

Carbon balance at representative agroecosystems of Central European Russia with different crops assessed by eddy covariance method

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Despite the fact that in Russia cropland's soils carbon loses 9 times higher than forest's soils ones (Stolbovoi, 2002), agroecosystems were not given sufficient attention and most of the papers are devoted to forestry and natural ecosystems.

Carbon balance was calculated at the Precision Farming Experimental Fields of the Russian Timiryazev State Agricultural University, Moscow, Russia, for two agroecosystems with different crops from the same crop rotation studied for 2 years. The experimental site has a temperate and continental climate and situated in south taiga zone with Arable Sod-Podzoluvisols (Albeluvisols Umbric).

Vertical fluxes of carbon dioxide were measured with eddy covariance technique, statistical method to measure and calculate turbulent fluxes within atmospheric boundary layers (Burba, 2013).

Crop rotation included potato, winter wheat, barley and vetch and oat mix. Two fields of the same crop rotation were studied in 2013-2014. One of the fields (A) was used in 2013 for barley planting (*Hordeum vulgare* L.). The field B was in 2013 used for planting together vetch (*Vicia sativa* L.) and oats (*Avena sativa* L.).

Inversely oats and vetch grass mixt was sown in 2014 on field A. Winter wheat was sown on field A in the very beginning of September. On the second field (B) in 2014 winter wheat occurred from under the snow in the phase of tillering, after harvesting it in mid of July, white mustard (*Sinapis alba*) was sown for green manure.

Carbon uptake (NEE negative values) was registered only for the field with winter wheat and white mustard; perhaps because the two crops were cultivated on the field within one growing season. Three other cases showed CO₂ emission. Great difference in 82 g C m⁻² per year in NEE between two fields with vetch and oat mix was related to higher difference in grass yields. NEE for barley field was positive during the whole year; considering only the growing season, NEE for barley was 100 g C m⁻² lower and was negative.

Closed balance for whole years showed that carbon losses were observed for all studied agroecosystems. It was minimal for field with winter wheat, with mustard, used as green manure, and it was maximal for field with vetch and oat mix.

Values about 200-250 g C m⁻² per year may be considered as estimated values for the total carbon loss for agroecosystems with grain crops and grass mixt on sod-podzolic soils. The use of mustard as a green manure may reduce this value by three-quarters.