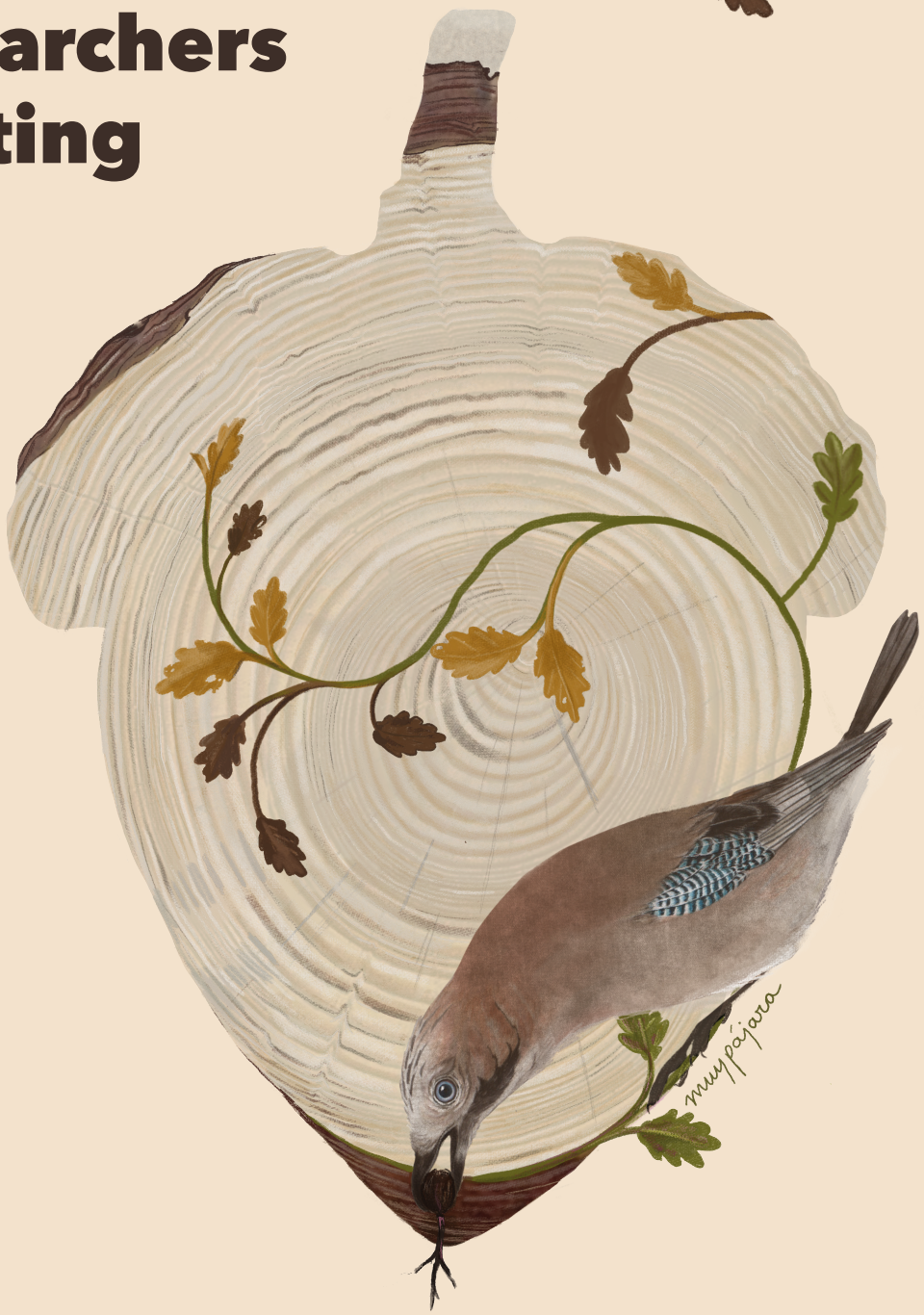
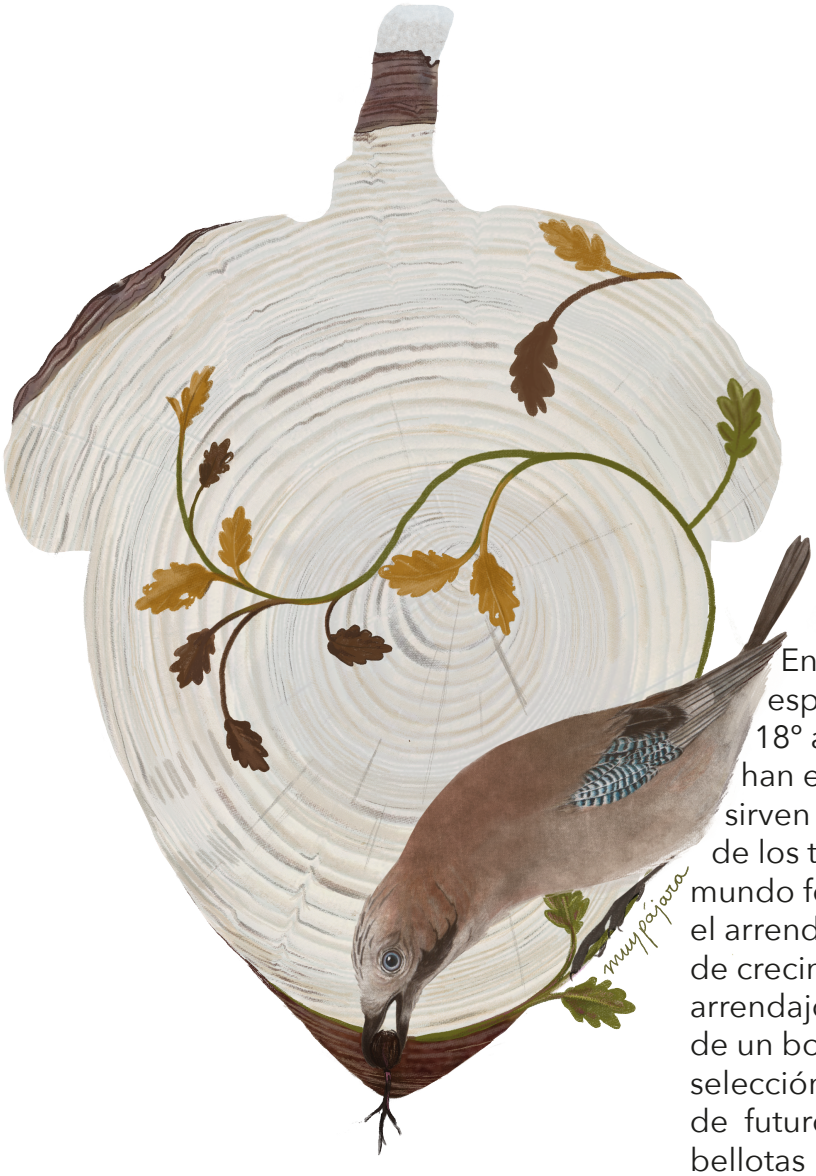
XVIII Annual Young Foresters Researchers Meeting



#YF24

31.01 - 01.02

Palencia



Logo YF24

En el diseño elegido especialmente para celebrar el 18º aniversario del congreso, se han escogido tres imágenes que sirven para representar algunos de los temas de interés en el mundo forestal. Concretamente, el arrendajo, la bellota y los anillos de crecimiento de los árboles. El arrendajo representa el nacimiento de un bosque por su labor de selección, recolección y plantación de futuros árboles enterrando las bellotas que dan lugar a diferentes especies de *Quercus*, especies muy representativas de los bosques mediterráneos. Finalmente,los anillos de crecimiento del árbol que se utilizan en los aspectos más técnicos de los aprovechamientos forestales.

Instituto Universitario de Investigación iuFOR GESTIÓN FORESTAL SOSTENIBLE
UVa PALENCIA
50 años Escuela Técnica Superior de Ingenierías Agrarias Palencia
MEDfOR Mediterranean Forestry and Natural Resources Management
Co-funded by the Erasmus+ Programme of the European Union
NOS IMPULSA Junta de Castilla y León
Europa impulsa nuestro crecimiento

General Editor:

Elena Hidalgo Rodriguez

Deputy Editors:

Olga Barreiro Verea
Ruth C. Martín Sanz
Irene González García
María Martinez Jáuregui
Jonatan Niño Sánchez

Desing and editing:
Irene González García

Sustainable Forest Management Research Institute
Unidad asociada al CSIC (University of Valladolid)

Av. de Madrid, 57, 34004 Palencia, (Spain)

Telephone: +34 979108300

Fax: +34 979108301

Website: https://iufor.uva.es/

ISBN: 978-84-09-58959-3

ÍNDICE

PREFACE

Once again, and on behalf of the Organization Committee, I am proud to present you the Abstracts Book of our XVIII edition, held in Palencia on 31st January and 1st of February 2024.

This Young Forest Researchers Meeting started at Palencia in 2007as a short meeting with some 20 participants, our PhD students at that moment. The goals were, and still are, three: 1) to show and discuss on our research in all the different aspects of Forest Sciences in a relaxed and friendly environment; 2) to give to our masters, doctoral and young postdoctoral fellows the possibility and training related to scientific communication at all levels, using and perfectioning their oral, graphic and written skills; and 3) to serve as a public platform of cohesion and visibility of our institute. Our strength depends on our capacities of response to important questions in Forestry.

Along the years we have adapted to new situations: more posters to held more than 100 participants every year; shorter speeches; shift to English, Abstracts Book with ISBN, and more open and international meeting. But we have always maintained our goals: research, training and networking, and our identity signs: the youth of most of the participants, as they are the main target audience; and our international character.

Many people from more than 60 countries have participated in these 18 editions showing their work in talks or posters, many of them have participated in the organization of the meeting through different responsibilities as chairpersons, or invited speakers, and all of them contributed to make this Meeting a reference for Forest Research. Welcome to this fruitful XVIII edition of our meeting and enjoy! NOTA: If you lost part of the meeting presentations, you can find all of them together with a short video at https://www.youtube.com/channel/UCU9AuDVUSALMUM0sEVzppUg/playlists

Elena Hidalgo
Coordinator of the Organization Committee

PROGRAMME

WEDNESDAY 31st JANUARY

08:00-09:15 REGISTRATION
(Posters will be placed the day before)

09:15-10:30 SESSION I
Chairpersons: Tamara Sánchez; Irene Bocos
Participants:

Ruth Martín	Rubén de Prado
Ali Askarieh	Frederico Tupinamba
Inés Pereira	Eduardo Pastor
José Carlos Porto	

10:30-11:00 COFFE BREAK

11:00-12:00 OPENING SESSION
YFR Meeting 2007-2024 by Prof. ELENA HIDALGO
(Video by Pilar Valbuena)

Academic & Local Authorities:

- **Dña. Blanca Ares González**, Directora de Universidades e Investigación de la Consejería de Educación de la Junta de Castilla y León
- **D. Enrique Baeyens Lázaro**, Vicerrector de Investigación de la Universidad de Valladolid
- **D. Julio Javier Díez Casero**, Vicerrector del Campus de Palencia
- **Dña. Miriam Andrés Prieto**, Alcaldesa de Palencia
- **D. José Ramón González**, Director de la EsDUVa

12:00-12:15 SHORT BREAK

12:15-13:30 SESSION II
Chairpersons: Huma Amin; Ruth Martín
Participants:

Farooq Ahmad	Natalia Crespo
Aitor Vázquez	Tomás García
Tamiriss Oliveira	Rocío Tarjuelo
María Encarnación Coca	

13:30 MEETING GROUP PICTURE

14:00-16:00 LUNCH at University Cantine

16:00-17:15 KEYNOTE SPEAKER & ROUNDTABLE
"Soils: Where everything starts"
Chairperson:
Belén Turrión (iuFOR)
Keynote speaker:
JORGE MATAIX
"Soil as a key factor in forest disturbances"
Roundtable Participants:

- **Jorge Mataix**, President of the Spanish Society of Soils and Professor of Soils Science (Universidad Miguel Hernández)
- **Cristina Aponte**, Senior Researcher at the Institute of Forest Research (ICIFOR, CSIC)
- **Ramiro Oliveri**, Jefe de Servicio en la Sección General de Aire Limpio y Sostenibilidad Industria, MITECO
- **Rodrigo Antón**, Assistant Professor at Universidad Pública de Navarra
- **Mireia Llorente**, PhD in Soil Sicence. Fundación Entretantos

17:15-18:15 POSTER SESSION + COFFEE BREAK

18:15-19:30 SESSION III
Chairpersons: Aitor Vázquez; Eduardo Pastor
Participants:

Juan García	Olga Barreiro
Hao Chenxi	Herminia Alonso
Saioa Munuera	Amara Santiesteban
Miguel Manso	Katell Marie A. Menard

19:30-21:00 COLD DINNER & NETWORKING at University Cantine

THURSDAY 1st FEBRUARY

09:15-10:30 SESSION IV
Chairpersons: Alba Díez; José Bernardo González
Participants:

Raad Kadour	Huma Amin
Abeer Arous	Nerea Pérez
Raquel Melgar	Raquel del Campo
Alba Magarzo	Mayra A. González

10:30-11:30 POSTER SESSION + COFFEE BREAK

11:30-12:45 SESSION V
Chairpersons: Elena Muñoz; Natalia Crespo
Participants:

Albert Rivas	Afifa Zahid
Alba Díez	Eric Cudjoe
Andrés de la Cámara	Carmen Delgado
José B. González	Nguyen Thi Kieu Anh
Muhammad Lukman Yazid	

13:00-14:00 CLOSING SESSION & DIPLOMAS DELIVERY
Academic and Research authorities

14:00-16:00 LUNCH at Univerisity Cantine

SESSION I

Use of ATR-FTIR for the prediction of toc, tn in forest litter

Martín-Sanz, R.C.[1,2*], Getino-Álvarez, M.[2,3], Pando, V. [2,4], Lafuente, F.[2,3], Bravo-Nuñez A. [4], Turrión, M.B. [2,3]

1 Dpto. Producción Vegetal y Recursos Forestales, ETSIIAA (Palencia, UVa)
2 Sustainable Forest Management Research Institute, University of Valladolid
3 Dpto. Ciencias Agroforestales, ETSIIA (Palencia, UVa). 4 Dpto. Estadística e Investigación Operativa

***Presenting author**
ruthcristina.martin@uva.es

Keywords: Mid-infrared spectroscopy, forest soil organic layers, mixed forest, monospecific forest

The organic forest horizons and their decomposition processes play a fundamental role on nutrient cycling and in the maintenance of soil fertility, and they have a high contribution to the Carbon sequestration in forest ecosystems. The application of infrared spectroscopic techniques has been widely used to assess diverse physical and chemical attributes within soil samples. However, the efficacy of these methodologies has been less remarkable when extended to forest floor samples and their decomposition. The objective of this study was to assess the efficacy of Attenuated Total Reflection Fourier Transform Infrared Spectroscopy (ATR-FTIR) within the mid-infrared spectrum to predict forest floor properties such as total organic carbon (TOC) and total nitrogen (TN). A dataset comprising over 240 forest floor samples from a European network of forest plots was analyzed. The organic layers of Pinus sylvestris, Quercus sp, and Fagus sylvatica in both monospecific and mixed forest stands were examined, differentiating between species, and litter layers: undecomposed litter (L, if present), intermediate decomposed litter (F), and humified litter (H). Total C (TC) and total N (TN) were determined by dry conventional methodologies using a LECO CNS928 elemental analyzer. Total organic carbon (TOC) was calculated as the difference between TC and total inorganic carbon (TIC) which was determined by dissolution of carbonates with an excess of HCl, followed by back titration in samples where carbonates were present. ATR-FTIR spectra spanning from 4000 to 400 cm-1 were recorded and their distinctive peaks were calculated. A modified partial least-square method (PLS) and a Generalized Mixed Models (GMM) with cross-validations were used to develop equations for TOC and TN concentration prediction. Environmental factors such as forest stand type (pure, mixed), litter layer type (L, F, H), and litter tree species were included in the GMM model. The prediction of TOC and TN concentrations by the GMM was better than by the PLS method. The performances of TOC prediction models were better when samples with carbonates were not included in the calibration for both methods. The GMM model obtained in this study could be used as an alternative to the traditional methods for determining TOC and TN in litter samples.

Scots pine trees' different compartments growth performance in dry years in pure and mixed conditions

Askarieh, A. [1,2*], Bravo, F. [1,2], Pretzsch, H. [3], del Río, M. [4]

1 SMART Ecosystems Group. Instituto Universitario de Investigación y Gestión Forestal Sostenible (iuFOR), Unidad Asociada de I+D+i al CSIC. Universidad de Valladolid, Avda. Madrid s/n. 34004. Palencia, Spain.
2 Departamento de Producción Vegetal y Recursos Forestales, ETS de Ingenierías Agrarias. Universidad de Valladolid. Palencia, Spain.
3 Chair of Forest Growth and Yield Science, School of Life Sciences Weihenstephan, Technical University of Munich, Hans-Carl-Von-Carlowitz-Platz 2, 85354 Freising, Germany.
4 Instituto de Ciencias Forestales (ICIFOR-INIA), CSIC, Ctra. A Coruña, km 7.5, Madrid 28040, Spain.

***Presenting author**
* Ali Askarieh: ali.askarieh@uva.es

Keywords: Climate change, Droughts, Lloret indices, Forest dynamics, Pinus sylvestris

Climate change is increasing the frequency and intensity of drought on a worldwide scale. Furthermore, a growing body of research is presenting substantial evidence of drought negative impact on forest dynamics at both the individual tree and stand levels. However, little is known about how tree's different compartments performance in growth during dry years. In this study we investigate the growth resilience components in south-eastern Germany (resistance, recovery, and resilience) at the compartment level of individual trees (Stem, Branch, root, and height growth) during 4 different dry years (1976, 2003, 2015, and 2018). Dry years were defined using standardized precipitation-evaporation index at a 6-month scale for August, characterized by SPEI values falling below -1. Chronological growth data was collected using a total of 31 dominant Scots pine trees (stem cores, branch and roots disks, and height growth series), grouped into 13 trees in mixed conditions with European beech (5 trees in Geisenfeld and 9 trees in Amberg). We aimed to identify differences in growth responses at the different tree's compartments after drought episodes and how some variables (mixture, SPEI, and DBH and site) influence them. Results indicate that drought resilience components depend on the site, drought intensity (SPEI), tree size, and tree neighborhood composition, though with variation among different compartments. The effect of mixing with beech is significant in the recovery of stem, branch, and root growth after drought, although it only affects branch growth resistance and resilience. While under single-species conditions, there's a positive correlation between stem resistance and that of branches and roots, this disappears in mixed conditions, indicating that in this case, normal diameter is not always representative of tree growth.

