COMPARISON OF TRADITIONAL AND MODERN CROPPING STRATEGIES UNDER THE ASPECT OF SOIL WATER AVAILABILITY IN A SEMI-ARID RUSSIAN STEPPE

DER VERGLEICH TRADITIONELLER UND MODERNER ANBAUSTRATEGIEN UNTER DEM ASPEKT DER BODENWASSERVERFÜGBARKEIT IN EINER SEMIARIDEN RUSSISCHEN STEPPE

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SUMMARY

During the virgin land campaign carried out in the Soviet Union in the 1950s, large areas of steppe ecosystems were converted into arable land. While the soils are initially very fertile, water is the main limiting factor for crop production. In the southwestern Siberian Kulunda steppe, this conversion resulted in severe soil degradation due to inappropriate agricultural use. Tillage affects the physical soil properties, which affects the water storage capacity of the soils. This study presents the results of measuring the effects of tillage on soil water content and water availability at trial fields in the driest part of the steppe. During growing seasons in 2013-2016, soil water content and matrix potential were continuously measured at three different depths at two soil hydrological monitoring stations to compare the effects of different tillage and cropping strategies (conventional tillage, no rotation with fallow – CT and no-till, modern rotation – NT). The results show that the studied cropping strategies produced moderate differences in soil water content after four years of experimentation. Optimally available soil moisture at matrix potential in a depth of 30 cm for both CT and NT was observed for 51 % of all hourly observations. At a depth of 60 cm, the same value was measured for 53 % at CT and 49 % at NT. At 120 cm depth, it was recorded for 60 % and 81 %. The presented results provide important information for the implementation of modern conservation tillage strategies to reduce the risks in crop production caused by climate variability.

Keywords: Russia, Steppe, Field Trials, Soil Water Balance, Crop Rotation