Mexico - Finland Webinar
Forest Inventories, Planning and Information

General Description:

The Mexico-Finland Webinar on Forest Inventories, Planning, and Information was a collaborative effort between the Ministry of Agriculture and Forestry of Finland and the National Forestry Commission of Mexico (CONAFOR), supported by the Embassy of Finland in Mexico and the Embassy of Mexico in Finland.

This event was carried out on September 26th, 2023 and it served as a valuable platform for the exchange of knowledge and experiences related to forest information planning and management. It was held within the Memorandum of Understanding between CONAFOR and the Ministry of Agriculture and Forestry of Finland, set for renewal in 2023, and highlighted the longstanding collaboration between Finland and Mexico in sustainable forest resource management.

Finland, globally recognized for its sustainable forestry practices, and Mexico, endowed with vast tropical and temperate forests, as well as arid and semi-arid zones, present distinctive opportunities for sustainable production and biodiversity conservation.

Cutting-edge technologies such as laser scanning and LiDAR, which enhance the accuracy of forest inventories, were presented. Finland shared its expertise in this field, while Mexico highlighted the results of the most recent cycle of the National Forest and Soils Inventory and its innovative approach to promoting the active involvement of local communities in field data collection.

The seminar also delved into Mexico's Forest Emission Reference Level (NREF) for the period 2007-2016 and the REDD+ results achieved for the period 2017-2019, in the context of climate change. Finland outlined its climate policy, aiming for carbon neutrality by 2035 through forest sinks, and emphasized EU regulations aimed at preventing deforestation. Both nations stressed the importance of enhancing forest resilience and ecosystem services to address climate challenges. Noteworthy initiatives such as Mexico's Payment for Environmental Services and Finland's use of bioenergy were discussed, underscoring the vital role of research and monitoring in these efforts.

Both countries also emphasized the significance of comprehensive forest inventories, research, and monitoring for conservation, climate change mitigation, and sustainability.

The event was broadcasted by CONAFOR through WebEx, Facebook, and YouTube platforms. Over 150 participants followed the event in real-time, and the video received over 2,600 views on Facebook the following day, highlighting its widespread impact and reach.

The exchange was structured as follows:

OPENING REMARKS
Message from the Embassy of Finland in Mexico
His Excellency, Ambassador **Ari Mäki**
Message from the Embassy of Mexico in Finland
Deputy Head of Mission, **Estanislao Sánchez Rodríguez**
Message from CONAFOR
General Director, **Luis Meneses Murillo**
Message from SEMARNAT
Coordinator of International Cooperation, **Iris Adriana Jiménez Castillo**
Thoughts from Finland
Forestry Expert, University of Helsinki, **Markku Simula**
Topic: Cooperation perspectives about forest inventories between Mexico and Finland.
FIRST SEGMENT
Finland
Founder and President of Arbonaut, **Tuomo Kauranne**
Topic: Forest Inventory and Operational Forest Intelligence.
Facilitator: General Coordinator of Planning and Information, CONAFOR, **Jorge David Fernández Medina**
SECOND SEGMENT
Finland
Senior Researcher at the Natural Resources Institute Finland (LUKE), **Matti Katila**
Topic: The National Forest Inventory (NFI) and the Multi-source NFI.
Mexico
Deputy Manager of Data Collection Instruments, CONAFOR, **Rubí Angélica Cuenca Lara**
Topic: The National Forest and Soil Inventory (INFyS). Main Results, Challenges, and Prospects.
THIRD SEGMENT
Mexico
Consultant in the area of Monitoring, Reporting, and Verification System at CONAFOR, **Miguel Ángel Muñoz Ruiz**
Topic: Forest Emissions Reference Level and REDD+ Report. Mexico's Results.
Finland
Member of the Intergovernmental Panel on Climate Change, **Markku Kanninen**
Topic: Perspective on the Paris Agreement and Global Climate Objectives.
CLOSING REMARKS
Message from Finland
Research Manager and Chief Scientist, LUKE, **Kari Korhonen**
Message from Mexico
His Excellency, Ambassador of Mexico in Finland, **Enrique Rojo Stein**

Facilitator: General Coordinator of Production and Productivity, CONAFOR, **Pedro Antonio Plateros Gastelum**

Opening Remarks

The event was attended by distinguished guests, including Ari Mäki, Ambassador of Finland in Mexico; Estanislao Sánchez Rodríguez, Deputy Head of the Diplomatic Mission of Mexico in Finland; Luis Meneses Murillo, General Director of CONAFOR; Iris Adriana Jiménez Castillo, Coordinator of International Cooperation at the Mexican Ministry of Environment and Natural Resources; and Markku Simula, renowned forestry expert from the University of Helsinki.