Iron mineral mapping in sierra minera de cartagena

Pereira, I.[1*], Ferrer-Julià, M.[1] and García-Meléndez, E.[1]

1Research Group Environmental Geology, Quaternary and Geodiversity (Q-GEO), Facultad de Ciencias Biológicas y Ambientales, Universidad de León. Campus de Vegazana, s/n, 24071 – León (Spain)

***Presenting author**
iperr@unileon.es

Keywords: Multi-temporal, Remote Sensing, Iron oxides, Soil degradation.

Soil degradation is one of the biggest concerns in relation to agriculture and food security, being the Mediterranean countries the most vulnerable to these erosional processes. The southeaster Spanish Mediterranean region, where Sierra Minera de Cartagena (Murcia, Spain) is located, is characterized by an arid climate regime affected by extreme erosion episodes with an important translocation and loss of sediments. The impact of these sediments in this area is particularly challenging as the ramblas are fed by mining residues, irrigating a wide agricultural area.

These mining materials are spectrally active and can be mapped by remote sensing techniques. In the present research, the distribution, and changes of two ferric iron oxides (hematite, goethite) and one iron hydrous sulphate mineral (jarosite) have been mapped. For this purpose, four Sentinel-2 images, captured both in dry periods and precipitation events, were analysed. These images were processed using Google Earth Engine (GEE) cloud computing platform, in which band ratios and a SAM (Spectral Angle Mapper) classification were applied. The results show the spatial distribution of the different iron mineral based on the weather season, with hematite dominating during the dry periods and goethite and jarosite having their maximum in the humid season. Furthermore, the overlay of a land use map and the spectral information has allowed the identification of the agricultural area (use) as the most affected by iron oxides deposition, especially hematite. However, the ramblas channels and the grassland are the areas where the highest content of jarosite and goethite is found.

Acknowledgment: FEDER/Ministerio de Ciencia e Innovación – Agencia Estatal de Investigación/Proyecto ISGEOMIN-ESP2017-89045-R and HYPOPROCKS-PDC2021-121352-100 financed by MCIN/AEI/10.13039/501100011033 and the European Union "NextGenerationEU"/PRTR. I. Pereira's thanks a pre-doctoral FPU21/04495 contract.

Forestadapt tool, presenting the future potential distribution of the main tree species in the province of Soria, Spain

Porto-Rodriguez, JC.[1,3*], Gallego, R. [1], Moreno-Amat, E. [2], Olano, J.M. [2], Trassierra, A. [1], Blázquez-Casado, A. [1]

1 Fundación Centro de Servicios y Promoción Forestal de Castilla y León (CESEFOR). Soria, Spain;
2 Cambium Research Group EiFAB-iuFOR, Universidad de Valladolid, Soria, Spain;
3 Instituto de Investigación en Gestión Forestal Sostenible (iuFOR), ETS de Ingenierías Agrarias. Universidad de Valladolid, Avda. de Madrid 44, 34004, Palencia, Spain

***Presenting author**
josecarlos.porto@cesefor.com.

Keywords: Climate change, species distribution models, SSP, adaptation, LIFE project.

In the coming years, current forest cover is expected to undergo changes in its condition due to climate change. In this sense, foresight is needed to help forests to adapt to the future situation. Thus, the Life Soria Forest Adapt project focuses on the adaptation to climate change of forest in the province of Soria (Spain). Among other measures, species distribution models were developed for the most important tree species in the province (Pinus pinaster, Pinus sylvestris, Pinus nigra, Pinus halepensis, Fagus sylvatica, Juniperus thurifera, Quercus pyrenaica, Quercus faginea, Quercus ilex) under different climate scenarios (SSP-126, 370 and 585) for various future time periods (2011-2040, 2041-2070, 2071-2100), including the reference period (1980-2011). To ensure the transfer to stakeholders, a tool was needed to allow easy access to the results. For this purpose, an online viewer, called ForestAdapt Tool, was developed. It allows access to the models "By species" and "By location". In the former case, selecting the species of interest generates a map with its potential distribution. It can also be compared with real data from Spanish National Forest Inventory and Forest map of Spain. In the second case, selecting a given pixel (1km*1km), the number of species studied that could potentially succeed there, which is called richness, is obtained, also showing the suitability of projected future habitat of each species. Furthermore, it allows selecting in which area a given species presents the highest suitability. Additionally, maps and alphanumeric information can be accessed with reports and comparative tables of the results. All the data is available to download from the section "Data source". This tool was developed in collaboration between CESEFOR and Cambium Research Group (University of Valladolid), as part of action C2 of the Life Soria Forest Adapt project. Tool available in: https://soriaforestadapt.es/herramienta/#

Spatiotemporal monitoring network implementation for the identification of post-coal-mining restoration success indicators

Prado-Jimeno, R.[1,*], Reja-Gómez, J.A.[2], Martínez-Ruiz, C.2, García-Duro, J.2, López-Marcos, D.1

1 Área de Edafología y Química Agrícola, Instituto Universitario de Investigación en Gestión Forestal Sostenible (iuFOR), Escuela Técnica Superior de Ingenierías Agrarias, Universidad de Valladolid, Avda. de Madrid 57, 34004 Palencia, Spain; 2 Área de Ecología, Instituto Universitario de Investigación en Gestión Forestal Sostenible (iuFOR), Escuela Técnica Superior de Ingenierías Agrarias, Universidad de Valladolid, Avda. de Madrid 57, 34004 Palencia, Spain.

***Presenting author**
ruben.prado@uva.es

Keywords: plant and soil relationships, ecological succession, open-cast coal mine restoration, environmental monitoring, post-mining environment dynamics.

Mining activities have shaped northern Spain's landscape over the last centuries, causing a high environmental impact that requires proper restoration. The post-mining recovery towards an agroforestry system is often slow and difficult because of the total/complete remotion of vegetation and soil. Decades after the restoration works, the effectiveness of the restoration is limited by different factors such as the slope, orientation, or distance to the forest. The vulnerability of the restored areas is also high, with the analysis of the dynamics of the vegetation of restored areas (e.g., by orthophotography) revealing vegetation coverage loss over time.
Within this context, we hypothesize that there is a spatiotemporal variation in the soil of the reclaimed mines that generates gradients affecting natural revegetation. We aim to identify indicators that allow us to model the effectiveness and evolution of future restorations under the new European Nature Restoration Law. This study will be developed in an open-cast coal mine in northwestern Palencia (Spain) reclaimed to agroforestry use more than 30 years ago. The area has a mean altitude of 1188 m, an average slope of 8,5° and a mainly eastern orientation. The climate is sub-humid Mediterranean with a dry season in summer and a rainy season between autumn and spring. The surrounding forest, where Inceptisols are common, is dominated by sessile oak (Quercus petraea). The reclaimed mine consists of a grassland with some shrublands as Cytisus scoparius and Genista florida, in Entisols with rocky outcrops and high stoniness.
A temporal soil monitoring network will be designed covering several forest-mine gradients with different slopes and orientations 9 x 8 transects (50 samples) over the reclaimed mine and the close forest. A starting-point characterization of the soil and vegetation will be carried out and monthly monitoring will analyse the soil temperature and humidity, and several biochemical parameters.

Monitoring the forest carbon in Mediterranean mixed forests using vegetation profiles derived from mobile laser scanning. A showcase in Central Portugal

Tupinambá-Simões, F.1*, Pascual, A.[2], Guerra-Hernández, J.[3], Ordóñez Alonso, A.[1], Barreiro, S.[3], Bravo F.[1].

1 SMART Ecosystems Group. Departamento de Producción Vegetal y Recursos Forestales. Instituto Universitario de Investigación en Gestión Forestal Sostenible (iuFOR), ETS Ingenierías Agrarias, Universidad de Valladolid, Palencia, Spain;
2 Department of Geographical Sciences, University of Maryland, College Park, MD 20742, United States of America;
3 Forest Research Centre, School of Agriculture, University of Lisbon, Tapada da Ajuda, 1349-017 Lisbon,Portugal

***Presenting author**
frederico.tupinamba@uva.es

Keywords: Precision forestry, Forest monitoring, Mobile laser scanning, Forest inventory

The adoption of novel methods in forest management planning requires the incorporation of precise forest and tree data information to better schedules and meet multi-objective criteria principles. In this study, we evaluate forefront methods in the mapping of tree structural attributes to create detail baselines for forest carbon biomass, a reference indicator in environmental policies. We timely employed laser sensors from above and below the canopies to estimate biomass and carbon stocks in a mixed forest. Our contribution specifically looked at the synergized use of mobile sensors, terrestrial (hand-held laser scanning, HLS) and airborne (unmanned laser scanning, ULS). We evaluated the parametrization of ULS flight altitude varying the altitude (50, 70, 90, 110 m) and the scanning mode. The investigation features a case study on a 1-ha plot located on a complex, terraced forest region in Portugal. We aimed to provide a differentiated understanding of the results associated with different flight altitudes and ULS return numbers and the potential need to harmonize the HLS and ULS point cloud data, with the data obtained from the HLS alone. We estimated changes in above and below ground stocks for biomass and carbon from measurement errors using standard tree biomass allometries used by the National Forest Inventories of Spain and Portugal to estimate stocks by species in our study area. Our results showed false-positive errors for HLS in tree detection for small trees but still the distribution of HLS estimates is aligned to reference DBH measurement but systematically lower (~ 2-3 cm bias). The impact of these measurement error range in total biomass was estimated in 13% assuming all trees were systematically under-predicted. For tree height, the comparison showed major discrepancies between tree height distributions from HLS, ULS, fused ULS-HLS point cloud and field reference data. ULS can operate effectively at heights up to 110 meters, expanding the coverage area without affecting the quality of results. We showcase how merging point cloud datasets does not necessarily improve the accuracy of tree height estimates considering the complexity of the stand and high species mingling. We do not recommend measuring the performance of laser sensors for tree height estimation using field measurements in these conditions.

RNA-seq analyses to unravel the underlaying mechanisms of *alder-phytophthora* interaction

Pastor Durántez, Eduardo[1*], del Campo Calvo, Raquel[1], Díez Galán, Alba[1], Diez Casero, Julio J.[1]

1 Sustainable Forest Management Research Institute, University of Valladolid (Unidad Asociada al CSIC

***Presenting author**
eduardo.pastor@uva.es

Keywords: Oomycetes, *Phytophthora spp*., alder, alder decline, pathogenicity, RNAseq

Alder (Alnus glutinosa (L.) Gaertn.) is one of the most ecologically important riparian tree species. They contribute to the nitrogen fixation in the ecosystem via symbiosis with the bacteria Frankia alni, to the riverbank stabilization, and to the formation of biological niches, among other important aspects. However, the alder decline disease is spreading through different parts of Europe, which has caused a severe decline in alder populations. This disease is caused by several oomycetes from the Phytophthora genus, especially P. alni species complex and P. plurivora. The pathogens primarily affect the root and lower trunk regions, resulting in the development of bleeding cankers, along with crown dieback and leaves turning yellow. Pintos-Varela et al. (2010) detected P. alni complex species in Spain for the first time and Galicia is thought to be one of the most affected areas. Due to the severity of this problem, we carried out an extensive sampling in different parts of Spain to isolate and identify Phytophthora species from alders, and thus to determine the actual distribution of this disease. This will lead to the generation of a collection of the different strains with which it will be performed inoculation assays with alder seedlings. These will serve to carry out different RNAseq analyses to analyze the gene expression of both the pathogen and the host during the infection to understand the molecular basis of this interaction. This knowledge will be valuable for further research on how to manage this important disease.

SESSION II

Spanish ecological battleground: Population structure of two invasive fungi, Cryphonectria parasitica and Fusarium circinatum

Ahmad, F.[1,2*], Diez, J. J. [1,2]

1 Department of Forest Resources and Plant Production, Palencia, Spain;
2 Sustainable Forest Management Research Institute, University of Valladolid (Unidad Asociada al CSIC).

***Presenting author**
Farooq.ahmad@uva.es

Keywords: Invasive pathogens, forest pathogens, population genetics, biocontrol, chestnut blight.

Globalization is causing a rapid movement of pathogens, leading to an increased threat to forests by invasive pathogens. Understanding the origin of these pathogens and how they establish in the introduced population is crucial to manage them. Cryphonectria parasitica and Fusarium circinatum are both invasive pathogens in Europe that represent a threat to Mediterranean forests. These introductions are separated temporally; C. parasitica was introduced almost a century ago, whereas F. circinatum was introduced around two decades ago. We hypothesize that C. parasitica is better established in the North Spanish populations than F. circinatum. For this purpose, the genetic diversity of both organisms was studied considering mating types and the Internal Transcribed Spacer Region (ITS). In addition, we used vegetative compatibility (VC) type markers in C. parasitica as the information about VC type is essential to apply biocontrol against the fungus. All the isolates of C. parasitica from the studied area belonged to only one VC type (EU-1) and one mating type (MAT-2). However, three distinct haplotypes of C. parasitica were identified through ITS sequencing, showing that multiple introductions might have happened to Cantabria. Among F. circinatum, no diversity was observed in the ITS and MAT loci in the studied area. Overall, C. parasitica had higher genetic diversity than F. circinatum despite both organisms appearing to reproduce clonally. This study helped understand the invasion patterns of C. parasitica and F. circinatum in northern Spain and will be useful in applying biocontrol against both pathogens.

Machine learning alternatives to assess individual tree mortality: a performance comparison

Vázquez-Veloso, A[1*]; Toraño Caicoya, A[2]; Biber, P[2]; Uhl, E[2,3]; Pretzsch, H[2]; Bravo, F[1]

1 SMART Ecosystems Group. Instituto de Investigación en Gestión Forestal Sostenible (iuFOR), ETS de Ingenierías Agrarias. Universidad de Valladolid, Avda. de Madrid 44, 34004, Palencia, Spain;
2 Chair for Forest Growth and Yield Science, Center of Life and Food Sciences Weihenstephan, Technische Universität München, Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, Germany; 3 Bavarian State Institute of Forestry, Hans-Carl-von-Carlowitz-Platz 1, 85354 Freising, Germany

***Presenting author**
aitor.vazquez.veloso@uva.es

Keywords: Norway spruce, survival, mortality, artificial intelligence, supervised learning

Tree mortality is a crucial process in forest dynamics and a key component of growth simulations. However, the complexity of the factors influencing it makes this process challenging to predict. One commonly used algorithm in this field is logistic binomial regression (LR), but the increase in computing power has led to a higher popularity of using Machine Learning (ML) algorithms. While ML algorithms have been increasingly applied to various forest modelling topics, including the prediction of tree mortality, a performance comparison between them in this field is lacking. In this study, we compare the performance of LR, serving as a reference approach because is the business as usual method in this kind of analysis, to five different ML algorithms (Decision Trees, Random Forest, Naive Bayes, K Nearest Neighbor, and Support Vector Machine) in estimating individual tree mortality probability. We selected Picea abies pure stands established under different plantation and silviculture treatments, comprising 97 permanent plots located in 8 different study areas in Bavaria (Southern Germany). Each tree was individually studied in its neighborhood, and features related to tree size, site productivity, competition, growth, social position and climate were considered as candidates for explaining tree mortality. Various case studies, considering dataset size, the number of available variables, thinning regime, and inventory record length, were conducted to assess the behaviour of each algorithm. We compared their performance and model fitting time. Additionally, a cross-application among thinning regimes was performed. Preliminary results demonstrate the potential of ML in assessing tree mortality, showing similar or even better performances compared to those obtained with LR. Different behaviours were observed during cross-application. In cases where ML techniques did not outperform LR (and even when they do it), interpretation difficulties reduced their utility.

Strategies for maintaining the productive value of native amazonian forests during harvest cycles

Tamiris Roda*

*Escola Superior de Agricultura Luiz de Queiroz "ESALQ", University of São Paulo. Piracicaba, Brazil.

***Presenting author**
tamiris.o.roda@gmail.com ; tamiris.oliveira23@estudiantes.uva.es

Keywords: Amazon, sustainable forest management, wood logging, sustainability.

Sustainable Forest Management is a set of logging techniques that result in a lower impact tan unplanned harvesting, which is the method of legal management currently used in the Brazilian Amazon. The cutting intensity and the management strategies used in an area are the main determinants of logging sustainability. Currently, there is a lot of criticism about the way this is done, and if forest management in the Amazon is in fact sustainable. Studies show that if management continues to be carried out in the current way, future cutting cycles will not be possible, the demand for wood will not be supplied, and the Amazon forest will be affected. It is essential to improve the current strategies and implement new ones, based on the recommendations contained in the literature. This study included a literature review of publications on the subject, and a questionnaire sent to players in the Amazon timber sector in order to understand the main challenges for the sustainability of the sector in a systemic way. The main strategies raised by scholars of the sector were listed, which were used as a basis for designing a part of the questionnaire. Through the questionnaire, which was answered by 34 key players, it was possible to obtain the opinion of professionals who work in the area and bring a more practical view of the problems, and make a comparison between the discussions addressed by them and the strategies raised in the literature. The main actions listed by the actors of the wood sector are compatible with the strategies found in the literature. Eight main strategies to enable the maintenance of the productive value of native Amazonian forests during the cutting cycles and to leverage the sustainability of the sector were mapped out. The obtained results demonstrate that the empirical knowledge of those who work directly in the sector is in synergy with the published scientific recommendations and can be a potential instrument for initiatives that aim to promote strategic plans for the use and conservation of production forests in the Brazilian Amazon.

