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Crop and agrotechnology influence on CO_2 emission in case of representative agrolandscapes of Moscow region, RF

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Agroecosystems have a very important role in the regional balance of greenhouse gases (GHG). However, the volume of existing data on the different crops and agrotechnologies influence on the GHG emission sharply varies. The European territory of Russia (ETR) is one of regions with strong deficit of this information. At the same time ETR is characterized by high heterogeneity of soil cover patterns, land-use technologies and land agroecological quality.

Our research has been done in the fields of Precision farming experiment of Russian Timiryazev State Agrarian University (RTSAU) that soil cover and landscape patterns are typical for Moscow region of RF. The investigated fields include four 1-ha plots with winter wheat and potatoes with versions of traditional tillage and no-till. Each key plot comprises the representative sites for analysis the autotrophic and heterotrophic respiration, and control ones. Carbon dioxide fluxes have been weekly measured in June - September 2012, by the portable infrared system gas analyzer LI-COR LI-6400XT.

The carried out research has shown the crop strong influence on the soil CO_2 emission. In case of field with winter wheat in June - August it was in 1.5-2.5 times higher (2,93 μmol m-2 s-1) than in potatoes one. The maximum difference has been fixed at the first half of August after the wheat harvest. July is characterize by gradual decrease soil carbon dioxide emission from 1.56 μmol m-2 s-1 to 1.06 μmol m-2 s-1.

Comparative analysis of the model sites with differentiation of the autotrophic and heterotrophic respiration showed the absolute dominance of microorganism contribution: 1.56 μmol m-2 s-1 (76.3% of the total respiration). It is especially important that no-till sites have CO_2 "microbial" emission in 24.8% less the traditional tillage ones.

The carried out in June-September comparative analysis of investigated sites with forest control ones has shown the following set with increasing soil CO_2 emission: “winter wheat no-till” (3.11 μmol m-2 s-1) > “winter wheat tillage” (2.77 μmol m-2 s-1) > “forest ecosystem” (2.40 μmol m-2 s-1) > “potatoes no-till” (1.19 μmol m-2 s-1) > “potatoes tillage” (1,13 μmol m-2 s-1).

Marked in this research the essential influence of crop and agrotechnology on CO_2 emission has good relation with the long-term monitoring results on spatial-temporal variability of organic carbon pools in the investigated soils and should be considered into attention in practice of every-day design of environmentally friendly agricultural land-use systems in Moscow region, RF.

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