

Assessment of croplands dynamics in the river basins of the different landscape zones of the Russian plain for the last 30 years as factor of soil erosion rate trend

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After the collapse of the USSR in the period of transition from a state-controlled economy to a market-driven economy, there have been significant changes in land use. Information about changes in the structure of agricultural land is very important to assess the ecological condition of the territories.

In this study was evaluated the changes of croplands in areas of the European territory of Russia located in different climate, landscape and geomorphological conditions.

Mapping of the croplands in the territory of 9 river basins for the two time slices (the middle of the 1980s, and the present-day period 2013-2015) was carried out by visual interpretation of multi-seasonal images Landsat 5 and Landsat 8. We are using mapping technique realized in the CORINE Land Cover 2000 project (CLC2000), adjusted for the regional features and purposes of our study. Using vector layers, obtained as a result of digitization, the areas of croplands in the analyzed periods have been calculated and changes occurred in 30 years was evaluated. Croplands is the dominant category of land use in almost all regions, and it is in the range of 40-65% in 2015.

The decrease of croplands area was established for the all studied river basins. The largest decrease of croplands (37.7%) is observed in the Izh river basin located in the forest landscape zone. Significantly smaller reduction of croplands (10%) observed in the basins belonging to the forest-steppe landscape zone. In the basins, located in the steppe zone of the reduction of croplands is in the range 10-20%.

Land use changes are a powerful factor determining the rate of erosion and sedimentation and some other exogenic processes. However, for the evaluation of these rates is important to determine whether the decrease of cropland due to the abandonment the more steep slope, which are less suitable for traditional cultivation. For this aim, steepness of slopes was analyzed for the each river basin. Slope rasters for the studied river basins were calculated using 30m SRTM DEM. Pixels belonging to areas of abandoned croplands have been extracted, and a statistical analysis of the corresponding values of slopes was carried out.

The average values of slope on abandoned croplands in all basins do not exceed 2.1 degrees, and 80 to 90% of the pixels have a slope value less than 3 degrees. Thus, we can conclude that the croplands abandonment was not due to prevention of soil losses from erosion prone areas. It is more likely that cropland abandonment is explained by socio-economic reasons. So it is possible to conclude that land abandonment within the different landscape zones of the Russian Plain led to reduction of total soil losses on cultivated lands, but it isn't influenced on mean annual soil erosion rates.