



SUSTAINABLE LAND MANAGEMENT

NEW LIFE FOR THE STEPPE





[Source: M. Frühauf]

Aerial view of the agricultural land and wind protection strips in the Virgin Lands region west of Barnaul.

- **The Kulunda Steppe in the Soviet Union was once highly valued for arable farming. With the collapse of the multinational state in the 1990s, large areas of the land fell into disuse. This situation has to be changed. A joint German-Russian research project seeks to ensure that land-use change develops as sustainably as possible.**

The Kulunda Steppe in the Altai region of southwest Siberia was once regarded as one of the granaries from which the Soviet Union hoped to provide enough food for its population. In the so-called Virgin Lands Campaign of the 1950s and 60s, Soviet leader Nikita Khrushchev had vast amount of steppe and grassland area converted into farmland, predominately for cereal cultivation. After the collapse of the Soviet Union at the beginning of the 1990s, large areas of this farmland were left fallow. 20 years after the transition, the region is still undergoing changes. »After the independence of the Ukraine and Kazakhstan«, says Professor of Geography Manfred Frühauf from Halle-Wittenberg University, »Russia has had to rely on its cereal producing regions to ensure the food supply. The Kulunda Steppe is therefore of a particular importance«. The government of the Altai region has therefore pledged to double cereal production in this agricultural area by 2025.

The effects of this land-use change are being investigated by the joint German-Russian research



[Source: T. Meine]

Wind erosion event on 10.05.2005 in the German National Rayon, Altai region.

project KULUNDA in eleven sub-projects. The German Federal Ministry of Education and Research provides a total of 3.2 million Euros funding for the project, up to year 2016. Geo-ecologist Frühauf is the project leader and speaker for the German-Russian research consortium of 16 universities, non-university research institutions and enterprises. The scientists' fundamental objectives are to develop land-use strategies which stop or at least minimize soil degradation processes and which also stabilise and increase crop yields at the same time. In addition, the project aims to support sustainable land use, rural and regional development to better withstand climate change challenges.

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To achieve this, the scientists are analysing soil and vegetation degradation in the Kulunda Steppe attempting to minimize the deficiencies of global models to assess the carbon balance and thus the greenhouse effect on these arable steppes. In addition, they attempt to analyse the economic and social effects of the land use.

The scientists are concentrating on finding the best ways of shaping agricultural land use for future viability and restoring the disturbed ecosystems



Gully/ravine erosion on the Aley river (southern Kulunda Steppe).

to optimum functionality at the same time. Particular focus is on the region's fertile black soil: this type of soil with its thick humic horizon once provided the basis for the flourishing cereal cultivation in the temperate grasslands of the Altai region. But the decades of arable land farming using the methods poorly suited to the local conditions led to the serious soil damage – so not only yields were declining but the soils were also becoming more vulnerable to degradation.

No new dust bowl

Because the State farms cultivated the land too intensively and too monotonously over too great an area, surface water and winds eroded the soils. In many places their humus content decreased by up to 50 percent. This greatly diminished the soil's capacity to store water, carbon dioxide and nutrients. The scientists have pledged to prevent the West Siberian plains from turning into a second »global dust bowl«, as it was seen in the US Midwest in the first half of the 20th century. The great plains were struck by devastating dust storms in the 1930s after the farmers turned a vast amount of the prairies to cereal cultivation, thereby exposing the soil to serious erosion.

Consequently hundreds of thousands of people were forced to abandon their homes and farmsteads and move away. In the Kulunda Steppe, says a geoecologist of Halle-Wittenberg University Dr. Gerd Schmidt, we want to investigate the effects



Humus and soil-carbon depleted southern Chernosem (Black Earth) region, Virgin Lands.

of land-use and climate change on the black and chestnut-brown soils prevalent in the region.

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»We want to investigate how to build the humus content of the soil up again by means of suitable land-use processes«, says Schmidt. This would have many positive effects: higher levels of organic matter improve the soil's capacity to store water, this safeguards and increases yields, stabilizes the soil and makes it less susceptible to erosion. In addition, this has benefits for the climate: large-scale enrichment of the soil with organic matter makes a significant contribution to carbon storage and thus helps to protect the climate. »This is a win-win effect in many respects«, says Schmidt. So his research focus is to investigate how sustainable land-use processes adapted to local conditions can help to improve soil characteristics in the climatic conditions of South Siberia.

