Contribution of the plantations of the Lignite Center of Western Macedonia to environmental protection and climate change mitigation - COFORMIT

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Objectives of the project

Estimation of the carbon footprint and environmental footprint of the forest plantations established during the last 30 yrs at restored fields of former lignite mining activity.

- ✓ Determination of C stocks in the 5 carbon ecosystem pools: aboveground, belowground, litter, deadwood and soil.
- ✓ Determination of CO_2 fluxes, based on an eddy covariance tower and other long-term monitoring equipment.

Carbon stocks

Forest plantations inventory and estimation of carbon stocks in above and belowground pools

The biometric traits (height and diameter at breast height - DBH) of restoration plantations with *Robinia pseudacacia* have been measured by applying a systematic sampling plot approach (Fig. a) in order to estimate the distribution of DBH categories (Fig. b). Based on this distribution, and with the use of an allometric equation that will be established, we will calculate the total aboveground biomass of the plantations (Fig. c). Standing and lying deadwood has also been recorded. The coarse root system of selected trees will be excavated for the determination of belowground biomass (Fig. d). The fine root biomass and turnover will be assessed with soil coring and ingrowth cores installation.

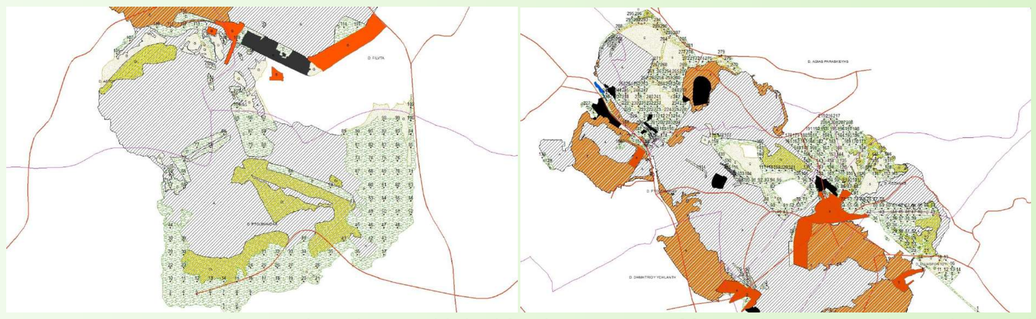

Figure a: A map presenting the sampling plots established for the inventory of forest plantations in the study areas (left: Amyntaio, right: main and south fields of Ptolemaida).

Figure b: Determination of height and DBH – distribution of DBH classes across the sampling plots of the study areas

Figure c. Harvesting of black locust trees for the establishment of an allometric equation between aboveground biomass and DBH.

Figure d. Root excavation and standing biomass of fine roots sampling.

Carbon stocks in litter, forest floor and soil organic matter

36 litter traps (Fig. e) have been established in selected plots of the study areas. Collection of litter and forest floor takes place every two months, in order to estimate the dry biomass and the carbon stock in these pools, as well as the seasonal fluctuation of these pools. Soil coring took place in the same selected plots to determine C stock in soil organic matter.

Figure e. Collection and sample processing from a litter trap and from forest floor.

Carbon fluxes

Real time CO_2 και H_2O fluxes

An eddy flux tower (Fig.1) equipped with a CO_2/H_2O analyser and ultrasound anemometer (Irgason, Campbell Scientific, Fig.2) and a meteorological station, are established in the study area. The data are analysed in situ and are sent telemetrically to a central server.

Figure 1: The eddy tower

Figure 2: The CO_2/H_2O analyser at the top of the tower

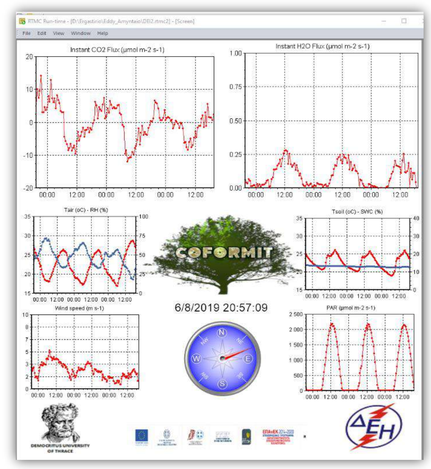

Figure 3: Real time fluxes diagrams

Estimation of vegetation indexes based on satellite images

For this purpose high precision Landsat satellite images are currently used, while images from the European satellite Sentinel will be used in the future. An example of timeseries of pseudo-colored NDVI images is presented for the study area of Amyntaio in Figure 4. Figure 5 shows the timeseries of NDVI values of the entire study areas.

