

IAF SYMPOSIUM ON INTEGRATED APPLICATIONS (B5)  
Satellite Applications for Sustainability and Climate (3)

Author: Dr. Valerio Roscani  
Fondazione E. Amaldi, Italy

Dr. Lorenzo Scatena  
Fondazione E. Amaldi, Italy  
Mrs. Eleonora Lombardi  
Fondazione E. Amaldi, Italy

ENABLING CARBON CREDITS INITIATIVES WHILE PRESERVING BIODIVERSITY, WATER  
SECURITY, AND SOIL HEALTH THROUGH EARTH OBSERVATION AND OTHER INNOVATIVE  
TECHNOLOGIES: THE INNO4CFIS PROJECT

**Abstract**

The challenges posed by Earth's Environment and Climate in this century are exceptionally intricate. Embracing sustainability is imperative, and Carbon farming emerges as a strategy to enhance the sustainability of human activities. Employing an agroforestry system that utilises land efficiently and integrates trees and plants can significantly increase carbon sequestration while reducing greenhouse gas emissions from terrestrial ecosystems and thereby aiding in mitigating global climate change. The project "Nature-Based Business Model and Emerging INNOvations to enhance Carbon Farming Initiatives (CFIs) while preserving Biodiversity, Water Security, and Soil Health" (INNO4CFIs), coordinated by E. Amaldi Foundation, aims to promote an innovative Carbon Farm Technology Platform integrating Earth Observation and other innovative technologies with tree planting practices, validated across five different European innovation ecosystems with a minimum of 6000 trees and biological species. Earth Observation data processed by Artificial Intelligence algorithms for forestry and precision agriculture, through hyperspectral, multispectral, and LiDAR aims to analyse, at a centimetre-scale resolution, the relationship between different carbon sequestration techniques and spectral reflectance (400-900nm) on soil and vegetation cover. This analysis will be complemented with satellite images, obtained from open access platforms with resolutions down to 10m and a revisit period of 5 days, along with auxiliary data from nearby meteorological stations, UAV data, carbon storage tracker technologies, and mycelium-based technologies. These inputs will be utilised to develop models simulating carbon sequestration based on land cover that will be validated using unlabelled datasets collected simultaneously. Through this process, the project will create a model able to quantify carbon sequestration capacity while preserving biodiversity, water security and soil health, facilitating the evaluation of innovative practices and implementations. Ultimately, INNO4CFIs aims to create a Carbon Farm Technology Platform for peer-to-peer carbon credits exchange, leveraging Artificial Intelligence and Blockchain, marking an unprecedented milestone in contributing to the Green Deal objectives and at the same time fighting biodiversity loss, deforestation, drought and water scarcity, and soil health loss. The aim of the paper is to analyse the impact that this Platform will have in pursuing the project's objectives to support Carbon Farming activities and initiatives.