Reconstructing historical tree management patterns of deciduous oaks woodlands using machine learning

Coca, E.[1]*, Olano, J.M.[1], Sanmiguel, A.[1]

1 EiFAB- iuFOR, University of Valladolid. Soria, Spain

***Presenting author**
mariaencarnacion.coca@uva.es

Keywords: Dendrochronology, Pollarding, Random Forest

Old trees are extremely scarce in nature. Human activity (agriculture, forestry…) has increased its scarcity. However, the highest density of old trees in Europe occurs in the vicinity of towns, where management has been more intense. Pollarding, a traditional management practice, consists in pruning branches at a certain height above the ground to obtain materials ranging from firewood to sophisticated pieces for shipbuilding. That practice leads to periodic growth reductions which predispose trees to a longer lifespan and are recorded on their wood. We can read that enclosed information thanks to the dating and studying of the different tree ring characteristics. Deciduous oak open woodlands, once extremely prevalent in the Mediterranean, have received minimal attention, and, moreover, they are undergoing a tree decline due to the effects of dismissed pollarding and climate change. To fill this gap, we conducted a dendrochronological study to identify spatio-temporal patterns of management of four deciduous oaks woodlands in North-Central Spain. Using 80 out of the total 200 sampled trees (Quercus pyrenaica and Q. faginea), we trained a machine learning algorithm called Random Forest model with >800 pruning events that were identified visually in wood cores. During the training, we considered a multiscalar drought index to detect drought events during the S. XX to avoid confusion with pollarding events. This machine learning algorithm was then successfully applied to detect automatically pruning events on the rest of the dataset. This approach allowed us to reconstruct the historical management of these dehesas over the past 500 years.

Using linked open data for forest inventory data analysis at the local level

Crespo-Lera, N.[1,2*], Vega-Gorgojo, G. [1,2], Giménez-García, J.M. [1,2], Bravo F. [2,3], Ruano, [I.2,3]

1Grupo de Sistemas Inteligentes y Cooperativos, Universidad de Valladolid, Spain; 2Instituto de Investigación en Gestión Forestal Sostenible, Universidad de Valladolid, Spain; 3 SMART Global Ecosystems Group, Universidad de Valladolid, Spain.

***Presenting author**
natalia.crespo@uva.es

Keywords: National Forest Inventory plots, municipalities, counties, GIS, GeoSPARQL

In recent years there is a growing need to analyse forests at the local level. These needs include promoting the use of the ecosystem services they provide (CO2, biomass, fruits, wood, recreational services...), improving their conservation, and supporting local economies through sustainable management. National forest inventories collect relevant information on forest ecosystems. However, these inventories are sometimes unavailable or difficult to access. This is the case of the Spanish National Forest Inventory, whose data is accessible but difficult to handle due to the use of proprietary formats (Microsoft Access), a complex schema and the dispersion of the dataset in 100 files. The aim of our work is to obtain in which municipality the inventory plots are located, enabling the management of all the information they contain to carry out analyses at local or county (comarcas) level (grouping municipalities). Furthermore, we intend to openly distribute this information as Linked Open Data so that it can be used for different purposes. The Linked Open Data approach is based on the interconnection of data through Semantic Web technologies, thus making it possible to integrate, explore and perform basic analysis of data from different sources. Once the databases of the geographic limits of the municipalities from the Spanish National Geographic Institute (IGN) are integrated with the information of the Spanish National Forest Inventory, it is possible to perform different studies; some examples include: assessing the amount of forest biomass per municipality, or county, the number of pure and mixed plots and their composition, the diversity of species, or insight on forest type abundance. To illustrate this, in our work we have carried out a study of the dominant species per municipality at national level and in the specific case of Picos de Europa National Park. Besides, we also conducted an analysis about mixed forests dominance across a set of Spanish counties covering a wide range of ecosystems and forestry situations. In conclusion, the possibility of having these data published in an open format available to government officials, scientists, foresters and planners opens the door to different analyses for management and research at the local level with the possibility of using them for different purposes in a time and cost-effective way.

Effects of supplementary crops on the browsing behaviour of red deer in mediterranean landscapes: preliminary results

Tomas García Calama[1*], María Martínez-Jauregui[2], Jose Manuel García del Barrio[2], Miguel Delibes-Mateos[3], Rafael Villafuerte-Jordán[2]

1Universidad Politecnica de Madrid (UPM)
2 Instituto de Ciencias Forestales (ICIFOR, INIA-CSIC), Madrid, Spain.
3 Instituto de Estudios Sociales Avanzados (IESA, CSIC), Córdoba, Spain

***Presenting author**
tomas.gcalama@alumnos.upm.es
Rafa.arfa@gmail.com

Keywords: Cervus elaphus, cropping, herbivory, monitoring, ungulates.

The increasing red deer (Cervus elaphus L.) populations across Europe are a reality that entails the need for management tools from both an ecosystemic and social point of view. The degradation of woody vegetation due to high browsing pressure is a threat reported in medium or large fenced game estates, and protected areas, in Spain. In Mediterranean environments, cultivating vetch, rye, and oats is a common practice to improve the availability and quality of feeding resources for the deer to maintain their condition, particularly during the summer, when water and quality feed are scarce. In this study, we aimed to assess whether this practice alter the spatial dynamics and natural behaviour of the red deer. To do so, we placed 30 systematically distributed camera traps in a perimeter-fenced estate of 6,600 hectares in "Montes de Toledo", central Spain, where there was 97.18 ha of cultivated sheets. Camera-traps were active and analyzed for one week before the crops became accessible to deer (i.e. crops were fenced to prevent deer access until crops reached maturity in mid-late May of 2021) and for one week after the removal of the fences. Overall, we identified the presence and feeding behavior of 1,199 adult deer captured by the cameras. A Random Forest (RF) model was used to determine the effect of different environmental factors (i.e. vegetation, altitude, and distance from crops) and population factors (i.e. sex) on the distribution of adult red deer browsing in the area. The RF model yielded an estimated error rate of 32%, with altitude and distance from crops significantly influencing browsing likelihood, accounting for over 70% of the model variance, whereas gender, vegetation, and altitude each accounted for less than 10%. This enables us to anticipate the impact of providing supplementary crops on deer spatial dynamics and browsing behavior, which in turn may serve as a proxy for the potential reduction in damage to woody vegetation. Our results provided a perspective on deer behavior by introducing crops to Mediterranean landscapes: a management which could have a "win-win" effect improving the quality of forage available to animals ahead of a period of scarcity and reducing damage to woody vegetation.

Factors affecting spatio-temporal dynamics of wildlife-vehicle collisions in Castilla y León

Tarjuelo, Rocío[1*], Luque-Larena, Juan José[1], Mougeot, Francois[2], Delibes-Mateos, Miguel[3],Martínez-Jauregui, María[1,4]

1 Sustainable Forest Management Research Institute, University of Valladolid (Unidad Asociada alCSIC).;
2 Instituto de Investigacion en Recursos Cinegeticos (IREC-CSIC), Ciudad Real, Spain;
3 Instituto de Estudios Sociales Avanzados (IESA-CSIC). Córdoba, Spain;
4 Instituto de Ciencias Forestales (ICIFOR, INIA-CSIC). Madrid, Spain.

***Presenting author**
Rocio.tarjuelo@gmail.com

Keywords: deer, random forest, road safety, wild boar, wildlife-management

Increasing road safety is a major goal for the United Nations in this decade. However, the geographical expansion and increments in population size of most large ungulate species in many European regions over the last decades pose a major threat to achieve this goal. We aim to explore the environmental and anthropogenic factors underlying the spatio-temporal dynamics of road accidents caused by collisions with the three commonest ungulate species – the wild boar (Sus scrofa L.), the roe deer (Capreolus capreolus L.), and the red deer (Cervus elaphus L.) – in Castilla y León, where a notable increase in the number of vehicle collisions with these species has been reported in the last two decades. We will use traffic data in 2015-2020 to evaluate the effects and relevance of the following factors related to the probability of colliding with each of these species: habitat cover, landscape diversity, topography, road type, traffic intensity, road sinuosity, species density, and hunting occurrence. For that purpose, we will use random forest, a machine learning technique based on the averaging of multiple decision trees, which have been widely used for classification and variable selection. We will develop one random forest model per species and season to investigate whether the contribution and influences of environmental and anthropogenic factors vary over time depending on the species and their biological cycle (e.g., dispersion, reproduction). We will report on the first exploratory analysis and discuss the findings in the light of potential mitigation actions to increase road safety.

SESSION III

Restormine proyect contribution to the ecological restoration

García-Duro, J.[1*], López-Marcos, D.[1] , Lafuente, F. [1], Fernández-Fernández, M.[1], Taboada-Castro, M.M.[1], Muñoz-Adalia, E.J. [1], Fernández-Santos, B.[2] , Pérez-Valera, E.[3], Ciceu, A.[4], Muñoz-Cerro, E. [1], Alonso-Zaldívar, H.[1] , Manso-Arribas, M.[1] , Prado-Jimeno, R.[1] , deTorre-Sáez, A.[1], Martínez-Ruíz, C.[1]

1 Instituto Universitario de Investigación en Gestión Forestal Sostenible (iuFOR), Escuela Técnica Superior de Ingenierías Agrarias, Universidad de Valladolid, Avda. de Madrid 57, 34004 Palencia, Spain.
2 Department of Animal Biology, Ecology, Parasitology, and Soil Science, Universidad de Salamanca, Salamanca, Spain
3 French National Institute for Agriculture, Food, and Environment (INRAE). Department of Agroecology
4 Department of Forest Growth, Silviculture and Genetics, Austrian Research Centre for Forests, Seckendorff-Gudent-Weg 8, Vienna 1130, Austria

***Presenting author**
juan.garcia.duro@uva.es

Keywords: nurse shrubs, facilitation, reclaimed coal mines, oaks recruitment, pasture

Plant-to-plant and plant-soil interactions have been largely proved to be crucial for ecosystem assembly and functioning. Facilitation is an important structuring force in natural plant communities, especially in severe and disturbed environments, where tree recruitment does not often occur in open spaces, but under the protection of nurse trees or shrubs. Shrubs can also play a key role in grassland conservation, contributing to increase their diversity and production. Shrubs can act as engineering species in grasslands and forests through microclimate and soil amelioration and protection against herbivores. Thus, the use of shrubs offers great opportunities for ecosystem conservation in many limiting environments around the world. It's expected that climate change will increase aridity in sub-Mediterranean areas, reducing tree species recruitment, and altering their relative abundance. Similarly, over-exploited pastures tend to show low diversity, production and, in general, a high risk of degradation. These risks are increased in degraded ecosystems (mine sites), even though they have been restored. Shrubs could be used there to strengthen ecological processes and interactions among and within components of the ecosystems, being an excellent method to carry out landscape restorations and an innovative technique for reforestation with minimum costs and maintenance. However, there are still few studies evaluating the use of shrub species to restore ecosystem functions and promote biodiversity. RESTORMINE aims to help optimize Pyrenean oak and sessile oak recolonization in coal mines of the Cantabrian range, where mine soils lack edaphic structure and the herbivore pressure (livestock and wild ungulates) is high, promoting natural processes such as shrub-tree facilitation. It also aims to promote the sustainable management of old coal mines restored to pastures by using shrubs as engineering species that contribute to ecosystem functioning, diversity and production.

Social organizations in relation to vegetation cover in tibetan ground tits

Hao,C.[1*], Lu,X.[2]

1 Institute for Advanced Studies, Wuhan University, China;
2 College of Life Sciences, Wuhan University, China; 3 Department of Territory and Agro-Forestry System, University of Padua, Italy

***Presenting author**
chenxi.hao@studenti.unipd.it

Keywords: cooperative breeding, delayed dispersal, food abundance, Pseudopodoces humilis, vegetation index

Animal social organizations typically include cooperative breeding, which refers to the phenomenon that a sexually mature individual in a population abandons the chance of independent reproduction and chooses to delay dispersal and stay in the nest to help other individuals, especially relatives. Tibetan ground tits Pseudopodoces humilis are a facultatively cooperatively breeding bird distributed over the Tibetan Plateau, and because the social organization of birds is closely related to their ecological environment, ecological factors must play a key role in the evolution of social organization. This study selected vegetation cover as an ecological factor, calculated vegetation index by analyzing remote sensing satellite images, combined with field work in 15 research sites in Gansu, Qinghai, Sichuan and Tibet Autonomous Region from 2016 to 2017, applied molecular biological techniques for gender and paternity identification of the collected tits blood samples, and used the least square regression combined with the AIC model screening method to preliminarily explore the relationship between vegetation covers on Tibetan Plateau and the social organization of Tibetan ground tits. The results showed that the square of mean vegetation index of June, July and August of the previous year could predict the proportion of nests with helpers with 19% R2. Food abundance reflected by vegetation index is the key to understanding this result. The lack of food resources in the plateau is an important ecological factor restricting the survival and reproduction of Tibetan ground tits. It is speculated that in poor vegetation conditions, Tibetan ground tits tend to refuse cooperative breeding in order to avoid relatives' competition. And when vegetation conditions are good, sexually mature individuals tend to reproduce independently. In the future, we should pay more attention to the life history of the insects that the Tibetan ground tits feed on and their relationship with environment. Besides, we should synthesize more population data to research the relationship between social organizations of Tibetan ground tits and vegetation cover.

Detecting clearcut patterns in soria province combining sentinel-2 and sentinel-1 data during period 2019-2024

Munuera, S. [1*], Gómez, C. [2], Rodríguez-Puerta, F. [3]

1,2,3 iuFOR, EiFAB, University of Valladolid, Campus de Soria, Spain

***Presenting author**
saioa.munuera@uva.es

Keywords: forests, monitoring, Sentinel-1, Sentinel-2, Fusion Near Real Time.

In Soria, approximately 60% of the entire province is covered by forests. Notably, 68% of this forested land is of private property, while 27% is designated as public land and the remainder has an unknown ownership status. The dominant tree species are Pinus sylvestrisand Pinus pinaster, whichplantations are usually managed by clearcutting and natural regeneration or planting. Currently, oversight of timber and wood extraction from private properties relies on field inspections, incurring substantial economic and temporal costs, and there is no database tracking clearcuts or other forestry extractive activities. The European Union advocates for the use of remote sensing technologies to monitor forest health and changes,to align with the Sustainable Development Goals (SDGs) and the 2030 Agenda. Remote sensing approaches may enable efficient and accurate monitoring of forestry extractive activities, a cornerstone for sustainable management of natural resources. In this research we endeavour to employ the Fusion Near Real-Time (FNRT) algorithm, implemented within the Google Earth Engine cloud platform, across 147255 ha of Soria´s forests. The primary goal is to monitor disturbances, identifying the onset, duration, and intensity of these changes. Originating as a tool for identifying alterations in tropical regions, the FNRT algorithm combines Sentinel-1, Sentinel-2 and Landsat time series data, creating distinct reference harmonic models for each sensor series. Subsequently, it evaluates change scores for individual clear observations throughout the monitoring timeframe. To address the challenges posed by cloud coverage, especially prevalent in the northern mountainous regions dominated by P. sylvestris, we implemented a stratification process based on the cloud cover probability database within the Google Earth Engine. We anticipate that our results will underscore the significance of incorporating active sensor data in areas prone to frequent cloud coverage, particularly in the mountains where highly productive stands flourish, and we aspire to contribute valuable insights to the sustainable management of Soria´s natural resources.

The role of nurse shrubs in the biodiversity conservation of post-coal-mining grasslands in palencia mountains

Manso-Arribas M.*, Tesón-Yudego A., Martínez-Ruiz C., García-Duro J.

Área de Ecología. Dpto. Ciencias Agroforestales. Instituto Universitario en Gestión Forestal Sostenible (iuFOR), E.T.S.II.AA. de Palencia, Universidad de Valladolid. Avda. Madrid 57, 3071. Palencia, España.

***Presenting author**
miguel.manso@uva.es

Keywords: Facilitation, nurse shrub, plant-to-plant interactions, mine reclamation, grassland diversity

Someshrubspeciesareknowntogradually modify the environment(microclimate and soil)and generate ecological niches, helping others to establish (nurse effect).These facilitation mechanisms can play a key role in the spatial configuration of post-mining grasslandcommunities wherenative shrubs colonize barren and disturbed soils. Cytisusscoparius(L.)Linkactively colonizesthecoalminesofnorthernPalenciareclaimed to pasturesand probably determines greatheterogeneity in theherbaceous matrix of post-mining grasslands,as it is widely known for other Mediterranean formations. Thus, ourstudy aims toassess the contributionof isolated plants of this shrub species to increasethe post-mining grasslands'ß-diversity.For each plantand following the main four orientations(north, south, east,and west),the species composition and its abundance (cover percentage) were taken in sevenconsecutive20 x 20 cm quadratsfrom the centre towards the open areas: three quadrats under the shrub canopy, one in the canopy border and three outside the shrub canopy. The Shannon diversity accumulated along the gradient of distance fromthe shrubincreased significantly regardless of orientation, although more markedly between the first inventories towards the south, as evidenced by the quadratic Linear Mixed Models fitted.The accumulated richnessfollowed the same trend than diversity, with small differences between orientations in the values achieved,whereas evenness remained constant.Grouping the inventories of the seven distances for each orientation, ß-diversity didn't differ significantlyamong orientations, suggesting thattheamount of spatial heterogeneity generated by isolated shrubs,from the canopy to open areas inthese grasslands,is not determined bytheorientation. However, grouping the inventories of four orientationsfor each distance, ß-diversity decreased from the centre of the shrub to the open areas,fitting aquadratic Linear Mixed Models,indicating thatshrubs have different effectsover the four main orientationsas getting closer to the shrub, and thus contributes tothe spatial heterogeneity in post-coal-mining grasslands.Therefore, we conclude that C. scopariusnurse shrubs have a key role in the biodiversity conservation of grasslands in mining areas of northern Spainby promoting ß-diversity under its canopy.

Growth responses to drought of primary producers in Pinus pinaster ecosystems

Barreiro-Verea, O.[1]*, Sangüesa-Barreda, G.[1], Madrigal-González, J.[1]

1 EiFAB- iuFOR, University of Valladolid. Soria, Spain

***Presenting author**
olga.barreiro22@uva.es

Key words: climate; ecological stability; global change; growth; species richness.