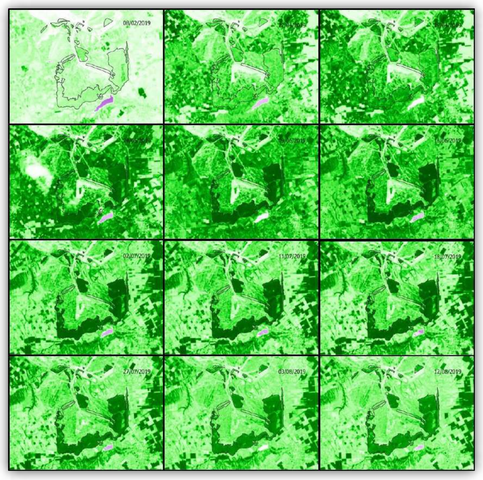

Figure 4: Timeseries of pseudo-colored NDVI images in Amyntaio (2019)

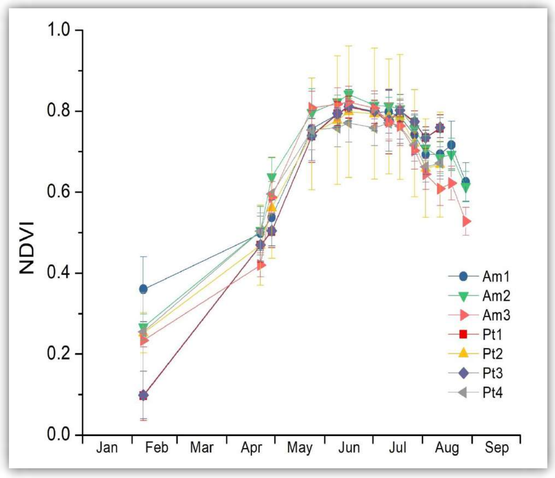

Figure 5: Timeseries of estimated NDVI values for the entire study areas (2019)

Phenology monitoring based on a ditigal PhenoCam camera

Phenology cameras enable the production of timeseries of real images and the calculation of vegetation indexes with better quality and frequency than that of the satellite images. The PhenoCam (Fig.5) established in the study area allows the continuous monitoring of the study area.

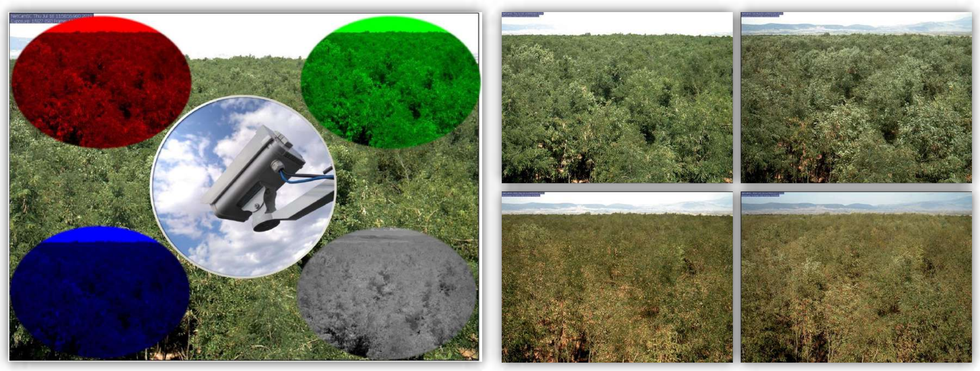

Figure 5: The phenology camera and its outcomes at the study area

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