another name is *Fraxinus oxycarpa* Willd. (Caucasian Ash), *Fraxinus ornus* L. (Manna Ash) and *Fraxinus pallisae*. Ash trees spread in Thrace, Eastern and Western Black Sea, Marmara and Aegean regions in Turkey. *Fraxinus angustifolia* in Sakarya has wet forest ecosystem. Süleymaniye where is located the territory of Sakarya is one of the unique territory increasing forests and rehabilitating the degraded forest lands.

Forest-based assessment of water quality; hatila creek watershed case study

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Keywords: land use, ammonium, nitrate, pH, salinity

Recent changes in the rivers; since the main basinCoruh River has recently undergone significant changes due to the construction of dams and roads, urbanization, mining etc. has been proved by scientific studies. For this reason, in order to show the effect of forests on water quality in Coruh Basin of Artvin province, HatilaWatershed, which is a national park, was selected as a working area.For this purpose, from the identified 7 sampling points in total, water quality parameters of pH, dissolved oxygen (DO), total dissolved substance (TDS), ammonium (NH4+), nitrate (NO3-N), salinity, conductivity, and temperature were measured in the field using YSI (Professional Plus) portable instrument while the total suspended sediment (TSS) amounts were estimated in the laboratory.As a result, when we compare water quality parameters according to European Water Framework Directive (WFD), it is found that water quality parameters are below the limit values. In comparison with previous studies, water quality in rivers that are not in forests is well above WFD's water quality criteria.However, especially in terms of the use of water resources from forest watersheds, it is necessary to protect our resources and to make sustainable watershed management in a sustainable manner.

People's perception on vulture conservation: a case study in far-western Nepal

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Keywords: scavengers, carcass, vulture colony, diclofenac, jatayu restaurant

Out of the eight species of vultures found in Nepal, two species of vultures are critically endangered namely *Gyps bengalensis* and *Gyps tenuinostris* due to drastic decline of more than 95% of their population in last decade. Perception of local people towards conservation is vital to devise strategies for the future course of biodiversity conservation actions. The study was carried out in two different vulture colonies representing mid-hills and low lands of Nepal to assess local people's perception on vulture conservation. Semi-structured questionnaires were conducted with 64 purposively selected households within 3 km of each nesting sites. Most of the respondents from both sites perceived recent decline in vulture population in their respective localities and acknowledged need of conserving vultures for future generation. Awareness programmes and protection of nesting trees were seen as best conservation measures for future by the locals. Thus, provision for vulture conservation with different community based activities in operational plans of forest is key for future vulture conservation programmes.

Pesticide retailer's knowledge and practices in northeastern part of Bangladesh

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Keywords: training, insect, infestation, farmer, retail farm

Pesticide retailers are directly involved to recommend and sale pesticide to the end user (farmer) for pest management, although it is observed 31.5% of retailers have higher secondary education followed by secondary (25.9%) and primary (18.5%). Surprisingly, only 1.9% of retailers received diploma course on pesticide where maximum (68.5%) received a short training (1 to 2 days) that organized by agriculture office (AO) and different pesticide companies. Moreover, 20.4% retailer did not participate in any kind of training; they just suggest pesticide based on their primary idea and experience. Retailers don't have any scientific knowledge or academic courses on insect infestation, while 42.6% attended in a short training. The facilities like standard safety measures, first aid kid, and fire fighting equipments are not available most of the retail farm, although 22.2% farm has poor storage facilities. According to 81.5% retailer, pesticide application has been increasing over the last 5 years, on the other hand 14.8% replied it was decreasing. Another concern matter is that just after 1-5 days of pesticide application, maximum farmers are harvesting their crops (fruits and vegetables), thus cause residual effects on human health. As a result, it is totally contradictory to the modern concept integrated of pest Management (IPM) for a safe environment and health.