



The trajectories and determinants of agricultural land-use change over the last two decades in post-Soviet European Russia

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The transition from state-command to market-driven economies in Russia in 1991 triggered fundamental political, economic and institutional changes, which in turn drastically affected agricultural land use. Large tracks of agricultural lands became abandoned, particularly during the first decade of the transition. However, it is not clear how the changing socio-economic and political conditions in post-Soviet Russia changed abandonment trajectories over the last two decades. We analyzed agricultural land-use change, both agricultural land abandonment and recultivation of once abandoned agricultural lands, with multitemporal Landsat TM/ETM+ images for 1990-2000-2009 to study Ryazan province in the forest-steppe transition zone and Rostov province in the steppe zone of European Russia. We classified agricultural land use change over 1990-2000-2009 with Support Vector Machines and assessed classification accuracies with independently of training datasets collected validation data. Overall accuracies were over 80%. We summarized the rates of agricultural land use change, and quantified the spatial determinants of these land use change processes using logistic regressions. Results indicated that 28% of agricultural land managed in 1990 were abandoned by the year 2000 in Ryazan province. From 2000 to 2009, agricultural land abandonment increased by another half what was abandoned from 1990 to 2000 and comprised 42% of abandoned agricultural that was managed in 1990 while only 1.4% of previously abandoned agricultural land was recultivated. In other words, agricultural abandonment was a continuous and permanent land use change in Ryazan province. In Rostov province, abandonment rates were substantially lower at nearly 10% of the agricultural land managed in 1990 and only minor additional abandonment from 2000 to 2009. The pattern of agricultural land abandonment in Ryazan province was largely determined by a mix of socio-economic and environmental factors (e.g. increased distances from settlements, areas with low agricultural productivities-low grain yields and lower soil qualities), while in Rostov province mainly marginal environmental factors alone explained abandonment patterns. Interestingly, in both provinces agricultural fields abandoned after 2000 were in close proximity to fields that were abandoned between 1990 and 2000. While agricultural land abandonment has slowed down recently, it remains an important land use issue, because these abandoned lands may provide an opportunity for biodiversity conservation, but also because of the negative socio-economic implications of land abandonment, and the strong evidence that abandonment at least in north and temperate Russia is permanent.