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OPENEARTH CONFERENCE PROCEEDINGS-ABSTRACTS

Innovative solutions for maintaining and improving soil fertility protecting the environment and mitigating climate change

Marinova Svetla*

*ISSAPP ”N. Pushkarov”, 1080 Sofia, 7 Shosse Bankya str.

Keywords: sludge, composting, decontamination, gypsum

Abstract

Climate change is caused by the release of greenhouse gases into the atmosphere. These gases ape accumulated in the atmosphere, leading to global warming. Research has focused on protecting the environment and limiting the negative effects of climate change. The report addresses issues related to the characterization and evaluation of sewage sludge and the possibilities for their use in agricultural practice as a soil improver, for the rehabilitation of disturbed and poorly productive terrains, in forestry and others. Methods for decontamination of sludge before their utilization have been developed and put into practice. Soil changes have been identified as a result of the use of sludge as a soil improver. By-products of bio-sludge obtained from biogas production as an organic reserve are conducted. New soil improvers are presented, such as industrial gypsum obtained from the desulphurization installations /SOEs/ of Maritza-East 1, composting as an alternative to organic fertilization and environmental protection.

In conclusion, it is noted that in Bulgaria a number of problems with various organic wastes are being worked on in order to find the most efficient and rational technological solutions for their utilization and environmental protection. New technologies limit carbon emissions in the atmosphere and limit negative climate change.

Estimation of the above ground biomass and carbon stock in the restored mines of the Western Macedonia Lignite Center

Spyroglou Gavriil[1]*, Nanos Nikos[2], Fotelli Mariangela[1], Radoglou Kalliopi[3]

1-Forest Research Institute, Hellenic Agricultural Organization DEMETER, Thessaloniki, Greece.
2-Department of Forestry and Natural Environment, Aristotle University of Thessaloniki, Greece.
3-Department of Forestry and Management of Environment and Natural Resources, Democritus University of Thrace, N. Orestiada, Greece.

Keywords: climate change mitigation, forest restoration, forest biomass estimation, geostatistics, kriging regression

Abstract

Forest plantations have immense potential to store carbon, playing a substantial role in climate change mitigation. The assimilated carbon is stored in the above and below ground parts of the trees, in dead wood, in litter and in soil. The Lignite Center of Western Macedonia having the obligation to rehabilitate the restored areas after the end of the mining activity, started to create tree plantations in the 80s. Today some of these plantations are almost forty years old and occupy more than 2,000 ha in total. The dominant planted species is the black locust (*Robinia pseudoacacia* L.), a fast-growing pioneer species, covering 95% of the planted area. Other planted species are *Spartium junceum*, and *Cupresus arizonica*, covering 2.45% and 1.44%, respectively.

The aim of this study is the estimation of the above ground biomass and the carbon stock and its distribution across the planted areas of the Lignite Center of Western Macedonia. 215 sample plots of 100 m^{-2} each were set up through systematic sampling in a grid dimension of 500 x 500 m. In each sample plot the tree species, breast height diameter (cm), tree height and the height to the base of live crown (m) were tallied. The standing and laying dead wood were also recorded. The above ground biomass was estimated using an exponential allometric model for black locust of the form $M=a \cdot dbh^b$ and its distribution along the planted areas was calculated using geostatistics and kriging regression. The results have shown that in the Amyntaio mine field the above ground biomass ranges from 20,1 to 90,2 tn ha^{-1} with a mean value of 55.3 tn ha^{-1} or 36,9 to 165,2 tn ha^{-1} in terms of CO_2 equivalent. In the Ptolemaida mine field from 11,6 to 75,8 tn ha^{-1} with a mean value of 36.3 tn ha^{-1} or 21,2 to 138,8 tn ha^{-1} in terms of CO_2 equivalent. The biomass distribution in Ptolemaida mine field seems to show a spacial orientation (anisotropy) from Southeast to Northwest. This might be due to the course and direction of the excavations and their corresponding plantation restorations. This spatial anisotropy occurs to a lesser extent in the Amyntaio mine field to west and north where these parts are close to the active mining areas and have therefore been recently restored by planting. The black locust shows a remarkable ability to survive and grow on disturbed sites such as the restored mines of the Lignite Center of Western Macedonia. It is very competitive compared to other planted species and has created the necessary forest environment for the natural regeneration of other, more shade and soil demanding species such as oaks and maples.

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