Climate change will be a significant issue in Mediterranean ecosystems, due to increased frequency and intensity of droughts. These events critically impact functions such as growth of primary producers. However, different species may imply varied responses to drought, thus conferring resilience to ecosystem functioning. Our primary aim is to explore whether species of primary producers, from lichens to annual herbs to woody species and epiphyte shave similar or different growth responses to drought. We firstly study growth responses in primary producers during the driest years of the 21st century, and secondly evaluated resistance, recovery, and resilience capacity of every species in these years. To achieve this, we established five points in Cuellar, Spain, within Pinus pinaster ecosystems on sandy soils. We collected growth samples of Pinus pinaster, Lavandula stoechas, Hallimiun umbellatum, Viscum album and several annual and perennial herbaceous plants. We used a multiscalar drought index (the SPEI) for the identification of drought years. We calculated resistance, recovery, and resilience indices for these species using methodology in Lloret (). Notable drought events occurred in 2005, 2012, 2017, and 2019, during which all the species, in general, showed growth reductions between 15% and 90%, except for mistletoe, which showed no significant growth reductions in dry years. L. stoechas exhibited the highest resistance and resilience, whereas P. pinaster demonstrated superior recovery capacity. H. umbellatum, in turn, showed the lowest resilience and the longest recovery time periods. The annual and perennial herbaceous plants had different responses, but their main strategy was recovery. Years of extreme drought are becoming more frequent, impacting the resistance, recovery, and resilience capacities, and thus posing greater challenges for primary producers to overcome these events. Consequently, the ecosystem's functional stability is compromised.

Sessile oak forest natural self-establishmentafter mine reclamation

Alonso-Zaldívar, H.[1,*], Muñoz-Cerro, E.[1], López-Marcos, D.[2], Martínez Ruiz, C.[1],García-Duro, J.[1],

1 Área de Ecología. Dpto. Ciencias Agroforestales. Instituto Universitario en Gestión Forestal Sostenible (iuFOR), E.T.S.II.AA. de Palencia, Universidad de Valladolid. Avda. Madrid 57, 3071. Palencia, España.
2 Área de Edafología y Química Agrícola. Dpto. Ciencias Agroforestales. Instituto Universitario en Gestión Forestal Sostenible (iuFOR), E.T.S.II.AA. de Palencia, Universidad de Valladolid. Avda. Madrid 57, 3071. Palencia, España.

***Presenting author**
herminia.alonso22@uva.es

Keywords: Nurse shrub, mine reclamation, Quercus petraea, ecological restoration, nature-based solutions

Interactions between plant species and plant-soilinteractionsare very important in the assembly and functioning of ecosystems. Among them, facilitation is a structuring force for plant communities, especially in harsh and disturbed environments, where tree recruitment does not usually occur in open spaces but under the protection of nurse trees or shrubs. Shrubscan act as engineering species in grasslands and forests through microclimatic and edaphic improvement and protection from herbivory. Climate change is expected to increase aridity in sub-Mediterranean areas, reducing recruitment of tree species and altering their relative abundance. Shrubs could be used here to enhance ecological processes and interactions between and within ecosystem components, making them an excellent method for landscape restoration and an innovative technique for reforestation with minimumcosts of implementationand maintenance. However, few studies evaluate its use to restore ecosystem functions.In this context, this study aims to assess the natural recolonization of coal mines reclaimed to pasturesin the Cantabrian mountain rangeand tocontribute to the reforestation and sustainable management of those areasby promoting natural processes such as facilitation by nurse shrubs. We monitored sessile oak (Quercus petraea(Matt.)Liebl.)natural regeneration in 2m x 2m plots installed 14 yearsagoin an old mine in Northern Palencia reclaimed to pastureuse.Sessile oak seedlingswithin these plots were identified and monitored. The high mortality, small annual growth,and aboveground parts depletion characterizesessile oak recruitment dynamicsover this period.Succession is arrested. However, shrubs contribute to oak survival and growth, and therefore they might have a crucial role in the establishment and early dynamics of sessile oakforests.

Beneath the ashes: vulnerability of soil functions to a severe wildfire

Santiesteban-Serrano, A.[1,2*], Hornos, Z.[1], Rincón, A.[2], Aponte, C. [1]

1 Centro Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA-CSIC). Madrid, Spain; 2 Instituto de Ciencias Agrarias (ICA-CSIC). Madrid, Spain.

***Presenting author**
amara.santiesteban@inia.csic.es

Keywords: fire severity, fire regime change, soil function indicator, multifunctionality, Mediterranean ecosystem

Wildfires have been experiencing increases in their frequency and severity for decades, linked to the effects of climate change and land uses changes. Models suggest that this trend will continue in the future. However, the impact of this fire regime changes on the multifunctionality of forest soils is not yet fully understood. In the present study, we assess the impact of fire severity on the functionality of Pinus sylvestris L. forest soils affected by the 2019 fire in Navalacruz (Ávila, Spain). Soil samples were taken at the topsoil (0-5 cm) and the subsoil (5-10 cm). Areas sampled included unburned zones, areas burned at low severity (tree canopies unaffected), and areas burned at high severity (total scorching of tree canopies). The latter were further divided based on slope to assess the interaction between slope and post-fire erosion. We conducted analyses on the different soil function indicators: soil inherent properties (e.g., pH, electrical conductivity), nutrients pools (e.g., exchangeable cations, available phosphorous, nitrogen reserves), biodiversity indicators (ergosterol and nematode abundance) and process rates (acid phosphatase activity and carbon microbial biomass); and multifunctionality indexes were generated. Results highlighted the multifunctionality loss that soil experiments with increasing fire severity, especially in the topsoil, evidencing the vulnerability of the studied ecosystem functions to wildfires. Our findings underscore the relevance that changes in fire regimes may have on the functionality and provision of ecosystem services by forest soils.

Characterization of seven bacteriophages infecting streptomyces bacteria

Menard, K. [1*], Kullolli, U.[1], Abdennour, A. [1]

1 Centre de Recherches Interdisciplinaires. Paris, France

***Presenting author**
katell.menard@cri-paris.org.

Keywords: microorganisms, antiviral, phage diversity, phage isolation, phage genomics.

Streptomyces bacteria, residing in soil, are susceptible to infection by bacteriophages, and recent findings indicate their capacity to generate antiviral compounds in response to such infections, offering potential applications in antiviral drug development. The fascinating domain of molecules produced by Streptomyces to thwart phage infections remains largely uncharted. Aiming to investigate the compounds naturally generated by Streptomyces in response to phage infection, the effort was undertaken to assemble an unprecedented collection of bacteriophages capable of infecting diverse strains. For this, 12 soil samples were collected in Île-de-France and Provence-Alpes-Côte d'Azur and 6 Streptomyces strains - S. albus, S.venezuelae, S. coelicolor, S. lividans, MBT86, MBT66 - were used to amplify the bacteriophages. The phages were then isolated and tested against different strains. The characterization of the phages, based on the bacteria they were able to infect (their host range), lead to the drawing of an infection matrix of 25 phages on 6 Streptomyces strains. Analysis suggested that the phages isolated on the same strain and on the same sample are often identical and that the phages isolated on the same strains, but different samples, were generally different. 7 different phages were found to be different when isolated. 1 phage, named C0P1, could be sequenced, and its genome is 90% similar to that of Alderaan (phage isolated on S.venezuelae). This study not only led to the isolation of diverse Streptomyces phages but also facilitated the development of a scalable protocol for phage isolation. Accordingly, an exceptional collection of at least 7 distinct Streptomyces phages was successfully assembled.

SESSION IV

The impact of rainwater harvesting on the sustainability of local communities in light of climate change: the northern Syrian region

Raad Kadour

1 University of Agricultura, Higher Institute for Regional Planning, Damascus

***Presenting author**
raadkadour96@gmail.com

Keywords: Spatial Stability, Climate change, Rainwater Harvesting Technology, Water Resources Management

This paper, presented at the Smart Spatial Planning Conference in Damascus, Syria, and sponsored by the Higher Institute for Regional Planning at the University of Damascus, explores the interconnection between water resources management and the sustainability of local communities. The research centres on an analysis of data from the Euphrates River Project, situated in the northern region of Syria. The project, a collaborative effort between the University of Damascus and the FAO Food and Agriculture Organization, implemented rainwater harvesting technology to mitigate the impacts of climate change in the specified region. The study involved examining climate change scenarios across the Arab region, with a focus on northern Syria, and assessing their influence on the deterioration and desiccation of the Euphrates River, leading to the displacement of residents to alternative areas. The project successfully achieved spatial stability for over 350 families, providing them with a secure water source and rejuvenating their agricultural lands.

Monitoring of nitrate levels in some local vegetables and their impact on human health

Arous, Abeer[1, 2*], Yassin, J.[2], Sal khadi, M.[2]

1 Erasmus Mundus Master Programme in Mediterranean Forestry and Natural Resources Management (MEDfOR), University of Padova, Italy
2 Department of Food Sciences, Faculty of Agricultural Engineering, University of Tishreen. Latakia, Syria

***Presenting author:**
Abeerarous97@gmail.com

Keywords: zucchini; eggplant; lettuce; nitrite; Syria; Green Test

The current study aims to assess the levels of nitrate in various local vegetables and to verify if these levels are within the internationally permitted limits. The purpose of this evaluation is to understand whether the nitrate concentrations present a health risk to consumers. The analysis was conducted utilizing the Green Test device. To achieve the objectives of the study, 35 samples of fresh vegetables were randomly collected from consumer markets in Jableh and Latakia in Syria, during the period between February and June 2020. The samples were collected over several weeks from more than 12 types of fresh vegetables. The results of the study showed that nitrate levels were high in most of the collected samples, exceeding internationally allowed limits. The highest levels were recorded in varieties of black eggplant, zucchini, lettuce, red eggplant, and cabbage. Based on these findings, the current study recommends the following: 1) Monitoring and providing guidance to farmers to reduce the levels of added fertilizer. 2) Conducting more studies on the impact of other factors on increasing the absorption of nitrates by plants. 3) Responsible authorities should take random samples from vegetable supply sources and measure their nitrate content according to well-planned schemes to ensure farmers' compliance with these guidelines

A voxel-based ray tracing model to simulate sunlight captured by trees

Melgar, Raquel[1]*; Bravo, Andrés[1]; Spyridon Michalakopoulos[1]; Tupinambá Frederico[1]; Bravo, Felipe. [1]

1 Instituto de Investigación en Gestión Forestal Sostenible (iuFOR), ETS de Ingenierías Agrarias. Universidad de Valladolid, SMART Ecosystems Research Group, Avda. de Madrid 44, 34004, Palencia, Spain; Chair for Forest Growth and Yield Science.

***Presenting author**
raquel.melgar@uva.es

Keywords: voxel, computational geometry, ray-tracing, competition for light, radiation attenuation.

As a metric for calculating the vigor of a tree, an estimate of crown dimensions is often used because of its impact on the efficiency of light and other resources. Light captured by the trees is mainly determined by canopy foliage density, relative position and interactions with neighbouring trees. Our objective is to define a metric that quantifies the amount of sunlight that an individual tree captures in a given time period, taking into account crown size and shape and relative position of its crown in the canopy.
For this purpose, 3D models of tree crowns based on voxelization on LiDAR point-cloud voxelization have been used and light extinction has been simulated by ray-tracing over the voxels and applying the Beer Lambert law of light. The absorption coefficient to be considered in the Beer-Lambert law will depend on the number of laser points contained in each voxel.

Enhancing fungal diversity and production through landscape-scale mosaic forest management in mediterranean ecosystems while reducing fire risk

Magarzo, A.[1,*], Sanz-Benito, I.[1], Mediavilla, O. [1,2], Hernández-Rodríguez, M. [1,2], Oria-de-Rueda, J.A.[1], Dejene, T.[1,3], Martín-Pinto, P.[1]

1 Sustainable Forest Management Research Institute, University of Valladolid, Avda. Madrid 44, 34071, Palencia, Spain
2 IDForest-Biotecnología Forestal Aplicada, Calle Curtidores 17, 34004, Palencia, Spain
3 Central Ethiopia Environment and Forestry Research Center, P.O. Box 30708, Addis Ababa, Ethiopia

***Presenting author**
albamagarzo@gmail.com

Keywords: Sporocarps, wildfires, Oak forests, Cistus, mycological potential

In the Mediterranean region, oak (Quercus) forests mixed with Cistus scrub is a widespread ecosystem, showing a wide fungal diversity and production depending on the age and structure of the stand. Some species in these ecosystems can reach a high economic value. Wildfires represent a major threat to these areas, caused mainly by the flammability of shrubs and their accumulation due to rural depopulation. Both for its vulnerability and mycological potential, an adequate forest management is crucial. The aim of this study was to determine the mycological potential of these ecosystems by studying the production, diversity and composition of the fungal community, in order to define proper management practices in fungal production while reducing the risk of fire. Sporocarps were collected during four successive years (2012 - 2015) in young and old Cistus plots (1 m and 2 m tall, respectively), and in Quercus plots. Stand age and predominant vegetation were found to influence sporocarp production, diversity and richness, with young Cistus plots having the highest production. Diversity was also significantly higher with Cistus. Regarding fungal composition, there was an evolution from a large and diverse community in young Cistus to a smaller and less diverse one in Quercus. The old Cistus plots showed an intermediate composition, indicating a transition between both species. Management that favours stand rejuvenation while leaving certain areas in a state of senescence can increase the richness and production of sporocarps by promoting host diversity, thus enhancing fungal species of gastronomic value and reducing the risk of fire. This could be achieved by applying a landscape-scale mosaic model that interconnects the different stages of succession and the fungal communities associated.

Spray-induced gene silencing (sigs) as an environmental rna interference (ernai) tool for controlling pine pitch canker disease.

Amin, H.[1]*; Bocos-Asenjo, I.T.[1] ; Mosquera, S.[1]; Díez-Hermano S.[1]; Ginésy, M.[1]; Diez, J.J.[1] and Niño-Sanchez, J.[1]

1 Department of Plant Production and Forest Resources, Sustainable Forest Management Research Institute (iuFOR). Higher Technical School of Agricultural Engineering (ETSIIAA), University of Valladolid, Palencia, Spain.

***Presenting author**
huma.amin@uva.es

Keywords: Globalization; Fusarium circinatum; double-stranded RNAs (dsRNAs); virulence; sustainable method

Globalization and climate change are increasing the number of plant diseases caused by pathogenic fungi in forests worldwide. Chemical fungicides commonly used against agricultural pathogens are not approved to be used in forest ecosystems, so new strategies of control are needed. The external application of specific double-stranded RNA (dsRNA) can downregulate (silence) the expression of target genes through environmental RNA interference (eRNAi) in many fungi, nematodes, plants, or even mammals. This technology is known as Spray-Induced Gene Silencing (SIGS) and has been demonstrated to significantly reduce virulence when applied against some crop fungal pathogens, such as Fusarium graminearum and Botrytis cinerea, among others. However, to date, there are no studies assessing SIGS for forest pathogen management. This research aimed to determine whether SIGS could be used to control Fusarium circinatum, the causal agent of Pine Pitch Canker (PPC) disease, which affects coniferous species worldwide, resulting in severe ecological and economic damage. For this purpose, we designed and tested dsRNA molecules, and demonstrated that F. circinatum is capable to uptake external dsRNAs and susceptible to SIGS. dsRNA molecules targeted essential genes corresponding to vesicle trafficking (Vps51, DCTN1, and SAC1), transduction of the signal (Pp2a, Sit4, Ppg1, and Tap42), and cell wall biogenesis metabolic pathways (Chs1, Chs2, Chs3b, Gls1), leading to a reduction in F. circinatum. Furthermore, it is demonstrated for the first time that, in SIGS, frequent applications of dsRNAs (weekly) are more effective in protecting the plant against PPC disease than single applications. SIGS is a powerful and sustainable method for controlling plant pathogens; however, it is not being used in forestry. Here, we demonstrate the effectiveness of this control method against a global quarantine forest pathogen, providing the first proof of its efficacy for forest disease control.

Xylem vessel segmentation through artificial neural networks

Pérez-Andrés, N. [1*], García-Hidalgo, M. [1]

1 EiFAB-iuFOR, University of Valladolid, Soria, Spain.

***Presenting author**
nerea.perez.andres23@uva.es

Keywords: Automatic, climate, convolutional neural network, dendrochronology

Plant growth is influenced by climatic conditions, and in temperate climates, environmental seasonality and precipitation regimes are the main ones. Sap conductive vessels from the xylem tissue modify their growth and arrangement depending on these factors, thus becoming an interesting indicator of plant-environment interactions. The study of xylem anatomy over time, known as quantitative wood anatomy, helps to understand the response of forests to past conditions and to estimate their response to the current climate change scenarios. The identification (segmentation) of vessels is usually executed using various automatic and semi-automatic software that are fed with high resolution images from thin wood microsection samples. Once the time-consuming sample preparation and digitization is complete, preliminary manual segmentation of areas of interest (e.g. vessel and background) trains models according to the pixel values. However, predicted results also need a subsequent manual edition of incorrectly segmented vessels, increasing the invested time. With the aim to ease the segmentation process, new mechanisms based on artificial neural networks are being developed. Convolutional Neural Networks (CNN) are able to reinforce a set of learnt characteristics and keep improving them until they achieve a successfully segmented image considering pixel value and its location. This mechanism is currently being studied to achieve an automatic segmentation of xylem vessels on tree core images at high resolution. We trained a CNN to segment xylem vessels on macroscopic images of Fraxinus angustifolia. Macroscopic images of tree core samples were manually segmented through a graphical user interface and are then fed to a CNN. The segmented images were used to train a CNN model to correctly identify vessels. The development of this methodology has great potential to speed up the quantitative wood anatomy analysis and unveil responses of forests to surrounding conditions.

Unraveling viral diversity in Phytophthora species isolated from northern Spanish alders.

Del Campo Calvo, Raquel*; Pastor Durántez, Eduardo; Diez Galán, Alba; Diez, J. J.

Department of Plant Production and Forest Resources, Palencia, Spain;

***Presenting author**
rdelcampoc@funge.uva.es

Keywords: Alder, Phytophthora, virus, RNA, biocontrol.

Numerous alders in European riparian forests are threatened by different species of the oomycete Phytophthora. Specifically in Spain, the presence of the pathogen in alders is known, but to date there is no real mapping of the affected areas. During the last months, field surveys have been carried out in northern Spain in order to detect and isolate Phytophthora in trees showing symptoms of alder decline. For this purpose, wood, soil and water samples were taken from the affected areas. Isolation was successful from wood samples collected from areas adjacent to the existing canker and necrotic zone where Phytophthora cambivora, P. plurivora, P. xmultiformis, P. xuniformis and P. fragariae were isolated. Due to the need to predict whether there are tree populations capable of tolerating or adapting to the pathogen, work is being done on the possible use of the oomycete virome in order to find environmentally friendly methods of integrated management of alders. The proposed methodology starts with the extraction of RNA, double-stranded RNA and smallRNA for subsequent sequencing of the viral genome and thus to know which viruses are present in the Phytophthora species causing the disease. Subsequently, it becomes more important to study the effect that the virome has on the hosts and to discern whether the mechanisms it generates could provide greater advantages for the infection of the plant or whether, on the contrary, they could be used as a biocontrol method due to an attenuation or elimination capacity of the pathogenicity of the fungus.