The scientist from Halle sees possibilities for reducing the farmers' dependence on the meagre precipitation in the semi-arid region through better soil management, which can be achieved above all by the use of different methods how to prepare / cultivate the land. In particular, the farmers should be urged to use the no tillage (direct sowing) or



Relics of Soviet farm technology in the agricultural steppe near Poluyamki.

mulch sowing methods. These would allow organic matter to accumulate in the soil, Schmidt explains.

Direct sowing pays

Meanwhile Dr. Tobias Meinel tests the possibility of implementation of the scientific approaches of the German-Russian research team on the trial sites. The objective of his experiments is to find methods that will benefit the environment, the climate and the local farmers. To quote one example: the less the land has to be worked before sowing, the lower the diesel consumption of the farmers' tractors. »The areas are vast, so this saves the farmers quite a bit of money«, says Meinel, who handles business in Kazakhstan and Russia for a German agricultural machinery manufacturer. His first results are now showing that direct sowing in particular could not only benefit the environment but could also be profitable for the agricultural enterprises: »With wheat cultivation alternated with rapeseed, peas or linseed for example, the mix seems to work and to pay in economic terms«. The method is successful because the plant stubble from the previous year is still standing and the surface of the soil is broken only where the new seed is sown. This has beneficial effects for the soil microclimate, as Meinel explains. »The soil is better able to store water and the old stubble protects the seed well from drying out or being blown away«. But such precise methods of working the land also require precise fertilizer distribution and modern machinery, and this comes at a price. Meinel is aware of this, but does not see



Climate and soil moisture measuring station in the Perwomaisk test area.

cost as an insurmountable obstacle: »It perhaps poses financial problems for the smaller enterprises but not for the larger ones, which often comprise farm areas of 20,000 hectares or more«, says Meinel, and he gives a sample calculation: if an enterprise saves 20 percent a year on seed and up to 50 percent on diesel through direct sowing, a sower for example will have paid for itself after six years.

Of course it is not always easy for the locals employed in agriculture to get used to the new technologies. Meinel urges an open-minded approach: »They mastered the old technology; now they must not be afraid of innovation«.

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To overcome the farmers' distrust to the new machinery and to the scientific methods, the Kulunda scientists are holding so-called field days for demonstration purposes.

»Sometimes we have representatives from 300 agricultural enterprises at these field days. They come to see how we are working the land, what new varieties of cereals we are planting and how the crops are growing in the fields«, says Frühauf. These events are important from a psychological point of view. »They create confidence among the farmers and give us hope that they will implement our findings«,



Straw and stubble burning after the harvest.

says Frühauf. The initiative is also intended to resolve another central problem: »The communication of information in the region has been very poor until now«, explains Kulunda project coordinator Dr. Milada Kasarjyan. The field days can help to improve the knowledge transfer.

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Professor of Geography Dr. Sebastian Lentz, who is leading a sub-project to gather sociological data, also sees the need for confidence-building measures of this kind. »Over the years the people of the Kulunda region have worked out their own way of dealing with the soil, the climate and the machinery«, explains the Director of the Leibniz Institute for Regional Geography in Leipzig. This value system is now coming up against other values that the scientists are bringing into play. »The objective is no longer simply to achieve a particular amount of yields from the land but also to make a contribution to climate protection worldwide«, says Lentz. This is a new way of thinking for the local people. Lentz's team is seeking to investigate how this change will affect those working in agriculture. The geographer explains the aim of his sub-project using the example of a tractor driver: »In the past, he



Direct sowing trials on plots in the forest steppe of the Kulunda region.

was a master of his machine; he was able to repair it, and had a high standing in the village«. Because many farms are now changing over to more sophisticated machines, the tractor drivers are no longer able to repair them. Today this is a job for specialists who have to be flown in. »The tractor driver has lost his social status«, says Lentz. In the sub-project his research team wishes to identify such areas of conflict and work out ways of compensating for the loss of prestige of certain social groups by giving them new duties in order to increase acceptance of the new methods and technologies in the region.

