Geophysical Research Abstracts
Vol. 16, EGU2014-2269, 2014
EGU General Assembly 2014

Comparison of energetic productivity in differently renaturalized arable land

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Soil renaturalization or ecological recovery has been studied from local to global scales. On a global scale – it's one of the ways of carbon fixation, preservation of natural diversity, locally – renaturalization processes help to solve problems of damaged (eroded and polluted) and infertile soils areas. Efficient land use can improve soil structure and therefore be attractive as a renewable energy resource that can encourage thermal energy, fuel production and installation of new technologies. Soil renaturalization is very important not only in that it helps to decrease the impact on the environment, but it can produce higher energy value of biomass at a lower cost.
The aim of this study is to evaluate and compare different renaturalization methods through analyzing biomass yields and chemical composition (pine afforested, fallowing, manage grassland – Alfalfa and cropland) carried out during almost two decades (1995 – 2012).
The four stationary experimental sites were set up in 1995 in Vilnius district, Lithuania. Common sandy soils prevail in the region, and the agronomic value of soil is very low. All sites were arranged in one row (the divided sides is 400 m2 each). Managed grassland and cropland areas were subdivided into fertilized and unfertilized subplots. The size of the subdivided plots was 200 m2 each.
Gross productions (straw, grain, hay, pine biomass) was recalculated into total energy amount (in the calculation-swere used K. Neringa and R. Siman equation) expressed in MJ and the site's productivity data compared. Gross productions total energy amount of pine afforestration was recalculated into trees volume using diameter (DBH), height and density of pines.
Observed data suggest that the difference between fertilized and unfertilized plots in the cropland site was on average 1.62 times and made up an average of 20 339 MJ y-1 ha-1.
The grassland site was characterized by higher productivity and a bigger difference of total energy between fertilized and unfertilized subplots. The difference was 1.69 times and made up 24 483 MJ y-1 ha-1.
In the site of the fallowing land, energy production makes up 24 553 MJ y-1 ha-1. This site was significantly less effective in terms of energy production, comparing it to fertilized and unfertilized cropland as well as fertilized and unfertilized grassland. Throughout this period fallowing land accumulated 441 962 MJ total energy, this is the lowest energy production site and 29% lower than accumulated total energy (571 282 MJ) in unfertilized cropland.
The comparison of the total productivity of the entire experimental period showed that the largest amount of energy was accumulated in the pine afforested site (160%), compared to energy accumulation in fertilized cropland or the so-called control site (100%). A Significant amount of energy (1 193 007 MJ) was accumulated in fertilized grassland (130%) compared to energy accumulation in the control site. Productivity of unfertilized grassland (90%) is almost equal to control treatment.
Summarizing generalized data through 18 year experimental period, concludes that the transformation of cropland into various other phytocenoses can be assessed differently depending on use of the production (biomass) – for food industry, for animal feed and bioenergy.