Adaptation of free-living nitrogen-fixing microorganisms to different ammonium salt concentrations

Gonzalez, M.[1*]

1 Grupo de Investigación en Procesos Avanzados para Tratamientos Biológicos y Químicos (GAOX), Universidad del Valle. Cali, Colombia

***Presenting author**
mayra.gonzalez@correounivalle.edu.co

Keywords: Nitrogen Fixation, Saline Stress, Sequential Batch Reactors (SBR), Nitrogen-Fixing Bacteria (NFB), Soil Recovery.

The Nitrogen Fixation process is considered a key research focus for global sustainability on the planet. Therefore, seeking sustainable alternatives is a worldwide priority. Adapting to saline stress conditions can negatively impact native soil bacteria, limiting plant development and soil quality. Selection and adaptation of nitrogen-fixing microbial communities from soil and industrial wastewater sludge were conducted in Sequential Batch Reactors (SBRs). The first reactor was inoculated with sludge obtained from a Wastewater Treatment System in the yeast industry (RL), and the second reactor was inoculated with agricultural soil from Valle del Cauca (RS). Both reactors were fed with nitrogen-free medium to reactivate the growth of the inoculants. Once reactivated, the inoculants were subjected to defined salt concentrations to assess their resistance to saline stress. The RS reactor exhibited higher densities of Nitrogen-Fixing Bacteria (NFB) (2.8E+06 CFU/mL) during the enrichment phase. At the end of the adaptation phase, the RL reactor showed NFB densities of 4.6E+07 CFU/mL, and the RS reactor showed 4.9E+07 CFU/mL. Therefore, the results obtained in the experiment suggest that these types of inoculants could be an alternative for the recovery of soils degraded by salinity.

SESSION V

Eco-metabolomics: a tool to resolve the chemical phenotype plasticity of forest species

Rivas-Ubach, Albert[1*]

1 Instituto de Ciencias Forestales (ICIFOR, INIA-CSIC). Madrid, Spain

***Presenting author**
albert.rivas@inia.csic.es

Keywords: Climate Change, Adaptive Phenotypic Plasticity, Metabolome, Metabolites, Biomarkers

Metabolomics encompasses all the procedures, ranging from sample collection to data processing and analyses, to obtain a comprehensive measurement of the whole collection of low-weight compounds (metabolites) present in an organism (metabolome). Metabolomics applied in ecological research (Eco-metabolomics) is a growing discipline allowing ecologists and ecophysiologists to obtain exhaustive information of the overall functional status of organisms, especially when exposed to environmental stressors. In general, the metabolome is the first component responding to environmental fluctuations and, therefore, it is often considered as the organism's chemical phenotype. Plants have the ability to adjust their chemical phenotypes to cope with the environment. However, the adjustment capacity, acclimation and adaptation processes to new environments finally depend on the species' adaptive phenotype plasticity which should be defined between specific limits. Therefore, under the current projections of climate change, forest tree populations may face different fates which could threaten the stability of certain ecosystem services. It is thus of critical importance to decipher the thresholds of the chemical adaptive phenotypic plasticity of forest species to be able to predict the future of our ecosystems. In mountain forest ecosystems, altitudinal gradients can serve as "natural laboratories" to study the impacts of climate change and represent an excellent opportunity to shed some light on the metabolome plasticity of forest species. I will discuss the use of eco-metabolomics approaches along altitudinal gradients to elucidate the adaptive metabolic plasticity of natural forest species and how this information is valuable to predict the fate of the ecosystem structure, function and diversity. In addition, I will highlight how eco-metabolomics in the context of environmental gradients have the potential to reveal better plant biomarkers associated to specific stressors.

Integrated management of alder decline in spanish riparian forest ecosystems

Diez-Galán, A.[1]*, Del Campo-Calvo[1], R., Pastor-Durántez[1], E. & Diez, J.J [1]

1 Universidad de Valladolid. Instituto Universitario en Gestión Forestal Sostenible. Producción Vegetal y Recursos forestales. Camus la Yutera, Palencia, Spain;

***Presenting author**
alba.diez.galan@uva.es

Keywords: Forest pathology, alder decline, biocontrol, Phytophthora, molecular biology

Alder decline caused by Phytophthora species represents a major threat to riparian ecosystems. This event is causing great losses in ecological, social, and economic value. Along with the rapid onset of climate change, the search for strategies to cope with the increasing decline of alders becomes even more crucial. In Spain, alder decline was reported in the last decades in the northern and central river basins and, since 2010, the alder morality has been associated with the presence of the Phytophthora species pathogen. There are many Phytophthora species reported as pathogens causing the disease in Spain (P. alni complex, P. plurivora, P. lacustris) however, there is currently no mass screening to know the extent of the disease, or the national association of alder decline with the pathogen. The primary goal of the RETAIN project is to identify and characterize the pathogens responsible for alder decline in Spain. In pursuit of this objective, samples have been collected from various regions in central and northern Spain. Endophytic fungi and oomycetes have been isolated from wood pieces and identified using molecular techniques, including ITS amplification and ITS sequencing. Subsequently, research was carried out using environmentally friendly methods of managing alder decline to prevent and treat the disease. In this context, the proposed biocontrol methods focus on the identification of fungal endophytes of alder and evaluating their antagonism against Phytophthora species. Additionally, the strategy involves the identification of RNA viruses in Phytophthora isolates through High-Throughput Sequencing (HTS) technologies. Furthermore, the biocontrol of alder decline is pursued through the application of environmental RNAi by Phytophthora species.

Understanding natural regeneration of pinus pinaster ait. in the south of spain using regeneration cuttings

de la Cámara, A.[1*],de Frutos, S.[2], Aldea, J.[1], Ruíz-Peinado, R.[1], Rodríguez-Alonso, J.[1], Bravo-Fernández, J.A.[2], Roig-Gómez, S.[2], del Río, M.[1]

1 Instituto de Ciencias Forestales (ICIFOR, INIA-CSIC) Madrid, Spain.

2 ECOGESFOR. ETS de Ingeniería de Montes, Forestal y del Medio Natural. UPM

***Presenting author**

acamara@estudiante.inia.csic.es

Keywords: mortality, clearcut, group selection, adaptation, resilience

During the second part of the XX century, a high number of reforestations were performed in Spain to control the erosion impacts. These reforestations implied the establishment of monospecific and even-aged stands. The low resilience to disturbances and their synergic effects with climate change make these forests a major issue in forest management. With the objective of diversifying forests, in terms of structure and species, clearcutting with reserves (35 trees/ha) and group selection cutting had been tested in Pinus pinaster Ait. stands. Performed in Sierra Madrona, Ciudad Real, in 2017 the two adjacent stands were cut, and each autumn were controlled to identify the limiting factors of the natural regeneration. The group selection cutting experimental design consists of fourteen groups of two sizes (diameter of 36 m and 62 m), and in each group 25 one-meter-radius subplots were established in the principal and secondary cardinal radius, and four out of the plot. In the clearcutting stand 14 plots of 20 m of diameter were established, having each plot 5 subplots located in the center and the principal cardinal radius (N, E, S, W). The number of seedlings and other factors potentially affecting regeneration (shrub, grass, litter, etc.) were monitored every autumn since 2018. After the first years, low maritime pine establishment had been seen. Although, the seedling densities are high, the severity of the summers due to high radiation and drought intensity implies high seedling mortality. However, in the last two years, more than half of the plots are reaching the boundary of >2000 trees/ha despite the growing shrub and herbaceous density, and the high herbivory pressure. The results do not show a clear species diversification of the stands, even having adjacent forests with different Quercus species such as Q. pyrenaica, Q. suber, Q. ilex, and Arbutus unedo. Our results indicate, therefore, that natural regeneration using cuttings can be a suitable tool in the challenge of facing climatic change severity in Mediterranean forests, but more time and research are needed to identify the limiting factors that rule the dynamics.

Analysis of area level models for small area estimation with lidar auxiliary information in forested areas of soria province

González-Mesquida, José Bernardo[1]*, Mauro-Gutiérrez Francisco[2],

1,2 EiFAB- iuFOR, University of Valladolid. Soria, Spain

***Presenting author**
josebernardo.gonzalez.mesquida@uva.es

Keywords: Small Area Estimation, Soria, Area Level Models, LiDAR

Reliable estimates about the state of the forest are needed to make informed management decisions. These estimates are typically needed for management units (i.e., stands) that can range from 5-20ha in size. Given the often-limited sample size associated with these units, they should be treated as small areas. Various small-area estimation methods have been proposed to incorporate auxiliary information into the estimation process and improve the reliability of estimates for small areas. While unit-level Empirical Best Linear Unbiased Predictors (EBLUPs) have proven effective in obtaining reliable stand-level estimates; research is still needed to assess the potential of area-level EBLUPs in forest inventories. This study compares direct estimators with no auxiliary information (i.e., traditional approach) to area-level EBLUPs, and unit-level EBLUPs using LiDAR data. Comparisons were conducted in 22 pine-dominated forests—comprising 74 management units and 367 ground plots—and focused on six variables of interest for forest managers (i.e., stand density, volume, basal area, quadratic mean diameter, mean height, and Lorey's height). To assess the performance of each method, root mean squared errors for stand-level estimates were compared. Preliminary findings suggest that area-level EBLUPs have larger rmses than unit-level estimates and direct field estimates have even larger rmses than area-level EBLUPs. Consequently, area-level EBLUPs improve accuracy over direct estimates and, while-level EBLUPs offer substantial accuracy gains over area-level EBLUPs. This improvement would capitalize on the increased costs associated with acquiring accurate field plot coordinates.

Drone lidar forest inventory in eucalyptus plantation in indonesia

Muhammad Lukman Yazid[1*]

1 Mediterranean Forestry and Natural Resources Management, University of Valladolid. Palencia,Spain

***Presenting author**
muhammad.lukman23@estudiantes.uva.es

Keywords: remote sensing, precision forestry, forest modelling

This study delves into the transformative application of drone-based Light Detection and Ranging (LiDAR) technology for the streamlined forest inventory in expansive Eucalyptus pelita plantations. Traditional methods face impediments in arduous forest conditions, proving time-consuming and resource-intensive, particularly challenging for large-scale plantations. The adoption of dronebased LiDAR presents a ground-breaking solution, providing high-resolution three-dimensional data that enables accurate and rapid assessments of forest structure. Focusing on Eucalyptus pelita, a commercially significant species prized for its rapid growth and versatility in pulp and paper production, the study employs drone-based LiDAR to capture detailed information on canopy structure, tree height, and density within a 4.500-hectare plantation with 250 ground plots. The resulting data not only facilitates precise volume estimations but also identifies individual tree attributes, such as diameter at breast height (DBH), with an impressive R2 value exceeding 0,83. The study reveals a 4-year payback period for the drone-based LiDAR inventory covering a total area of 12.570 hectares, offering crucial insights for strategic forest planning and decision-making processes. Emphasizing the advantages of drone-based LiDAR, including swift large-areacoverage, cost-effectiveness compared to traditional methods, and provision of highly accurate information, the integration of this technology into Eucalyptus pelita forest inventory practices holds the promise of enhancing efficiency, reducing resource requirements, and contributing to informed decision-making in the realm of sustainable forestry.

Agroforestry and Climate Change

Afifa Zahid[1]

1 University of Agriculture, Faisalabad.

***Presenting author**
afifazahidaz21@gmail.com@gmail.com.

Keywords: Agroforestry, Climate change, Tree Nursery, Adaptation

This abstract describes the interconnected relationship of climate change, population pressure and agroforestry mainly focusing on the provision of tree seedling to the Farmers as a suitable solution of climate change adaptation. Agroforestry is defined as an intentional growing of agricultural crops with suitable trees on the same land at the same time. This is one of the adaptive strategies to meet the demand and supply gap of increasing population as well as climate change. The impact of climate change on the society and environment are obvious and includes rising temperature, erotic rainfall, floods, soil erosion, land degradation, forest fires, melting of glaciers, food security, malnutrition, water scarcity, damage of infrastructure, psychological issues. All these factors pose a greater threat to the population and creates a pressure on the land resources. Agroforestry can be potential a solution for all the above problems which enhances the social, economic and environmental health of the ecosystem. One of the major challenges that the community faces is the lack of awareness and knowledge about planting the appropriate tree species with optimum tree-tree distance and right crop. In this regard, the main part of this project is to not only to grow healthy tree seedlings suitable for agroforestry on a nursery farm but also to educate the farmers about the benefits of adopting this system. A short Forest nursery project was done under a national project of Billion Tree Tsunami Project in which we provided these pure tree seedlings to the Farmers. This is the most suitable way to mitigate climate change and the sustainable method towards climate adaptation to get a resilient and productive system through agroforestry.

The influence of mixing proportions and competition in young mixed stands of scots pine (pinus sylvestris l.) and pyrenean oak (quercus pyrenaica) stands

Cudjoe, E.[1*], Bravo, F.[1], Ruiz-Peinado, R. [2]

1 SMART Ecosystems Research Group, Department of Plant Production and Forest Resources, University Institute of Research in Sustainable Forest Management (iuFOR), Associated R+D+I Unit of CSIC, Higher Technical School of Agricultural Engineering of Palencia, University of Valladolid, Avda. de Madrid 44, 34004, Palencia, Spain
2 Department of Forest Dynamics and Management, Institute of Forest Science (ICIFOR-INIA), CSIC, Ctra. A Coruña, km 7.5, 28040, Madrid, Spain

***Presenting author**
eric.cudjoe@uva.es

Keywords: Aboveground biomass; Young trees; Wood density; Biomass models; Dirichlet mixed-effects models

Aboveground biomass and carbon stocks are quantified correctly through biomass models, which are not only of great interest to science but also crucial for global climate reports and the carbon cycle. Even though more reforestation and afforestation projects have been launched in recent years to lessen deforestation, and degradation and to provide goods and services. As tree biomass equations traditionally focus only on mature trees, most studies have neglected the biomass and carbon stored in small trees within temperate forests. Data were collected from mixed stands of Scot pine (Pinus sylvestris L.) and Pyrenean oak (Quercus pyrenaica) in their young generative stage (average dbh < 10 cm), across nine different stands in an experimental site located in northern Spain. A total of 90 trees were randomly sampled (45 Scots pine, and 45 Pyrenean oak) under test, light, and heavy thinning treatments. Dirichlet mixed-effects models using dbh, height, and wood density as predictors were used to estimate the biomass of foliage, branches, stems, and total biomass. The results show that local competition and the mixing proportion in mixed young stands significantly influence biomass allocation to tree components; Foliage biomass is greater in the test stands and stem and branch biomass are lower. In the case of light and heavy thinning treatment, biomass models produced dissimilar estimates. Therefore, scientists can evaluate the most beneficial combinations by analyzing the biomass of a mixture of trees.

Long-Term Tree Regeneration of Fragmented Agroforestry Systems Under Varying Climatic Conditions

Carmen Delgado Clavero[1*], Mario Díaz[2] Teresa Sánchez-Mejía[2,]
Teresa Morán López[3]

1 MEDfOR Student, University of Lisbon, Portugal.;
2 Department of Biogeography and Global Change (BGC-MNCN), Museo Nacional de Ciencias Naturales, CSIC, Madrid, Spain.;
3 Laboratorio Ecotono, INIBIOMA-CONICET, Universidad Nacional del Comahue, Neuquén, Argentina

***Presenting author**
carmendelgadoclavero@gmail.com

Keywords Quercus ilex, Dehesas, Forest, Cabañeros, Acorns.

Iberian dehesas and montados are usually portrayed as outstanding agroforestry systems due to high levels of biological diversity and economical value. The trade-off of these ecosystem is, however, the reduction of tree regeneration due to their tree-scattered structure, although some recent works suggest that this structure may protect tree populations from climate warming by decreasing plant competition. Using data gathered during the long-term monitoring (2001–2018) of reproductive effort, predispersal seed losses, and early seedling recruitment of 300 Quercus ilex trees located in Cabañeros National Park we analyze how climatic conditions, tree isolation and their interactions influence the outcomes of regeneration stages between forest (closed) and Dehesa (opened) ecosystems, from flower production to early seedling establishment. Holm oak were sensitive to climate change, especially to year-round drought. Reproductive effort and early seedling recruitment decreased, while abortion and predispersal seed predation increased with higher drought intensity. Spring warming increases pollination effectiveness isolated trees showed lower fertilization success due to the difficulty of pollen dispersal. Forest clearing seemed to have little potential to ameliorate these negative effects, as shown by weak or no interactive effects between the spatial configuration of trees (cover or isolation) and climate variables (spring temperature or drought intensity). Forest opening aimed at decreasing adult tree mortality under climate change scenarios but at the expense of tree recruitment. Landscape scale rotations alternating shrub cover and thinning along periods adapted to climate changing are proposed as the main management alternative and solution to preserve both oak forests and dehesas in the long term.

Susceptibility of pinus pinaster proveances to pine pitch canker by fusarium circinatum

Thi Kieu Anh Nguyen[1]

1 EiFAB- iuFOR, University of Valladolid, Spain.

***Presenting author**
nguyen.thi-kieu23@estudiantes.uva.es

Keywords: Fusarium circinatum, Pine Pitch Canker, provenance, Pinus Pinaster, resistance

Fusarium circiatum is an ascomycete fungus that is the causal pathogen of the Pine Pitch Canker (PCC) disease. This disease has significantly impact on the economy and ecology of coniferous species. In Spain, it has been detected in natural forests and nurseries and pose a threat to Pinus pinaster, a conifer species that has significant economic and environmental benefits and is endemic to the country.The study aims to evaluate the susceptibility of Pinus pinaster seedling provenances to Fusarium circinatum . The seed samples were taken from 34 different provenances – 28 from different parts of Spain, 2 from France, 2 from Morocco, and 1 from Portugal. In this study we found that the provenances exhibited varied resistances depending on the condtion of geographic origin. The results showed that the more resistant seedling provenances come from the North of Spain as follows: Galicia and the Northern part of Castile Leon. The least resistant provenances were from Morocco, from the center of Spain, Castile La Mancha and the Southern of Castile Leon. In a nutshell, we can conclude that choosing seed provenances from the north of Spain would be a good management option in order to reduce the effect of Fusarium circinatum of Pine pitch canker on Pinus pinaster populations.