Project intended to halt rural exodus

There is great interest in the eleven sub-projects from the Russian side. »The Altai region encompasses 7.11 million hectares of agricultural land, so the question of increasing yields is very relevant«, emphasises Dr. Andrej Bondarovich, a geoscientist from Altai State University who is collaborating on the Kulunda project. New technologies could improve the economic situation and help for example to prevent people from migrating away from the rural areas of the Altai. Moreover, as the leader of the KULUNDA project Russian coordination team Professor Vladimir Belyaev explains, the results of the research could allow measures to be developed to stop soil erosion. »The project gives us possibilities for developing progressive technologies in order to increase cereal production and to adapt it to local conditions«, says Belyaev. This will help to ensure the sustainable development of the Kulunda region.



Remaining natural dry steppe in the south-western Kulunda Steppe.

To ensure that good use is made of the scientific expertise in everyday life, the Kulunda team have called in an external German-Russian advisory committee consisting of six top experts in the fields of politics, government and agriculture, three from each side. »They offer us good advice in the form of annual statements, and also give us a lot of support«, says Frühauf. The advisory committee can help for example to solve the challenge of getting regional representatives from economics, government, politics and science together for a round table discussion. »We want to bring these stakeholders together because we hope this will generate new ideas«, says Kasarjyan. This is how the idea came to set up regional advisory centres for the farmers.

Green light for the farmers

Frühauf is also aware of the difficulties. »We know there are risks because the agricultural market and the regional politics are difficult to predict«, he says. Nevertheless, the prevailing conditions are generally stable: regional support is currently very high and the cooperation with the Russian partners is proving to be highly successful. As Frühauf says: »If our concept works out, then the project can be a green light for the farms' further self-development.« This could be of a great future benefit to the region, and also to other temperate grassland regions undergoing change to which the results could be transferred.



Production systems that are being investigated in the region are: agricultural systems (intensive)

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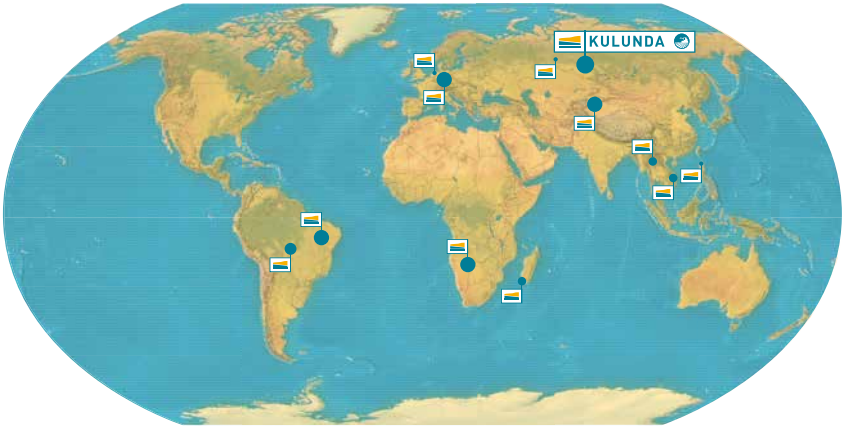
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■ **Funding:** 3.2 million Euros

■ **Funding period:** October 2011 to September 2016



»KULUNDA« is one of twelve regional projects funded by the Funding Measure »Sustainable Land Management« (Module A) provided by the Project Management Agency (PT-DLR) on behalf of the German Federal Ministry of Education and Research (BMBF).

Science Portrait 8 is published in the context of the Funding Measure »Sustainable Land Management« of the German Federal Ministry of Education and Research (BMBF).

www.sustainable-landmanagement.net

Publisher:

- Scientific coordination and synthesis (GLUES)
Helmholtz Centre for Environmental Research – UFZ
Department of Computational Landscape Ecology
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Author: Benjamin Haerdle, January 2013

Layout: Metronom | Agentur für Kommunikation und Design GmbH, Leipzig

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Federal Ministry
of Education
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DLR Project Management Agency