Ambassador Ari Mäki highlighted the longstanding and fruitful collaboration between Finland and Mexico in the field of forestry, spanning several decades. He emphasized the significance of this partnership, which has been instrumental in driving the development and promotion of sustainable practices in the forest sector since the 1960s.

In his address, the Ambassador talked about the richness and diversity of forest resources in both nations. Finland, with over 70% of its territory covered by vast forests, has been a global leader in sustainable forestry for many decades. In contrast, Mexico, with its extensive forests and diverse ecosystems, offers unique opportunities for sustainable wood production and biodiversity conservation.

Ambassador Mäki emphasized that the foundation of this collaboration has been the exchange of knowledge. For more than half a century, Finland and Mexico have collaborated on various initiatives aimed at enhancing forest productivity, market competitiveness, and long-term sustainable forest management. These initiatives include developing capacities related to long-term strategic planning, establishing planning systems for sustainable forest use, improving forest inventory-related activities, enhancing education in the forest sector, implementing technologies to increase forest productivity, and promoting reforestation and conservation programs.

Estanislao Sánchez, Deputy Head of the Mexican Diplomatic Mission in Finland, also spotlighted the historic collaboration between Mexico and Finland in the forest sector, dating back to the 1960s. He acknowledged the innovative treatments implemented in the forests of Durango during that period, marking the collaborative efforts to amplify productivity, competitiveness, and sustainability in long-term forest management. These endeavors have led to collaborative agreements over the years, making the relationship with Finland one of Mexico's most enduring partnerships.

The statement further emphasized recent areas of cooperation, including forest inventories and the creation of programs for climate change mitigation and adaptation. Mexico and Finland, drawing on their unique experiences in forest management, consider virtual seminars as vital platforms for dialogue, knowledge exchange, and collaboration.

The significance of collaborative efforts to comprehend future challenges and opportunities in forest management and devise innovative approaches for sustainable strategies was emphasized. The address underscored that forests are not only vital for the environment but also play an indispensable role in mitigating climate change, preserving biodiversity, and ensuring global well-being.

Sánchez concluded with an emphasis on the shared responsibility to safeguard these vital ecosystems for future generations, expressing confidence that cooperation would remain a cornerstone of the enduring bilateral relationship between Mexico and Finland.

Then, Luis Meneses Murillo, the General Director of CONAFOR, highlighted that this event was held in the framework of the Memorandum of Understanding between CONAFOR and the Ministry of

Agriculture and Forestry of Finland, signed in 2018 and set to be renewed in 2023, representing the mutual interest in continuing this long-term collaboration. He also shared Mexico's vision for building a new ecological civilization that ensures the preservation of the planet and all its life forms, aligning with President Andrés Manuel López Obrador's strategy known as the Mexican Humanism Model.

The pivotal role of forests in constructing this new ecological civilization and the importance of sustainable forest resource management were underscored. In this context, the exchange of experiences and knowledge with Finland in forest inventories, planning, and information was highlighted as an invaluable opportunity to enhance Mexico's capacities. Meneses Murillo mentioned the progress made towards an innovative approach in forest resource management in Mexico, including the implementation of community forest inventories, active involvement of communities in data collection, and strengthening community governance over forest resources.

Iris Adriana Jiménez Castillo, Coordinator of International Cooperation at the Mexican Ministry of Environment and Natural Resources, acknowledged the rich history of forest cooperation between Mexico and Finland, resulting in tangible actions that have advanced the forest sector in both countries. She talked about the crucial role of forest inventories as a fundamental source of information for decision-making, underscoring how this topic has reinforced bilateral collaboration. She also noted that the cooperation had not only benefited both countries but also other nations through the exchange of knowledge and experiences.

Finally, Markku Simula, a Forestry Expert from the University of Helsinki, talked about the relevance of national forest inventories and their significance in decision-making and forest policies. He addressed the importance of field measurements in forest inventories and emphasized the relevance of maintaining the comparability of results over time.

First Segment:

Tuomo Kauranne, the Founder and President of Arbonaut, delivered a presentation on **Forest Inventory and Operational Forest Intelligence** to showcase the vast potential beyond national forest inventories, particularly concerning larger spatial resolutions for operational applications. He highlighted innovative alternatives that overcome the limitations of traditional inventories by leveraging advanced sampling techniques and cutting-edge monitoring tools and technologies.

