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“Filling gaps and removing traps
for sustainable resource management”

Innovations for Sustainable Agricultural Resource Utilisation and Climate Adaption in Dry Steppes of Kazakhstan and Southwest Siberia (ReKKS)

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Abstract

While the intensive agricultural use of temperate grasslands plays a pivotal role for the global food supply, the overexploitation of these steppe soils causes severe economic and ecological consequences. The project ReKKS is focused on the dry steppes of Kazakhstan and southwestern Siberia, which have been put under widespread agricultural use in the mid-20th century. The applied land use techniques were not adapted to the specific requirements of these marginal lands, which resulted in significant soil degradation. The soil organic matter content decreased considerably, so that the steppe soils became a source instead of a sink of atmospheric carbon, with repercussions for the global climate. Furthermore, the loss of macro nutrients, which are contained in soil organic matter, leads to a significant reduction in soil fertility and thus the agricultural yield. In order to address these negative developments, the aim of the ReKKS project is develop innovative, sustainable, and climate-adapted agricultural concepts in close cooperation between German, Kazakh, and Russian companies and scientists, together with local partners. The project is focused on the reduction of erosion, the improvement of water balance, the increase in carbon sequestration as well as the nutrient and herbicide use efficiency. Moreover, on severely degraded soils, steppe restoration treatments are investigated. In particular, ReKKS quantifies soil carbon and nutrient stocks as affected by land use techniques and develops agricultural machinery for ultra-shallow tilling as well as the targeted application of liquid fertilisers and herbicides. In field experiments, specifically designed instruments such as weighing lysimeters are deployed. Hence, ReKKS will deliver land use systems specifically adapted to the dry steppes of Kazakhstan and southwestern Siberia, which will simultaneously limit climate change and contribute to food safety on a global scale.

Keywords: Carbon sequestration, herbicides, land use techniques, liquid fertilisers, soil degradation, steppe restoration, steppe soils