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Introduction of perennial wheat to farming practice in South and South-East of Kazakhstan to conserve biodiversity and soil fertility

Meruyert Kurmanbayeva, Zhumagali Ospanbayev, Adil Kusmangazinov, Tursynbek Kaiyrbekov

Al-Farabi Kazakh National University, Department Biodiversity and Bioresources, Almaty, Kazakhstan
Email: Meruyert.Kurmanbayeva@kaznu.kz

Abstract

Currently, Kazakhstan is facing a serious deterioration of the state of natural resources and the environment in all the most important ecological indicators. Almost a third of agricultural land is now degraded or under serious threat, and more than 10 million hectares of potentially arable land have been abandoned in the past. In recent decades, due to the problems of climate warming, environmental threats and increasing energy intensity of grain production, it has been proposed for agriculture, as an alternative to annual crops, to use perennial crops more widely, as they are more resistant to many negative biotic and abiotic environmental factors that can preserve the soil cover for many years and reduce the loss of moisture and nutrients, absorb more carbon, thereby reducing greenhouse emissions from agriculture, in the process of sequestering carbon to mitigate or slow global warming. Perennial crops are a potentially more sustainable alternative to the annual crops that currently dominate the global food system. Although annual cereals are a critical part of the global food system, they have several disadvantages. For example, annual crops has to be planted every year and therefore require routine field operations and accurately calculated costs and management. Intensively managed annual cereal production is also responsible for a number of environmental problems, including soil erosion, reduced water quality and availability, greenhouse gas emissions and loss of biodiversity. The extensive root system of perennial wheat can help reduce soil erosion, water pollution, and carbon emissions. The goal of the research is to develop an agrobiological basis for the introduction of perennial wheat to farming practice in South and South-East of Kazakhstan in order to increase on productivity of arable land, reduce the level of greenhouse gas emissions, conserve soil fertility and protect the environment. The main aspects we highlight here are based on previous findings regarding perennial wheat Kernza: the ability of maintaining a relatively high water-use efficiency throughout the whole growing season, which is beneficial to mitigate water stress, representing an important physiological mean to acclimate under severe, unfavorable weather conditions, and its higher evapotranspiration and net carbon uptake rates, particularly when compared to annual counterparts.

Keywords: perennial wheat, environmental problems, water-use efficiency, soil conservation.