POSTER SESSION

Impacts of eucalyptus plantation expansion on natural forest management, gurage zone, ethiopia

Dendir Tigstu, T.[1*]

1 Hawassa University Wondo Genet Collage of Forestry and Natural Resources (HU_WGCFNR), Ethiopia, 2Erasmus Mundus Master Program in Mediterranean Forestry and Natural Resources Management (MEDfOR), University of Lleida, Spain.

*Presenting author
tizazu2t@gmail.com

Key words: Deforestation, Drivers, Manual digitization, Vegetation, Yarech

In the study area farmers preferred to plant Eucalyptus trees by deforesting natural forest for its short-term economic value than long term economic and ecological value of natural forest. The main objective of this study was to assess the drivers behind converting Yarech natural forest into Eucalyptus plantation, and to examine and map the vegetation cover change of Yarech natural forest after Eucalyptus plantation has started in the study area. To attain the objectives both primary and secondary data were collected. Questionnaires distributed to 160 sample households and interviews with KIs and FGD were employed. Multi-stage sampling methods were employed in the sample selection process. Google satellite image was used to classify vegetation cover of Yarech natural forest. The manual digitization method was applied to classify vegetation cover. SPSS and Microsoft excel were used to analyze social survey data and QGIS and Google earth pro used for forest cover analysis. The survey result showed that, the presence of aggressive wild animals which can affect human, domestic animals, and crops (95.6%), and perceived benefits (temporary economic benefit) from Eucalyptus plantation (95.6%) were identified as the major drivers for Yarech natural forest conversion to Eucalyptus plantation. The forest cover change map showed that a higher decline of dense forest (-11.2ha) and faster Eucalyptus plantation expansion (+10.78ha) was observed after Eucalyptus plantation has started (in between 2008 -2021). Generally, both types of forests provide various benefits for the local communities, but Eucalyptus plantation expands at a faster rate than natural forest. Finally, I recommended that implementing an effective management strategy to balance natural forest depletion and Eucalyptus plantation expansion should be launched in the study area.

Integrating lidar-based equations into tree-level growth models: a case from mediterranean mixed oak-pine forests in northern spain

Dissanayake C.T.M*, Tupinambá-Simões F., Vázquez-Veloso A., Bravo F.

SMART Ecosystems research group, iuFOR - Instituto Universitario de Investigación en Gestión Forestal Sostenible, ETS de Ingenierías Agrarias de Palencia, Universidad de Valladolid, Spain.

*Presenting author
chamoditharuni.mahanama22@estudiantes.uva.es

Keywords: Handheld Laser Scanner (HLS), Forest Structural Complexity Tool (FSCT), Cloud Compare (CC), Forest Management Simulation Service (SIMANFOR), Remotely Piloted Aircraft Vehicle (RPAV)

The application of remote sensing technology for forest management has been rapidly popularized over the past years. This study focuses on the role of close-range remote sensing and highlights the adoption of open-source software for automating forest inventory processes. The principal objective was to develop a model to extract single tree attributes from forest inventory with LiDAR metrics. In the meantime, the accuracy and error estimation of different remote sensing techniques was the secondary objective. The study area is in Ampudia, Spain, a mixed forest stand with Pinus halepensis, Pinus pinea, Quercus ilex, and Quercus faginea. Data acquired from a Handheld Laser Scanner (HLS) and Laser Scanner mounted on a remotely piloted aircraft vehicle (RPAV), processed 2D data from the Structure from Motion (SfM) technique, and traditional forest inventory data were used in this study. The data was processed and analyzed using Forest Structural Complexity Tool (FSCT) and Cloud Compare (CC) open-source software to develop forest inventory with attributes such as the diameter of breast height (dbh), tree height, tree volume, and tree location. The Forest Management Simulation Service (SIMANFOR) was used to evaluate wood volume production at stand level under different management scenarios. In conclusion, as we confront the challenges of preserving and utilizing forests, these innovations emerge as crucial components of effective and data-driven forest management strategies, ultimately ensuring the health and longevity of these vital ecosystems.

Undestranding the influence of the cloud cover on scots pine metabolism

Esteban-Sánchez, Ángel1*, Aranda, Ismael1, Rivas-Ubach, Albert1

1 Instituto de Ciencias Forestales (ICIFOR, INIA-CSIC). Madrid, Spain

*Presenting author
angel.esteban@inia.csic.es

Keywords: Eco-metabolomics, GC-MS, Pinus sylvestris, Cloudiness, Plant metabolome

Metabolomics research aims to obtain new insights into biochemical processes by elucidating the entire set of small weight compounds (metabolites) present in an organism at a specific moment (metabolome). Therefore, metabolomes can provide information of the functional plant status under particular situations (i.e., water stress). It is known the influence of environment, such as light exposure, on plant diurnal rhythms being the metabolome a central component coordinating many physiological processes shifting throughout the day. Metabolomics studies in ecology and ecophysiology (eco-metabolomics), where samples are mostly collected in natural conditions, need to pay special attention to any factor that could impact plant metabolomes. Contrasted environmental conditions during the sampling time (e.g. light incidence) could generate critical data artifacts masking key plant responses directly related to our ecological questions. In this way, ecometabolomics studies acknowledge the importance of collecting samples under stable atmospheric conditions, within a short period of time (~2 hrs), and at the same time of the day (e.g. mid-day) when multiple sampling days and/or locations are required, in order to control as much as possible any variation consequence of distinct environmental conditions. Those factors often complicate field campaigns given the complexity of plant metabolic changes to multiple environmental stimulus which cannot be controlled but should never be ignored. To understand the effects of light on foliar metabolome of trees, needles of adult Pinus sylvestris trees in Sierra de Guadarrama were collected in two consecutive days with contrasted sun incidence. GC-MS metabolomics were performed and the main results of Pinus sylvestris primary metabolism under sunny and cloudy conditions are discussed. We also highlight the importance of following accurately field sampling protocols to avoid artifacts generated by uncontrolled environmental factors.

Multipurpose forest management including economic ecological, and social aspects

Hajredini V.*, Këllezi M.*

University "Ukshin Hoti" Prizren, Kosova. Faculty of Life and Environmental Sciences, Department of Forestry and Environmental Sciences, Rruga e Shkronjave, no. 1 20000 Prizren, Republic of Kosova.

*Presenting author
Vjollca Hajredini*
vjollca.hajredini1@gmail.com@gmail.com

Keywords: sustainable forest management, biodiversity, environment, communities, socio-economy.

Multipurpose forest management is a common European and global trend which is improving forest management by offering greater benefits, which focuses not only on the wood product for the community but also on the development of ecotourism, recreation and utilization of NWFP. Taking into account Kosovo's aspirations to be part of the European Union (EU) as well as its commitments to be part of international initiatives, it is necessary to adapt the management of forest resources in accordance with the EU Forest Strategy (2013) and New EU Forest Strategy for 2030 (EC, 2021). Current forest management in Kosovo is mainly based on wood products, not taking into account the division of forest areas within the management unit according to functions which would determine the priorities of forest management within the management unit. Therefore, the aim of this study is to determine the Environmental, Economic and Social functions of the management unit "Koritnik I" by defining and using the criteria and indicators for each function and analysis of potentials for other products (except wood) that offer the forests of this management unit as potential for increase of revenues and creation of opportunities for the population in income generation based on sustainable management. To ensure sustainable management, also analyse the activities and products that can be extracted from the forest based on the forest functions of this management unit, as well as the best international practices that must be implemented.

Establishing model forest villages for livelihood improvement and forest conservation

Htun, A.[1,2*]

1 Department of Land, Environment, Agriculture and Forestry, University of Padova, Italy,
2 Forest Department, Ministry of Natural Resources and Environmental Conservation, Myanmar

*Presenting author
*Aye Thiri Htun
ayethiri.htun23@estudiantes.uva.es

Keywords: Community forestry, poverty, shifting cultivation, agroforestry, community-based tourism

Myanmar has been experiencing deforestation and forest degradation at the highest rate. One of the root causes of deforestation is the high dependency on forests by local people for their livelihood while rural population occupies more than 70% of the total population of the country. This high dependency on forests came from some limitations like poverty, lack of alternative livelihood strategies, lack of technical and financial support, limited knowledge on forest conservation and limited market access. Recognizing the importance of forest conservation in rural areas, the project that can improve forest conservation and local livelihood has been implemented in Shan State and Bago Region of Myanmar. This project brought about a new concept of establishing model forest village that can maintain a balance between two pillars, the sustainable forest landscape and community development. The project is expected to achieve three main outputs: (i) improving the forest conservation through community forestry, homegarden, sustainable shifting cultivation; (ii) enhancing local livelihood through the development of community-based tourism and community-based enterprise; (iii) supporting technical skills and policy of Forest Department. Participatory Rural Appraisal approach and Participatory Action Research methods have been applied from the initial to implementation phases of the project. In addition to community development, this project has also contributed to the National Strategy of Community Forestry Development and Myanmar Rehabilitation and Restoration Program (MRRP) through Community forestry establishment.

Spatial dynamics of natural regeneration in a reforested pine forest subjected to different silvicultural treatments

Maestre Villanueva, Jorge[1]; Acuña Míguez, Belén[1]; Concepción Cuevas: Elena Daniela[1]. Bravo-Oviedo, Andrés[1]

1 Museo Nacional de Ciencias Naturales, Agencia Estatal Consejo Superior de Investigaciones Científicas (MNCN-CSIC) Madrid, Spain.

*Presenting author
Jorge Maestre Villanueva
jorge.maestre@estudiante.uam.es

Keywords: Ecology, Silviculture, Seedlings, Forestry, Management

In Spain, large areas of monospecific plantations have been established in the last 70 years. Although monospecific plantations could be more productive than mixed forests, it has been shown that mixed forests are more resilient and resistant in a current context of global change. The main aim of this study was transitioning a monospecific stand of Pinus pinaster into a mixed forest of oak species using the expanded gaps irregular shelterwood system. This study was carried out in Cabañeros National Park (Ciudad Real, Spain). Two treatments differing in the diameter of gaps were tested. A control area without gaps were also established. Three Mediterraenan oaks (Quercus ilex L. Q, faginea Lam. and Q. suber L.) were planted in 1, 2 and 3 species combinations with three replicates across gap sizes, resulting in 45 planted gaps. In this study, we first addressed whether the different treatments modifed the biophysical characteristics of the gaps, like the coverage of rocks, pruning residues, presence of herbaceous plants and light incidence. For this purpose, the biophysical variables were measured in regularly distributed plots within 6 unplanted gaps (2 gap treatments x 3 replicates). Additionally, a seasonal monitoring of the natural regeneration in the unplanted gaps was conducted over three years as well as two-year oak survival in the planted gaps. The results shown that the different silvicultural treatments modified the light incidence in the patches where they were applied compared to control plots. However, the various treatments did not have an effect on the regeneration of oak species, although they did have significant effects on pine regeneration. Pine regeneration was favoured in treatments with greater canopy openness compared to those treatments maintaining a more closed canopy. The survival of seedlings from the plantations was higher in treatments where the forest stand was more open, regardless of whether the clear-cut patches were large or small in diameter. Based on these results, the use of oak plantations within small gaps is proposed as a management tool in the transition from monospecific pine plantations to mixed formations.

Analysis of the effect of livestock exclusion on vegetation and soil characteristics in grasslands in tupicocha, lima, peru

Manrique Vargas Susan[1,2*], LLambí Luis Daniel[1,4], Villanueva Rosa5, Bonnesoeur Vivien[1,3]

1 Consorcio para el Desarrollo Sostenible de la Ecorregión Andina (CONDESAN), Calle Codornices 253 – Surquillo, Lima 34, Perú;
2 Universidad Nacional Agraria La Molina, La Molina S/N. Av. La Molina s/n, La Molina, Lima, Perú;
3 Iniciativa Regional de Monitoreo Hidrológico de Ecosistemas Andinos (iMHEA), Av. Ricardo Palma 698 – Miraflores, Lima 18, Perú;
4 Programa Adaptación en Las Alturas; 5 Herbario Forestal MOL, Facultad de Ciencias Forestales, Universidad Nacional Agraria La Molina (UNALM), Av. La Molina s/n, La Molina, Lima, Perú.

*Presenting author
sammanriquev@gmail.com

Keywords: livestock, pared plots, grasslands, grazing, humid Puna

A comparative study of the effects of grazing exclusion in humid Puna grasslands in San Andrés de Tupicocha, Huarochirí, Lima, Peru, was carried out. The objective was to analyze the effects of fencing for six years on vegetation and soil characteristics related to the provision of the ecosystem service of water regulation. A paired plot design was used, assuming that the area inside and outside the fence initially comprised the same ecosystem. The change in floristic composition, vegetation cover, diversity, richness, biovolume and necromass was compared. The change in organic matter, bulk density and soil hydro-physical parameters, obtained with the moisture retention curve (field capacity, permanent wilting point, available water) were also analyzed. No significant differences were found in the change in vegetation characteristics, except for the increase in Herb cover, the increase in Gramineae biovolume in stratum 10-20 and the reduction in Shrub diversity in the excluded zone. The PCoA indicated that 46% of the variability in species abundance is explained by plot location on the slope and 22.5% could be explained by treatment. The PCA linked the bulk density with the excluded zone and the available water with the grazed zone. Organic matter was associated with plots in the lower part, with a greater abundance of shrub species. However, no differences were found in the soil variables analyzed. It was concluded that the exclusion has positive effects on the cover and biovolume of desirable species for cattle, while reducing the diversity of undesirable shrubs. The lack of significant changes in the soil can be attributed to several factors related to the heterogeneity of the Puna, historical land use or time.

Analysis of the relationship between forest owners and forest administration, the cases of Palencia and La Vera (Spain)

Martín, D.[1*]

1 University of Valladolid. Palencia, Spain.

*Presenting author
*Martín Molina, David
dav.m.molina@gmail.com

Keywords: perceptions, stakeholders, forest ownership, forests commons

The understanding of relationships and the perception expressed by the stakeholders involved in rural life is necessary to implement new strategies and to search for solutions to the problems they face today. Part of this is the relationship between forest owners and public administrations, as they are responsible of forest management. Interviews in La Vera and Palencia (Spain) reveal negative perceptions of the owners, who feel a lack of support and distrust towards the administration. The lack of practical measures for rural development is also criticised, while this collaboration is perceived positively by public landowners and the forestry administration. Two opposing perspectives of the relationship are therefore evident, highlighting the need for management models that minimise conflict and encourage participation and effective communication between the parties involved in the management of forests and rural life.

Small-scale early effects of thinning on the topsoil in scots pine-pyrenean oak mixed stands

Martínez-Miguel.[1,2*], García-Duro, J.[2], López-Marcos, D.[1]

1 Área de Edafología y Química Agrícola, Instituto Universitario de Investigación en Gestión Forestal Sostenible (iuFOR), Escuela Técnica Superior de Ingenierías Agrarias, Universidad de Valladolid, Avda. de Madrid 57, 34004 Palencia, Spain;
2 Área de Ecología, Instituto Universitario de Investigación en Gestión Forestal Sostenible (iuFOR), Escuela Técnica Superior de Ingenierías Agrarias, Universidad de Valladolid, Avda. de Madrid 57, 34004 Palencia, Spain.

*Presenting author
marina.martinez@estudiantes.uva.es

Keywords: mixed forest, forest management, soil properties, short-term change

Many studies point out the growth rates enhanced, soil conditions improvement, carbon sequestration increased, wildlife habitat creation, biodiversity conservation, or heightened recreational appeal as benefits promoted by mixed forests. Nevertheless, the study of the effect of silvicultural treatments on the soil focused on mixed stands and with a short-term and small-scale approach has not yet been addressed. Thus, in a Spain northeast experimental set-up was investigated the thinning impact in soil dynamics in Scots pine (Pinus sylvestris) and Pyrenean oak (Quercus pyrenaica) mixed stands. For that, in a 36 10x10 m plots network with different thinning and mixture levels forest structure effect of soil water dynamics (available water: AW; water holding capacity: WHC) on the first 5 cm was analyzed by identifying the best models. A high number of potential Linear Mixed Models considering different combinations of overstory variables (thinning-mixture, before-after treatment, P. sylvestris-Q. pyrenaica, diameters-basal area-density) were subjected to a model selection relied on an algorithm that inspects and ranks it by combining Akaike Information Criterion (AIC), Variance Inflation Factor (VIF), and residuals heteroskedasticity and linearity testing. Both AW and WHC were significantly related to thinning variables. Therefore, this study enhances our understanding of the many factors shaping water use efficiency in Scotch pine-Pyrenean oak mixed stands by pointing to the thinning effects of at least the upper 5 cm of the soil profile on variables related to water in the soil.

Effect of harvesting age and drying methods on essential oil yield of rosemary (rosmarinus officinalis l.) leaves in wondo genet, ethiopia

Melese Aytolgn[1*], Abebe Getachew[2], Befa Abdela[3], Moges Girma[2] and Degu Basazinew[3]

1Southern Agricultural Research Institute, Jinka Agricultural Research Center, Jinka 4420, Ethiopia
2Wondo Genet College of Forestry and Natural Resources, Hawassa University, Hawassa 0000, Ethiopia
3Ethiopian Institute of Agricultural Research, Wondo Genet Agricultural Research Center, Addis Abeba 1165, Ethiopia

*Presenting author: Melese Aytolgn
aytonasnake7@gmail.com.

