



# ReKKS – Agricultural climate adaptation in the dry steppes of Kazakhstan

## Client II – International partnerships for sustainable innovation

**In the dry steppe regions of Kazakhstan innovations for the sustainable use of agricultural resources are urgently needed to solve problems caused by soil degradation, climate change, and changes to land use. In the “ReKKS” project, German and Kazakh partners work closely with local partners to develop innovative, sustainable and climate-friendly agricultural concepts and procedures for reducing soil erosion, improving water, nutrient and carbon balances, and recultivating the steppe on degraded soils.**

### Challenges of the dry steppe

The soils of the more humid steppe zones are primary areas for growing grain, particularly wheat. Since the 1950s, the steppes of northern Kazakhstan have seen intense agricultural cultivation, some parts of which border areas where farming is not possible due to a lack of precipitation. In addition to the lack of water, the local soils are also characterized by poor nutrient levels, humus losses, and related soil degradation.

Given that there is a limited amount of soil that can be used as the main resource for food production, the “ReKKS” project has adopted the philosophy that the use of land must be sensibly intensified in a manner that is both environmentally friendly and sustainable. In this context, technical intensification means increasing cultivation while using farming methods that conserve the soil and increase nutrient efficiency. With this goal in mind, the project works to address the challenging farming situation in northern Kazakhstan. The overarching objective is to develop tailor-made agricultural technology and agricultural concepts. Specifically, “ReKKS” develops agricultural machinery for ultra-shallow tillage and the targeted use of herbicides and liquid fertilizers. In addition to this, the project also develops concepts for restoring degraded areas. “ReKKS” conducts accompanying scientific research on experimental areas and farms to quantify the effects of different land and soil management processes on soil erosion, the water balance, carbon balance and nitrogen cycle, and the efficiency of use. The project uses some specially developed instruments (for instance, weighing lysimeters) for this purpose.

The project partners expect to obtain comprehensive insights into the mechanisms and control parameters for the ecologically and economically sustainable agricultural

use of the dry steppes. The results of this project will contribute towards achieving higher agricultural yields while at the same time increasing yield security and improving the competitiveness of the companies involved – not only in the Central Asian markets but worldwide.



Use of liquid fertilization methods in the project area.

### Reconciling ecology and economy

By combining improvements in soil management and fertilization with increases to soil water retention, it is possible to increase soil humus stocks. This can restore the important function of steppe soils as long-term carbon dioxide sinks. The increase in soil humus will also improve soil fertility, which will, in turn, lead to a significant increase in crop yields. The project will also develop techniques for reducing herbicide applications, which will help to minimize the associated environmental damage and protect the health of the local population.

Establishing climate-adapted agricultural techniques  
Overall, it is expected that the implementation of the

project results for establishing innovative, climate-adapted agricultural techniques will help to improve the livelihood of the people living in the steppe areas. The potential significance of the results will extend far beyond Central Asian countries. In Central Europe, in particular, drought during the growing season is becoming an increasing problem, and the future legal restrictions on herbicide application will also increase the demand for ultra-flat tillage and extremely precise methods of herbicide application.



Direct sowing protects the soil and results in economic success.

Furthermore, the “ReKKS” project aims to develop land use systems that will counteract further global heating, while at the same time helping to improve food security. The close relationship between climate change and land-use was emphasized extremely clearly in the Special Report on Climate Change and Land published by the Intergovernmental Panel on Climate Change in 2019. Historically, soil cultivation has led to a rise in the concentration of CO<sub>2</sub> in the atmosphere, and improper land management still represents a major source of CO<sub>2</sub> emissions today. At the same time, climate change is causing accelerated soil degradation in many areas, which results in more CO<sub>2</sub> being released and leads to lower yields. Ensuring sustainable food production without destroying natural resources and further exacerbating climate change is, therefore, one of the biggest challenges currently facing humanity.

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Client II – International partnerships for sustainable innovations

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