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Assessment of soil salinity in an agro-ecosystem under climate change in Western Siberia

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Soil salinization, which can be a serious environmental problem, poses critical challenges for the management of agricultural and the status of natural areas. Strongly influenced by climate, topography, soil and land-use it requires sound adaptation strategies in order to cope with recent and future ecological changes and landscape transformation.

Our studies on soil salinity were carried out in the Loktinka river basin with a catchment area of 334 km^2. The Loktinka is a slow moving, meandering lowland river, passing along the south-eastern part of an agricultural zone of Tyumen region, nearby the town of Ishim. The Loktinka river, with 25 km in length, is a left tributary of the River Ishim which originates in a relatively small wetland, flows east and terminates in Lake Mergen.

The area is representative for the southern part of the forest steppe zone with less favourable conditions for agriculture due to low soil qualities and salinization problems. The area is highly influenced by climate change. Reduced rainfall and increased evapotranspiration can intensify the salinity problem in the catchment and thus, there is a strong need for present and future research.

A field program was designed in order to assess the current situation of soils within the catchment area in terms of salinity. Soil profiles and soil texture were identified and soil electrical conductivity as well as pH were measured. The electrical conductivity of horizons ranged from 78 to 1742 μScm^{-1}. The soils were alkaline in reaction (pH 7.1 to 9.47), irrespective of depth. The texture was mainly clay loam.

For the prediction of long-term hydro-salinity under climate change, the agro-hydro-salinity model SaltMod (Oosterbaan et al., 2008) was chosen. The model is based on seasonal water balances of agricultural lands for prediction of future trends made on a seasonal basis.

Salinity in the soils column is simulated with SaltMod on different soil type and crop combinations.