Keywords: Rosemary, essential oil content, harvesting age, drying methods, rosemary leaves

Rosmarinus officinalis L. is extensively used in Ethiopian cuisine for flavoring dishes like roasted meats and spice blends. This study aimed to analyze how harvesting age and drying methods affect the essential oil content of rosemary leaves. Employing a 3 × 4 factorial design with 3 replications, this research explored the effects of harvesting age and drying methods on extracted essential oil yields from rosemary leaves. Data underwent a two-way ANOVA analysis using SAS software, with statistical significance set at $P < 0.05$. Harvesting age, drying methods, and their interactions significantly impacted rosemary leaf essential oil content ($P < 0.05$). Leaves harvested at 6 months after transplanting (MAT) exhibited the lowest essential oil content volume per weight (EOCV/W) for both fresh (0.55 ± 0.21%) and dry (1.34 ± 0.52%) leaves, as well as essential oil content weight per weight (EOCW/W) for fresh (0.50 ± 0.17%) and dry (1.22 ± 0.43%) leaves. Leaves collected at 12 MAT displayed the highest EOCV/W (fresh: 0.96 ± 0.27%; dry: 2.29 ± 0.69%) and EOCW/W (fresh: 0.84 ± 0.24%; dry: 2.01 ± 0.60%) values. Intermediate values emerged for leaves harvested at 18 MAT, with EOCV/W (fresh: 0.84 ± 0.16%; dry: 2.14 ± 0.43%) and EOCW/W (fresh: 0.74 ± 0.14%; dry: 1.88 ± 0.37%). During oven, sun, and shade drying processes, the mean EOCV/W losses for fresh leaves were 26.45, 27.72, and 25.19%, respectively, while EOCW/W losses were 27.12, 31.94, and 30.22%. For dry leaves, EOCV/W losses were 5.85, 7.32, and 8.62%, while EOCW/W losses were 10.41% and 29.31%, respectively, compared to the essential oil content of fresh leaves. Optimal rosemary leaf harvesting occurred at 12 MAT, utilizing fresh- and shade-dried methods for essential oil extraction via hydro distillation. Harvesting at one year post-transplanting, along with oil extraction from fresh- and shade-dried leaves, proved most efficient. These findings hold significance for enhancing rosemary essential oil production in both pharmaceutical and culinary sectors.

Women in the forestry sector in castilla y león: gender barriers and participation in decision making

Montes, A.[1*], Cruz, F.R. [1,2,4], Fernández, M. J. [1,3,4]

1 Master in Feminist Studies and Intervention for Equality, University of Valladolid, Palencia, Spain.
2 Department of Psychology, University of Valladolid, Palencia, Spain.
3 Department of Applied Physics, University of Valladolid, Palencia, Spain.
4 iuFOR- Sustainable Forest Management Research Institute, University of Valladolid, Spain.

*Presenting author
alemontes55@gmail.com

Keywords: gender inequalities, work obstacles, forest women, masculinization, and disregard of the forestry sector

This assignment aims to explore the situation of women in the forest sector in Castilla y León and their participation in related decision-making processes. To carry out this study, we have started analysing the gender inequalities presented to us by the gendered social organization. Also, we identify the gender barriers that extend in the labour market (sexual division of labour, vertical segregation, horizontal segregation and salary gap). Under this theoretical framework, a qualitative research has been proposed to analyse the role of women in the forestry sector, learning more about their education and the work they have been doing in it. A narrative approach through semi-structured interviews was used to highlights the experiences of forestry women in Castilla y León. The data gathered have been analysed through processes of coding and categorization. The participants were women who work or have worked in the forestry sector in Castilla y León. Results show that gender work barriers are also present in the forestry sector of Castilla y León. Family care and conciliation are important issues pointed by interviewees about why women do not reach decision-making positions. Furthermore, forestry sector is considered masculinized and is influenced by different gender stereotypes. In addition, young people do not know the sector in depth, so stereotypes influence their image. Apart from pointing out the problems regarding gender that the research has shown, participants have proposed solutions so more women can participate in the forestry sector and, in addition, can be part of decision-making processes. Some of these solutions are: research and innovation in the sector makes certain activities easier, not only to make it easier for women and require less physical strength, but for all workers in the sector; Help for conciliation, for training in the sector and for more women to be part of it.

Improving the performance of species distribution models in invasive species at high spatial resolution

Moreno-Amat, E.[1*], Zambrano Suárez, J.D.[2], García Álvarez, S.[3], Solana-Gutiérrez, J.[4], García-Amorena, I.[3]

1 Cambium Research Group EiFAB-iuFOR, Universidad de Valladolid, Soria, Spain
2 National Museum of Natural Sciences, CSIC, Madrid, Spain
3 Department of. Natural Systems and Resources, Universidad Politécnica de Madrid, Madrid, Spain
4 Department of Forest and Environmental Engineering and Management, Universidad Politécnica de Madrid, Madrid, Spain

*Presenting author
elena.moreno@uva.es.

Keywords: Species Distribution Models, Nighttime Lights, Opuntia ficus-indica, Google Colab

Obtaining reliable predictions is essential for decision-making in preventing the impacts of invasive species and ecosystem conservation. In terms of invasive species management, improving spatial predictions translates into a more efficient concentration of resources for preventing and controlling the impacts of the invasion processes. Since many invasive species have expanded globally, typically in these studies, a coarser spatial resolution of 2.5 arcmin (5km) is used, which hampers our ability to capture topographic heterogeneity and could lead to the overprediction of suitable areas. However, we still lack information on the spatial transferability of invasive species at a fine spatial resolution especially for those broadly distributed by humans, as is the case of Opuntia ficus-indica (L.) Mill.

In this study, we deepen the knowledge of the niche of Opuntia ficus-indica and evaluate the effect of including nighttime lights map as a proxy for human presence. As humans are the main drivers of the distribution of this species, including this variable would result in obtaining more robust and reliable predictions for this species.

We ran Species Distribution Models (SDM) with Random Forest and XGBoost algorithm for Opuntia ficus-indica with presence data from GBIF (Global Biodiversity Information Facility) under current climatic conditions. We obtained the global species distribution models at 30sec (1km) resolution using the online service Google Colab Pro Plus, proposed as a possible solution to the lack of computational resources for modelling at this spatial resolution.

Isolation and loading of outer membrane vesicles of Gram-positive and Gram-negative bacteria for dsRNA delivery in control via SIGS of plant diseases

Sandra Mosquera*[1,2], Irene Teresa Bocos Asenjo, Huma Amin, Julio Javier Diez Casero, Jonatan Niño Sánchez

1 Department of Plant Production and Forest Resources, University of Valladolid, Spain.
2 iuFORSustainable Forest Management Research Institute, University of Valladolid–INIA, Spain

*Presenting author
sandra.mosquera@uva.es

SIGS is a plant protection strategy in which dsRNAs are applied to plants to induce gene silencing in pathogenic organisms, limiting their proliferation and disease development. Despite multiple examples showing its effectiveness for controlling plant pathogens and pests, the instability of RNA molecules and their reduced uptake by the targeted organism still need to be addressed before using this technology. Nanocarriers, including outer membrane vesicles (OMV), help to overcome both challenges as they improve the pathogen uptake and protect the dsRNA from nucleases and harsh environmental conditions. However, the isolation and loading of OMV are challenging since they require extensive protocols that can lead to variable results and low yields. Several factors might influence the outcomes of such protocols, including the OMV origin. Here, we evaluated whether using OMV originating from Gram-negative and Gram-positive bacteria can lead to different results regarding the number of isolated OMVs and dsRNA loaded into them. Then, we used the dsRNA-loaded OMVs of these bacteria, using dsRNA specific to genes relevant to the forest pathogens Phytophthora cinnamomi and Fusarium circinatum, to assess whether the precedence of OMVs also translated to different levels of gene silencing in the targeted organism. Our work shows how selecting proper isolation and loading protocols, depending on the OMV origin, is relevant for the efficacy of the silencing and must be considered for the control via SIGS of plant pathogens.

Characterization and Process Optimization of Khat Waste Based Biochar Using Response Surface Methodology

(Muleta, A)[1*]. , (Hailu, A) [2] (Worku, Z) [2] (Angasa, K) 3 (Tessema, I) [3]

1 Instituto de Ciencias Forestales (ICIFOR, INIA-CSIC). Madrid, Spain;
2 Sustainable Forest Management Research Institute, University of Valladolid (Unidad Asociada al CSIC).;
3 EiFABiuFOR, University of Valladolid. Spain

*Presenting author
birhanuabdi2020@gmail.com

Keywords: Biochar, Khat waste, Optimization, Pyrolysis conditions, RSM

This study investigates the potential use of Khat waste for biochar production as resource recycling option. The research focus on characterization Khat waste(KW) and Khat waste driven Biochar(KB), optimizing the KB production process towards high-yield and desirable biochar characteristics. Response Surface Methodology(RSM) with Central-Composite Design was used for the determination of optimum production conditions considering pyrolysis temperature(PT), residence time(RT), and particle size(PS). The KW and KB were characterized with BET, SEM, FTIR, XRD, and proximate analysis. The biochar Yield, pH, fixed carbon content(FC), and ash content (AC) were adopted as the measurement parameters of biochar quality. The optimal pyrolysis conditions were identified as 390 °C PT, 44 minutes RT and 0.7mm PS associated with desirable biochar properties adopting yield of 45.12 %, pH of 8.96, with an FC of 60.08%, and AC of 10.55%. The study has indicated finding the significant effects of the aforementioned production parameters on biochar properties with pyrolysis temperature being the most influential factor. The research indicated that KW holds significant potential for biochar production demonstrating remarkable quality suitable for soil amendment. It also gives an insight to the utilization of KW as a valuable resource in contributing for KW management and sustainable practices in resource utilization.

Study on the selection of Fagus Sylvatica tree cluster in Dajti National Park to convert it into a seed bank

Mustafaj,E [1]

1 Forest Science Faculty, Agricultural University of Tirana

Presenting author
ergimustafaj26@gmail.com

Keywords: evaluation, measurement, collection, study, planting

The first step of the research is evaluation, going in the forest walking around watching and mark the trees that have straight trunk, full crown and look healthier than others to be the mother tree. Second step is measuring the height and the diameter of these trees. Third step is collecting seeds from these trees and putting their coordinates in the map with help of the GPS device. Fourth step is putting the seeds in the lab and monitoring them, how they will react to different weather and soil conditions. After a certain time of monitoring and studying them we have one or more seeds that can withstand weather and soil conditions of the place we want to plant. After finding resistant seeds we go to the mother tree and collect seeds. Fifth step is going to the area we want to plant and start planting.

Habitat ecology of himalayan musk deer in shey-phoksundo national park

Oli Aman[1], Paudel Rishi Ram[2], Ghimire Pramod[2]

1,2 Agricultural and Forestry University, Makwanpur, Nepal

*Presenting author:
amanwoli1@gmail.com

Keywords: Endangered, Sign survey, Ivlev's electivity index, Deforestation, Poaching

Musk Deer (Moschus leucogaster) commonly known as White bellied musk deer or Himalayan musk deer which are found in the Himalayas of Nepal, India, China, Bhutan and Pakistan. Himalayan musk deer is listed as an endangered species in the IUCN Red Book. Shey-Phoskundo National Park (SPNP) in western Nepal is one of the prime habitats for Himalayan musk deer. This study was conducted in the small block of SPNP to investigate the factors affecting habitat selection by musk deer concerning habitat variables such as elevation, slope, and crown cover. A total of 40 transects of 800-1400 m in length where each transect divided into 4 segments were established to perform sign surveys (pellet, resting place, footprint). Habitat correlates were recorded in the circular plot having 10m radii, for each segment with musk deer sign and termed as use plots and also for the segment with zero sign encountered which are termed as available plots. Ivlev's electivity index formula (Ivlev's 1961) is used to analyze the general habitat preference by Himalayan musk deer in the study area whose value ranges from -1.0 to +1.0 where positive value shows higher preference and vice versa. Within this area, Himalayan musk deer have a highly preferred range of elevation between 3500 – 3800m with IV value of 0.75, with a dense crown coverage of above 75% with IV value of 0.65, and a gentle slope of 25 – 50 degrees with IV value of 0.74. Musk deer are found to be using pine (Pinus wallichiana), birch (Betula utilis) and other conifers, Tsuga dumosa and, Picea smithiana forest. And uses Cupressus forest randomly and other habitat variables like aspect, ground cover, substrate, and distance to water have not shown any significant correlation with the presence and absence of musk deer in the study area. Consequently, deforestation of temperate mixed forest, illegal poaching of musk deer for musk pods should be clamped down for the conservation of this endangered species.

Detection of mistletoe (viscum album) in pinus sylvestris l. stand using uav-derived data

Ortiz-Ayuso, J. [1*], Saz, M.A. [2], Hoffrén, R. [2,3], Sancho-Knapik, D. [4, 5]

1EiFAB-iuFOR, Campus Duques de Soria, University of Valladolid, E-42004. Soria, Spain;
2Department of Geography and Land Management. University of Zaragoza. Pedro Cerbuna 12, 50009 Zaragoza, Spain;
3GEOFOREST-IUCA, University of Zaragoza, Pedro Cerbuna 12, 50009 Zaragoza, Spain;
4 Agrifood Research and Technology Centre of Aragón (CITA), Avda. Montañana 930, 50059 Zaragoza, Spain;
5 AgriFood Institute of Aragon (IA2) – IA2 (CITA-University of Zaragoza). Zaragoza, Spain.

*Presenting author
jorge.ortiz@uva.es.

Keywords: hemiparasitic plant, multispectral, LiDAR, drone

The presence of mistletoe in pine stands has expanded in recent decades, currently threating Mediterranean forests. Mistletoe outbreaks can make the host trees more vulnerable to intense droughts, which are expected to increase due to climate change. This work aims to detect the presence of Viscum album and characterize morphological traits linked to infestation levels in Pinus sylvestris by using multispectral and LiDAR UAV-derived data in a forest stand at Teruel province. Firstly, Maximum Likelihood Classification was used to detect Mistletoe presence, differentiating from pine crown, pine branches, ground or shades. In addition, we analysed whether morphological differences, derived from LiDAR data, exist between four infestation levels identified at individual trees through a field campaign. Kruskal-Wallis test and the subsequent Dunn's test were computed to analyze pairs of infection levels. Results show that we were able to detect Mistletoe presence, with over 90% accuracy by combining spectral bands, vegetation indices and LiDAR derived height. Significant differences were found between infestation levels in variables that characterize the variability, dispersion and form of the canopy heights distribution, as well as those related to the density and coverage of the tree canopy. This approach demonstrates their value for detecting and characterizing morphological changes in up to four levels of Mistletoe infestation in Mediterranean Pinus sylvestris forests, lending support to forest management monitoring.

Effect of prescribed burning on the fungal diversity of a forest ecosystem domined by pinus sylvestris in león (spain)

Cipra, J.A.[1], Molina, D. [1], **Perez, H.** [1]

1 University of Valladolid. Palencia, Spain

*Presenting author: Héctor Pérez Hernández
Hector.perez.hernandez@estudiantes.uva.es

Keywords: Fire, Wildfires, Fungus, ectomycorrhizal fungi, forest management

Fire has represented an essential component in the preservation and evolution of forest ecosystems in Spain. In order to manage these environments, prescribed burning is implemented as a preventive measure to mitigate the destructive potential of wildfires. However, despite their benefits, prescribed fires have an impact on the fungal community that resides in these ecosystems. The objective of this research is to determine the effect of prescribed burning on a Pinus sylvestris forest ecosystem in the province of León, Spain, with a specific focus on the diversity and abundance of the fungal community. Six months after prescribed burning, physicochemical and genomic DNA analyzes were conducted on soil samples collected from burned and unburned plots. The results revealed significant modifications in soil composition following prescribed burning with reductions in nitrogen and potassium levels, while pH and phosphorus levels remained stable. In addition, changes in the diversity and abundance of the fungal community were recorded. There was a notable increase in ectomycorrhizal fungi, accompanied by a decrease in saprophytic fungi and in the total diversity of fungi in the studied area. These results contrast with some previous studies in other ecosystems affected by prescribed burning, where different effects were observed in the fungal community. The decrease in saprophytic fungi and the increase in ectomycorrhizal fungi could be related to the resilience of these fungal groups against fire-induced alterations and changes in soil properties.

Translocation of cheetahs to india: an integrative review from socio-ecological system perspective

Sharma, R[1]

1 Wageningen University and Research (Forest and Nature Conservation Policy (FNP) Group). Wageningen, The Netherlands

*Presenting author
Raghav Sharma
raghav.sharma23@estudiantes.uva.es

Keywords: Translocation, reintroduction, introduction, rewilding, socio-ecological systems (SES), Integrative literature (IR)

Ecological restoration is an attempt to return an ecosystem to its historical trajectory. Such historical conditions can be an appropriate starting point for the restoration design. The need to restore degraded ecosystems is urgent because of the decline in biodiversity. It has been declining at an unprecedented rate and threatens the life of future generations of humans and other organisms. Attempts to restore ecosystems to a primary state may not be entirely successful because of contemporary constraints, but proxy trajectories may be facilitated. Conservation translocation is a method of intentional movement and releasing an organism to a place where it existed before it was terminated by anthropogenic factors. This started with the translocation of predators first, as in the case of reintroducing wolves in the Yellowstone National Park in the US. Reintroducing a top-order predator showed that it impacted on successive trophic levels, leading to the recovery of the whole ecosystem. Early cases like these led to the rise of the concept of rewilding, which got popular soon enough not only in the US but in Europe and around the world. Developing countries like India also drew inspiration from these projects. Which led the rise of introducing cheetahs to India. Since India is a densely populated nation, and people are living in and around national parks. Bringing in a new predator to India, means people living close to or inside national parks must be translocated. This has already happened in cases before where people unlawfully are removed from their homeland and resettled somewhere else. It is not only ethically incorrect, but in such cases the conservation projects are hindered in the long term if community support is not there. By using a socio-ecological framework (SES) to find the relation between different stakeholders involved in conservation decision making. The relation between government and people affected by the project is identified. Finally, a comparison of cheetah translocation in India to tiger reintroduction case in Sariska Tiger Reserve, Rajasthan and a cheetah translocation case from Zimbabwe's Matusadona National Park helped in identification of processes and outcome in a case of predator translocation.

Study of predictor variables in the production of carpophores in iberian forests

Cristina, A.[1], **Elena, V. [1*]**, Mihai, T. [2], Sofia, M.[2], Fernando, M.P.[3] , Sergio, M.[4,5], Juan Andres, O.[6], Marta, G.[7], Ana, R.[8],

1 Instituto de Ciencias Forestales (ICIFOR, INIA-CSIC). Madrid, Spain;
2 Departamento de Geografía, University of Alcalá (UAH), Madrid, Spain;
3 Centro de Investigación y Tecnología Agroalimentaria de Aragón (CITA), Zaragoza, Spain;
4 Departamento de Producción Vegetal y Ciencia Forestal, University of Lleida, Lleida, Spain;
5 Centro de Ciencia y Tecnología Forestal de Catalunya (CTFC) - AGROTECNIO, Solsona, Spain;
6 Departamento de Producción Vegetal y Recursos Forestales, University of Valladolid, Palencia, España;
7 Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA-CSIC), Madrid, Spain;
8 Instituto de Ciencias Agrarias (ICA-CSIC), Madrid, Spain

*Presenting author
elena.vegas@inia.csic.es

Keywords: mushroom, mycological inventory, NDVI, Mixed Linear Model, Landsat.