During his presentation, Kauranne provided an overview of Arbonaut, emphasizing its global track record spanning over 25 years. The institution specializes in Forest Ecosystem Inventories, ecological risk assessment, forest information systems, and forest operations management. Arbonaut utilizes diverse sources of information, starting with on-site inspections conducted by experts through sampling and data collection. In the past, gathering a significant number of samples required substantial human and financial efforts. However, modern techniques such as aerial laser scanning, drones, forest machinery, unmanned aerial systems (UAS), helicopters, airplanes, and satellites have streamlined this process, making it more accessible and cost-effective.

One of the technologies employed by Arbonaut is LiDAR, a crucial tool in inventory modeling. LiDAR involves aircraft flying at an altitude of approximately two kilometers above the ground, emitting laser beams that capture detailed 3D information (Figure 1), including topography and forest structure elements such as biomass, mean diameter at breast height, and height. This structural information integrates into ArboLidar, an algorithmic tool that combines aerial or satellite imagery with field data to generate precise forest maps.

Figure 1. Example of LiDAR Scanning
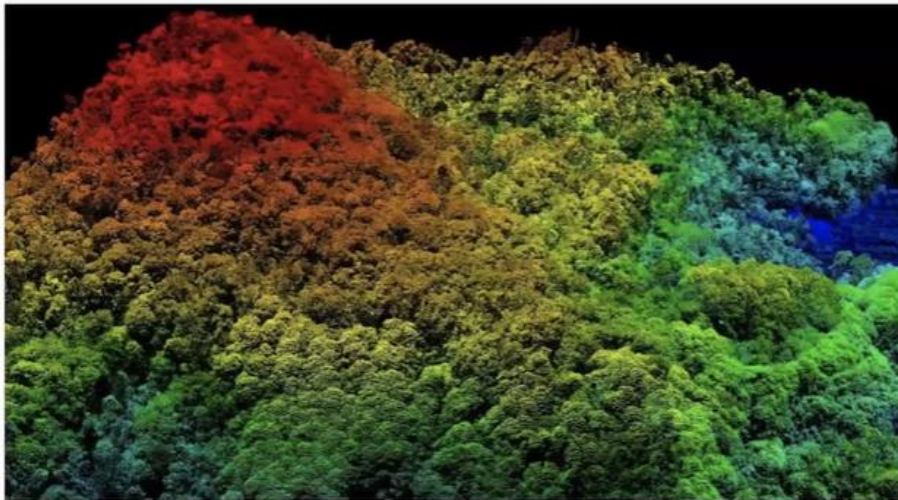
On the other hand, ArboTimber serves as a forestry information search engine, providing data at the stand level and details about forest exploitation. The resulting information is presented at the plantation level, simplifying the planning of activities such as harvesting and planting. Additionally, it offers valuable insights into forest production, logging costs, and wood transportation. This wealth of information instills confidence in buyers and empowers sellers to establish competitive prices.

To conclude, Kauranne shared case examples, including one from northern Sweden, where Arbonaut conducted a comprehensive forest inventory covering the classification of wood at the level of individual trees across 80,000 hectares. This inventory identified various elements such as springs, wetlands, dead trees, and their specific habitats. Importantly, the forest plans also ensure the rights of the indigenous Sami people and their traditional reindeer husbandry.

Second Segment

Matti Katila, senior researcher and specialist in national forest inventories, remote sensing, and sampling methods at LUKE, presented **Finland's NFI and the Multisource NFI.**

The NFI, operational since the 1920s, stands as a cornerstone in evaluating forest conditions and supporting Finland's forest policies. Serving as a statistical base, the NFI provides information for regional and national policy formulation and planning, overseen by the Natural Resources Institute Finland (LUKE). Complementing this, the Forest Management Inventory, managed by the Finnish Forest Centre, is utilized for precise operational forestry and silvicultural decision-making at the stand level. This inventory integrates advanced technologies like LiDAR, aerial, and terrestrial photography for efficient functioning.

The Multisource NFI, an operational system and a freely accessible platform, empowers the development of precise statistical estimates for forest variables in municipalities and small areas. This platform offers maps of forest resources across Finland, harnessing satellite data, NFI sample plots, numerical maps, and Digital Elevation Models (DEM), among other resources.

The materials utilized in Finland's NFI range from accessible tools to medium-resolution satellite data, including Sentinel 2A/B and Landsat 8. Additionally, recent sample plot data and rasterized cartographic data from the National Land Survey's Topographic database are incorporated. Digital elevation models from the National Land Survey, along with large-area forest resource maps derived from field data, are also integral components.

