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Effects of Applied Land Use Strategies on Farmland Soils in the Southwestern Siberian Kulunda-Steppe

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The Kulunda steppe in southwestern Siberia is one of the most intensely used agricultural regions in the world. The study area of the KULUNDA project is the Kulunda steppe, which is a part of the conversion region created during the so called “virgin land campaign” in the soviet era. Nowadays it is characterized by widespread soil degradation. Despite the fact that agriculture is the basis of existence, land use practice is maladjusted to the local conditions. The widespread soil degradation and accordingly the decreased soil humus content have negative effects on crop yields in this region. With respect to climate change, the current study analyses the cause effect relationship between land use practice and soil properties. In particular, different methods of soil cultivation will be tested and for each of the cases the soil humus content, soil water, soil solute balance will be measured and compared. In addition, the possibilities of soil carbon sequestration capacity will be analyzed. Furthermore, the study aims to achieve properly adapted sustainable cropping systems to stabilize the yields and to increase the productivity of plant production per spatial unit in this high vulnerable dry farming region. In 2012 the long term field trials started at three test farms in different steppe biomes, containing different soil types from chernozems to kastanozems. Each of them is characterized by a negative water balance. Successfully running cropping models, such as crop rotation, tilling intensity, plant protection and nutrition strategies from south Canadian steppe regions were adapted to regional agronomic needs. The traditional Russian cultivation system will be compared with two modern systems, including no-tillage methods on specially randomized test plots. Additionally, these plots are equipped with soil moisture monitoring systems to analyze the soil water content in different depths under the different cropping methods. The expected results will not only deepen the understanding of the impact of agricultural land use practice on field scale, but also largely contribute to the research on sustainable land management, rural development and climate change and connect applied science with capacity building for local stakeholders.