Soil fungi are a source of countless resources and ecosystem functions, hence the great interest in estimating their production. Knowing the variables that affect this resource and identifying their most impactful moments is essential for a comprehensive forest management. Such knowledge is fundamental for adapting resource utilization strategies in response to scenarios of climate change. Based on the standardization of seven mycological inventories carried out in Spain, mixed linear models have been constructed for each group of production-conditioning variables (climate, terrain, and vegetation) as well as for their most significant combination. The average NDVI (Normalized Difference Vegetation Index) of each season, obtained from remotely sensed images from the Landsat program, has been used as an indicator of plant productivity. The results indicate that, overall, the climatic variables with the highest predictive capacity are the mean temperature in September and October, and the total annual precipitations, followed by the NDVI in spring two years earlier. Notice that, at local level, in drier areas, summer precipitation is the most important variable. The model with the highest predictive power corresponds to the overall model, based on climatic variables, which explains 38% of the variability in the data.

Characterization of mdf produced with bolaina (guazuma crinite mart.) wood residues from plantation

Cipra-Rodriguez,J.A.[1*], Gonzales Mora, H.E.[1], Cárdenas-Oscanoa, A.J. [1]

1 Universidad Nacional Agraria La Molina, Facultad de Ciencias Forestales, La Molina, Lima, Perú

*Presenting author
jaciprarodriguez@gmail.com

Keywords: chemi-mechanical pulp, chemical characterization, emulsion polymer isocyanate, fiber morphology, refiner mechanical pulp, technological properties

Bolaina (Guazuma crinita Mart.) is one of the most widely used plant species in the forest plantations in Ucayali, Peru. The production of bolaina wood has increased, consequently the generation of wood residues has also risen. Fortunately, this waste can be used as raw material to manufacture other products. This study aims to produce test boards that can achieve at least, the minimal requirements of European and American standard for medium-density fiberboards (MDF) produced using two types of pulps, namely refiner mechanical pulp (RMP) and chemi-mechanical pulp (CMP), from bolaina wood residue obtained from a 5 to 8-year-old forest plantation and using two types of resins: urea-formaldehyde (UF) and emulsion polymer isocyanate (EPI). To manufacture RMP and CMP, wood residues were pretreated through water and 5% sodium hydroxide (w/w) soaking respectively for 24 h. The fiber morphological parameters of both pulps were analyzed using the Morfi compact equipment. Additionally, woods and pulps were also chemically characterized. The solid contents of the resins were 65% for UF and 23% for EPI diluted with distilled water. Both resins were applied with a dose of 10% (w/w). Four types of MDF were prepared: RMP-UF, CMP-UF, RMP-EPI, and CMP-EPI. The results confirmed the feasibility of preparing MDF with wood residues (5% bark) of bolaina as the raw material. In terms of the contributions of resins, MDF with EPI exhibited better physical and mechanical properties than that manufactured with the UF. The pulps, RMP and CMP, had similar performance in MDF. The RMP-EPI and CMP-EPI boards exhibited the best properties.

Bark beetles' biodiversity (coleoptera: curculionidae: scolytinae) in a local community in oaxaca, méxico

Cruz-Mejía, T.A.[1*], del Val, E. [2],

1 National School of Higher Studies Morelia (ENES UNAM, Morelia); 2 Institute of Ecosystem and Sustainability Research (IIES UNAM, Morelia)

*Presenting author
taan.mejia@gmail.com
Keywords: pest control, forest management, alternative management

Climate change has impacted the historical natural distribution of certain species. Some animal populations have expanded their latitudinal and altitudinal distribution in pine forests due to the high temperatures experienced in recent years. An example of this is the bark beetles of the genus Dendroctonus. Recently, in Mexico, there have been reports of bark beetle outbreaks causing the mortality of billions of pine trees. This has significantly affected species with forest value, wood supply, and wildlife habitat. Considering the economic and ecological importance of this issue, the presence of bark beetles was evaluated in the Santa Catarina Lachatao forest in Oaxaca. The goal was to describe the variation in the diversity of bark beetles (Coleoptera: Curculionidae: Scolytinae) and the factors determining it in sites where an increase in the abundance of these insects has been reported. With this information, the aim was to contribute elements for the forest management of the community. For this research, six sites were selected in the Santa Catarina Lachatao forest where the phytosanitary status of the forest, the structure of pine populations, and the insect community were evaluated. Microclimatic variables, as well as the social and political context of forest management, were also assessed. The results indicate that the Santa Catarina Lachatao forest is in good phytosanitary conditions, and the knowledge and activities of the community around the forest contribute to maintaining the dynamics of this ecosystem despite some bark beetle outbreaks. A wide diversity of beetles of the genus Dendroctonus is reported, represented by six of the seven species distributed in Oaxaca (D. adjunctus, D. frontalis, D. mexicanus, D. approximatus, D. parallelocollis, and D. valens). It is concluded that, based on the abundance reported for Dendroctonus species, they do not meet the criteria for being pests.

Compositional data for natural resources

Bravo Núñez, A[1*]

1 Department of statistics and operations research, University of Valladolid. Palencia, Spain

*Presenting author
andres.bravo@uva.es

Keywords: Natural resources, compositional data, statistics

Compositional data describe parts of a whole. In mathematical terms, a composition is an element of a sample space whose components add up to a constant. Compositional data are ubiquitous, having in ecology a high importance, in different fields such as population genetics (Relative abundance of species, metagenomics), soil texture, etology (wildlife time use) and forest composition (mixtures). The use of traditional statistical methodologies can cause problems such as, confidence intervals covering negative amounts of an element in a mixture or spurious correlations. The usual solution is to transform the data from the original sample space to a Euclidean space before use (e.g using the isometric logratio transform). Applying, these transformations, avoids most of the issues of traditional methods at the cost of making more complex the interpretation of the results.

Modeling the potential of forest stands for mushrooms productivity in ethiopian forests

Kewessa, G.[1,2*], Dejene, T.[1,3], Martín-Pinto, P.[1]

1 Sustainable Forest Management Research Institute, University of Valladolid, Avda. Madrid 44. Palencia 34071, Spain;
2 Department of Forestry, Ambo University, P. O. Box (+251) 19, Ambo, Ethiopia; 3 Ethiopian Forestry Development, P. O. Box 30708 Code 1000, Addis Ababa, Ethiopia

*Presenting author
gonfakewessa.hunde@uva.es

Keywords: Mushrooms, non-timber forest products, natural forest, plantation forest, climate Mushrooms are a fundamental component of forest ecosystem services and the health of terrestrial ecosystems.

Despite the recognized importance of mushrooms in maintaining ecological balance and a substantial supplementary source of income for local communities; the potential productivity of mushrooms in the forest systems of Ethiopia is not well understood. Therefore, we aimed to elucidate the types, potential production, and factors influencing mushroom production in different forest stands in Ethiopia. We established 63 sample plots of 100 m2 . All mature and young mushrooms are harvested weekly during the main rainy season to quantify their abundance and fresh weight. Composite soil samples have been collected from each plot and climate data recorded for each study area are used for yield prediction. In total, 64 mushroom species were collected. The average annual total fresh weight production in plantations (2097.57kg ha–1) was significantly greater than that produced in natural forests (731.18 kg ha–1). Six alternative models were fitted, and three yield categories were also defined as possible responses. Spatial factors like latitude, soil organic matter, and minimum daily temperature were identified as relevant explanatory factors. Understanding the practices and prospects of valuable mushrooms and modeling their fruiting bodies in different forest systems in the tropics could provide additional insight into fungal responses to environmental factors and allow for better decision-making related to forest management in the face of climate change. Furthermore, area-specific information on mushrooms in Ethiopia and the developed prediction models should serve as a basis for further studies in Ethiopian forests to optimize forest management based on non-timber forest products like mushrooms and help to understand what actions are needed to manage the forest landscape level.

Effect of prescribed burning on soil fungal communities in forests dominated by scots pine in león, spain

Cuberos-Sánchez, N[1*], Martin-Pinto, P

1 Sustainable Forest Management Research Institute, University of Valladolid (ETSIA - IuFOR) Palencia, Spain

*Presenting author
*Natalia Cuberos Sánchez
natalia.cuberos22@estudiantes.uva.es

Keywords: Ectomycorrhizal fungi, Forest management, Mycology, Wildfire, Saprotrophic fungi.

The Mediterranean region is renowned for its natural susceptibility to wildfires. In recent years, this risk has intensified due to various factors, including climate change and rural abandonment. Castilla y Leon stands out as one of the most severely impacted areas grappling with rural exodus. This evolving scenario accentuates the urgency of implementing forest management strategies to mitigate the escalating threat of wildfires, with a primary focus on fuel reduction. Although prescribed fires represent an efficient and cost-effective tool for wildfire prevention, they remain a contentious subject in Europe. The aim of this study is to scrutinize the impact of prescribed fires on the soil of Pinus sylvestris forests, particularly emphasizing the recovery of fungal populations. Fungi not only contribute significantly to rural economies but also play a pivotal role in maintaining the equilibrium of forest ecosystems. To assess the short-term effects of prescribed fires on soil fungal communities, we collected soil samples from both burned and unburned plots 12 months post-burning, conducting thorough physicochemical and genomic DNA analyses. Anticipated results suggest that, owing to the controlled intensity of the prescribed fire, the impact on the fungal community is expected to be minimal. Specifically, a reduction in saprotrophic fungi is anticipated, primarily influenced by the reduction in organic matter. Conversely, ectomycorrhizal fungi are expected to benefit from the decrease in saprotrophic fungi.

Short-term effect of historical mega-fire in sierra de la culebra on soil fungal communities

Dante Bertocci[1*], Pablo Martin Pinto

1 Sustainable Forest Management Research Institute, University of Valladolid

*Presenting author
Dante Bertocci
bertoccidante@gmail.com

Keywords: forestry, fire ecology, mycology, biodiversity, Spain

The 2022 Sierra de la Culebra mega-fire was the largest disaster of its nature in the history of Spain. Within 3 days almost 30000 hectares of forests were destroyed and between July and August a total of 65000 ha burned down, eliminating habitats of countless species of flora, fauna, and fungal communities. In this study we analyze how soil fungal communities were affected after one year from the fire occurrence. We compared 3 sites which presented both completely burned areas (test) as well as areas which were completely unaffected by the mega-fire (control). We took samples from both control and test areas and analyzed their composition from a fungal point of view by extracting and finding all DNA associated with soil fungi, as well as from a physio-chemical point of view by defining pH and macronutrient composition (nitrogen, phosphorous, and potassium). Once the results of the analysis are compared by using the Rstudio software, we will be able to determine how the soil fungus communities have been affected by the wildfire.

What consequences would early volume-based selection have on resistance to bursaphelenchus xylophilus, form and wood properties in the galician pinus pinaster breeding program?

Torres-Sánchez, E. [1]*, Prada, E. [1] , Menéndez-Gutiérrez, M. [1] , Acosta, J.J. [2] , Hodge, G.R. [2] , Díaz, R. [1]

1 Centro de Investigación Forestal de Lourizán, Ctra. de Marín, km. 4, 36153 Pontevedra, Spain
2 Camcore, Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, North Carolina, 27695-8008, USA

*Presenting author
esteban.torres.sanchez@outlook.es

Keywords: Maritime pine, pinewood nematode, modulus of elasticity, basic density, genetic correlations

Performing an early selection based on volume in the first-generation breeding population of the Galician Pinus pinaster breeding program is a tool that allows accelerating the breeding process. To perform an efficient early selection, we have focused on determining the optimal age as well as identifying the implications on other interesting traits. This involves identifying those relevant traits, their genetic parameters and the relationships between these traits. Therefore, we have studied traits related to growth, form and wood properties as well as resistance to Bursaphelenchus xylophilus on 116 half-sib families belonging to the breeding program in seven progeny trials planted in Galicia in 2005. We tested these families based on volume at age 7, 12 and 17. Once the optimal age for early selection was determined, traits related to growth, form and wood properties were also evaluated in these trials at that age. Resistance to B. xylophilus had to be assessed in 91 half-sibling families at age 2 under controlled conditions using artificial inoculation experiment. Our findings supported age 12 as an optimal age for early selection for volume. All field-traits exhibited potential for improvement, with wood properties showing high values of heritability. Resistance to B. xylophilus was also susceptible to improvement, showing a moderate heritability. Besides, resistance to B. xylophilus did not correlate with the rest of the traits. This indicated that removing the families most susceptible to B. xylophilus from the Galician breeding program would not negatively affect the performance in volume, form or properties of the wood.

Vegetation structure, composition and biomass of selected mangrove patches of western coast, india

Muhammed Afsal

Keywords: Mangrove ; above-ground biomass ; NDVI ; Importance Value Index

Mangrove forest is one of the ecologically and economically important ecosystems that thrive in brackish water environment of tropical countries. Worldwide mangrove forest cover was declining due to both natural and anthropogenic causes. The aim of this study is to conduct phytosociological studies and change detection in vegetative health and to estimate and compare above ground biomass of selected mangrove patches of Western Coast, India by using remote sensing and ground-based data. In this study spatial and temporal change of mangrove vegetation for the years of 2013 and 2021 were analyzed and NDVI maps were created using Landsat 8 images. A total of 2479 (trees > 10 cm gbh) enumerated. For the enumeration 200 quadrates of 10x10 m size were laid in the study area. From the quadrat data obtained from the field density, frequency, abundance, IVI (Importance Value Index), and diversity indices were calculated. The aboveground biomass (AGB) at individual and site level were calculated using allometric equation. The species diversity was more in Kerala part as evidenced by 11 species of mangroves from six families but Maharashtra part was represented by only two species. The AGB of mangrove Kerala ranged from of 1.53 tons/ha to 95.92 tons/ha and Maharasthra ranged from 21.02 tons/ha To 58.3 tons/ha The average biomass for Kerala is 21.02 tons/ha and that of Maharashtra is 32.33 tons/ha. According to the comparison, Maharashtra's AGB is higher than Kerala's. Using NDVI, we discovered a variation in the area of healthy vegetation in different areas of Kerala and Maharashtra. The findings of this study fill in a knowledge deficiency in a large mangrove ecosystem in India, allowing for more accurate and informed management decisions. As a result, as a climate change mitigation tool, it is critical that mangrove ecosystems be restored and maintained.

Species diversity, above ground biomass assessment of kerala mangrove forest

Athanikkal A 1*, Kalpuzha S[1]

1Forest Ecology Department, KSCSTE-Kerala Forest Research Institute, Peechi, Thrissur, India

*Presenting author
afsalshahid@gmail.com

Keywords: biomass, carbon stock, mangrove forest, Kerala

Mangrove forests, flourishing in the brackish water environments of tropical nations, stand out as ecosystems of great ecological and economic significance. The global coverage of mangrove forests has been diminishing, influenced by a combination of natural factors and human activities. Mangroves stand out as highly carbon-dense tropical ecosystems, actively absorbing carbon dioxide from the atmosphere through photosynthesis. This process holds the potential to alleviate challenges related to "greenhouse gases" and the phenomenon of global warming. In this study, species diversity and the above ground biomass by the mangroves in Kerala mangrove forest were estimated. A total of 321 trees with a diameter greater than 10 centimetres at breast height (dbh) were counted. This enumeration involved the placement of 20 quadrats, each measuring 10x10 meters, in the designated study area. 5 true mangrove species from 4 families were recorded in the sample plots of the study area. Among them, Avicennia officinalis L. from the Acanthaceae family was the abundance of species. Estimated mean above ground biomass at northern Kerala was 48.93 ± 21.33 t ha−1. The study findings indicate that mangroves in Kerala possess significant potential for storing carbon. It is imperative to implement sustainable management practices to uphold and enhance carbon storage. Climate change mitigation strategies should not solely focus on reducing carbon emissions; they should also prioritize the preservation of mangrove ecosystem services as crucial contributors to carbon sinks and sequestration.

Willingness to pay for forest ecosystem in kaghan valley

Afridi* ,Zarak Khan

1 Department of Land, Environment, Agriculture and Forestry, University of Padua, Italy.

*Presenting author
zarakkhan.afridi23@estudiantes.uva.es

Keywords: Non-market value, willingness to pay

Pakistan has forest cover about 4.2 million hectares or 4.8 percent of total land area. These forests provides different services includes provisioning, regulating, cultural and supporting that are must for survival of human beings. But their rate of degradation are high due to use for building, commercial, timber logging, mining, land expansion and for other goals that has high market value but their non-market value are totally disregarded. This research focused on contingent Willingness to pay method to ask respondents about their willingness to pay for restoration of Kaghan valley forests, situated in Northeast of district Mansehra, Khyber Pakhtun Khwa. A survey based questionnaire method is used in this study based on a hypothetical 'tree for tourism" program, and focuses on participant's observation from three categories i.e. locals, tourists and hotel management. 120 Questionnaires were filled out at ratio of 40:40:40 from each categories. According to results, most of participants are willing to pay for forests ecosystem restoration in which locals have high number followed by tourists and hotel management respectively. In addition, large number of respondents were also willing to save pond ecosystem and soil ecosystem which are on their way of depletion. 70% locals, 60% hotel management and 87.5% of tourists has been observed changes in the ecosystem of the valley. 30% locals, 35% hotel management and 22.5% tourists has found these changes positive and vice versa. The willing number of locals was high due to lack of resources in the area and their dependence on forests resources for their living and daily life purposes. In addition, according to respondents, Government agencies are also responsible for cutting these woods in large number, which is leading to shrinking forest cover in Kaghan valley. According to results if Government launches "Tree for tourism" program, 61% respondents would be willing to pay to save forest ecosystem, which would be beneficial for tourism, economy and environment of the valley and in this way forest ecosystem of the valley can be restored.

Instituto Universitario de Investigación iuFOR GESTIÓN FORESTAL SOSTENIBLE
UVa PALENCIA
50 años Escuela Técnica Superior de Ingenierías Agrarias Palencia
MEDfOR Mediterranean Forestry and Natural Resources Management
Co-funded by the Erasmus+ Programme of the European Union
NOS IMPULSA
Junta de Castilla y León
Europa impulsa nuestro crecimiento