Beyond estimation, a genetic algorithm is employed to optimize image variables and forest scale variables. This algorithm assigns precise weights to all features, ensuring accurate estimation of forest resources. Presently, Finland's multisource national forest inventory encompasses 44 thematic maps and a comprehensive index detailing the data sources used.

In his conclusion, Katila noted the efficacy of the multisource method while highlighting the potential for improvement, especially in image estimates. He underscored the method's utility but emphasized that it cannot replace the significance of field observations.

In the second part of the segment, Rubí Angélica Cuenca Lara, Deputy Manager of Data Collection Instruments at CONAFOR, provided an in-depth overview of **Mexico's National Forestry and Soil Inventory (INFyS)**, outlining its primary outcomes, challenges, and future prospects.

INFyS, established in 2004 and incorporated into the General Law on Sustainable Forest Development (LGDFS), stands as a public policy instrument in the realm of forestry. It offers comprehensive, up-to-date, and periodic information on the location, quantity, characteristics, dynamics, and quality of forest resources and associated elements. This system, deemed of National Interest (LSNIEG - INEGI), serves as the foundation for the National Forest Monitoring System (SNMF - CONAFOR), Forest Zoning, and international reporting obligations (FRA, NDC, REDD+, MRV).

INFyS provides detailed insights into forest composition and structure, encompassing forest indicators, natural regeneration, forest health, soils, environmental impacts, and change dynamics. It determines the area and location of forest lands, describing various types of forest vegetation. Furthermore, it offers quantitative indicators on resources such as wood, biomass, carbon reserves, and species diversity.

The ground sampling methodology, covering 58 vegetation types nationwide, is rooted in the distribution of major forest ecosystems, featuring 26,220 sample plots. INFyS operates on a five-year sampling cycle, with 20% of the plots surveyed annually. Field teams conduct direct measurements and observations in ecosystems, adhering to specific procedures to assess the state of forest resources.

The gathered data serves as the foundation for calculating key indicators such as tree density, canopy cover, aboveground biomass, carbon storage, and wood volume. These statistics are indispensable for characterizing forest resources and are made available on the National Forest Monitoring System (SNMF) website.

Challenges associated with INFyS were highlighted, including the integration of remote sensing data to evaluate areas that are challenging to access, or temporarily inaccessible. Regular monitoring and evaluation of critical indicators such as biomass and carbon, as well as areas under exploitation and those impacted by disturbances like fires, pests, diseases, natural disasters, deforestation, and forest degradation, pose significant challenges. To address these issues, there is a need to strengthen geospatial analysis to provide subnational and local-level information. This involves promoting active involvement from local communities in INFyS field data collection through an innovative community forest monitoring approach.

In this regard, INFyS is actively working on integrating community participation. The specific objectives of this initiative include empowering ejidos and communities for monitoring, enhancing their technical capacities, raising awareness about INFyS information among forest landowners, and providing practical tools for field data collection. Additionally, CONAFOR will oversee training and supervision to ensure data quality and accuracy. This community-focused approach aims not only to enrich INFyS's data but also to engage local communities, fostering a sense of ownership and empowerment in the conservation and management of Mexico's valuable forests.

Third Segment

Miguel Ángel Muñoz Ruiz, a consultant of CONAFOR's Monitoring, Reporting, and Verification System, presented **Mexico's Forest Emissions Reference Level (NREF) for the period 2007-2016.**

The estimates of forest surface loss due to deforestation or degradation serve as the foundation for designing and making decisions during the implementation of activities aimed at reducing emissions from deforestation and forest degradation (REDD+).

Under the United Nations Framework Convention on Climate Change (UNFCCC), developing countries are encouraged to voluntarily engage in activities that decrease emissions and increase carbon sinks in the forest sector. This involvement hinges on four essential elements:

- A National Strategy or Action Plan in the country;
- A reliable and transparent SNMF;
- The development of forest emissions reference levels, and
- The establishment of a safeguards information system.

Mexico has established an integrated forest monitoring system encompassing three vital components:

- INFyS: This component involves the collection and analysis of field data, incorporating indicators such as forest area, volume, growth, density, biomass, carbon, and disturbances.

- Satellite Forest Monitoring System (SAMOF): SAMOF comprises various processes and tools used to produce maps and information about forest cover and its changes over time.

- National Monitoring, Reporting, and Verification System (SNMRV): This system generates crucial information about greenhouse gas emissions resulting from deforestation and forest degradation, as well as absorptions by forest ecosystems. It also includes other mitigation reports.

These systems generate comprehensive reports on climate change mitigation in the forest sector, fulfilling both national and international reporting commitments.

To enhance consistency and reliability in data generation, Mexico has refined its monitoring, reporting, and verification system. During the REDD+ construction period, Mexico submitted two NREFs to the UNFCCC. The final version of the first NREF was published in 2015.

In 2020, Mexico presented a second reference level for the period 2007-2016, utilizing a "stock differences" approach of carbon on forest land based on INFyS results. A systematic grid plot analysis was conducted nationwide using high-resolution satellite images. The reference classification incorporated data from INEGI, considering land use and vegetation types, which were then translated into IPCC classes. Notably, this new NREF included reservoirs in aboveground and belowground biomass, as in the first NREF, but it also incorporated reservoirs in dead wood and organic soil carbon, providing a more comprehensive understanding of Mexico's forest carbon dynamics.

The following data were presented during the session:

- Forest Emissions Reference Level: 20,245,016 tons of CO_2 equivalent
- Emissions reduced due to gross deforestation and absolute forest degradation in Mexico: Total reduced emissions = 18,123,657 tons of CO_2 equivalent
- Average reduced emissions = 6,041,219 tons of CO_2 equivalent
- Total reduced emissions due to gross deforestation = 15,609,439 tons of CO_2 equivalent
- Total reduced emissions due to absolute forest degradation = 2,514,218 tons of CO_2 equivalent.

Following this presentation, Markku Kanninen, Professor Emeritus at the University of Helsinki and Member of the Intergovernmental Panel on Climate Change, presented **insights on the forest sector in the context of the Paris Agreement and global climate objectives**.

His presentation underscored the urgent need for coordinated efforts to fulfill the Paris Agreement's objectives: reducing emissions and enhancing carbon sinks. He emphasized the international strategy toward 2050, which involves emissions reduction, forest restoration, and enhanced forest and wildfire management.

Initially, the Paris Agreement was presented, highlighting its core goals: limiting global warming below 2 degrees Celsius and striving for 1.5 degrees, increasing climate resilience, and redirecting global financial flows to effectively respond to negative impacts. The presentation analyzed current

emissions and global warming projections, emphasizing the critical importance of addressing emissions from agriculture, forestry, and land use (AFOLU), constituting 18% of global CO2 emissions.

The presentation delved into elements of the land sector's 2050 roadmap, including reducing deforestation and degradation, lowering agricultural emissions, minimizing food waste, restoring forests and wetlands, enhancing carbon capture in soil, refining forest management, and promoting carbon capture and storage.

A comparison of greenhouse gas emissions (GHG) in Mexico and Finland from 1990-2020 highlighted the role of forest carbon sinks and emission levels due to land use change in both countries. Finland's climate policy, aligned with the Paris Agreement, aimed for carbon neutrality by 2035, offsetting emissions through forest carbon sinks. The presentation also addressed the EU Regulation on Deforestation, effective from January 1, 2025, ensuring products consumed in the EU do not contribute to deforestation and outlined climate change impacts on forests, emphasizing the need to enhance forest resilience and ecosystem services against challenges like droughts, forest fires, and floods.

Initiatives such as the Mexican Payment for Environmental Services scheme and Finland's significant contribution of bioenergy (89% of total electricity production) from non-fossil sources like biomass, wind, and hydropower were highlighted. Kanninen concluded by stressing the significance of monitoring and research, pivotal elements ensuring sustainability in combating climate change.

Closing remarks

The event concluded with closing remarks from **Kari Korhonen**, Research Manager and Chief Scientist at the Finnish National Resources Institute, and **Enrique Rojo Stein**, Ambassador of Mexico in Finland. They both expressed gratitude to the speakers for their invaluable contributions and to the facilitators for their support in successfully organizing the event. This gathering served as a unique opportunity to deepen the understanding of challenges and opportunities within the realm of forest inventories, planning, and forest information.

In their closing speeches, the pivotal role of NFIs was emphasized, and key themes explored during the seminar were succinctly summarized. These encompassed operational planning, climate change mitigation, and the active involvement of local communities. The significance of cutting-edge technologies, such as laser scanning and satellite imagery, was underscored, highlighting their indispensable status in operational planning and the execution of increasingly precise forest inventories.

Kari Korhonen proposed that if there was mutual interest in developing a collaborative initiative in the field of forest inventories, it could be submitted for consideration to the European Commission for potential funding.

Ambassador Enrique Rojo Stein reaffirmed Mexico's unwavering commitment to ensuring that the bilateral collaboration in the realm of forestry remains one of the most successful chapters in the relationship with Finland. Thanks to this partnership, both nations are making significant progress toward promoting more sustainable practices within their respective territories, and it marks a significant milestone in their joint endeavor for a more equitable and sustainable forest future.