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The influence of zero tillage and the effectiveness of various grain cropping rotation schemes in the flocked grain rainfed of Uzbekistan

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Abstract: The use of an optimal system of main and pre-sowing tillage is the most important and decisive agrotechnical measure for obtaining stable and high yields of grain and other products in rainfed farming conditions. The use of minimal and resource-saving soil cultivation technology improves its properties, rainfed areas are used especially effectively, and the yield and quality of grain increases. In this regard, through the effective use of soil moisture, maintaining soil fertility and increasing the yield of grain crops.

Keywords: Rainfed farming, soil, crop rotation, resource-saving technology, tillage, zero tillage, flat cutter, soil density, clean fallow, precipitation, productive stems, number of weeds, amount of grain, yield, economic efficiency.

Introduction: The use of an optimal system of main and pre-sowing tillage is the most important and decisive agrotechnical measure for obtaining stable and high yields of grain and other products in rainfed farming conditions.

Currently, the area of rainfed arable land in Uzbekistan is more than 750 thousand hectares and the main crops of grains, legumes and other crops are located on gray soils, occupying the territory between altitudes from 200 to 1500-1800 m above sea level. In all vertical zones, specific features of climatic conditions are clearly manifested: periodic precipitation and the presence of two hydrothermal phases - a wet, warm spring and a dry, hot summer. As the area rises above sea level, the air temperature improves, the biomass of plants increases and the intensity of microbiological processes noticeably decreases.

The average annual precipitation in the lower part of the rainfed region varies between 250-400 mm (plain and plain-hilly zones) and in the upper zone from 400 to 600 mm or more (foothill and mountain zones).

Through many years of research carried out in the 60-70s at the former Uzbekistan Research Institute of Rainfed Agriculture, a system for cultivating rainfed soils was developed (G.A. Lavronov, V.I. Korobov, 1969, 1979, etc.). This tillage system primarily involves annual moldboard plowing of the soil at a depth of 20-22 cm.

However, in their opinion, in some conditions, especially with the introduction of scientifically based schemes of grain-fallow crop rotation, minimal moldboard-free cultivation with flat-cutting and disk implements is not inferior in efficiency to moldboard plowing by 20-22 cm and can reduce production costs by almost 1.5-2 times.

Currently, research on the development and improvement of soil protection systems for the treatment of rain-fed gray soils has been carried out extremely poorly.

In this regard, we studied the effectiveness of multi-depth tillage systems using minimal and "Zero technology" (no till) without main tillage with direct sowing of winter and spring wheat seeds into the soil with a Turkish seeder "AGROLEAD" and their effect on the yield of winter wheat in the links of grain-fallow crop rotation in the conditions of a semi-sufficient flat-hill rainfed zone.

METHODOLOGY

Methodology and conditions for conducting research. The research was carried out at the Central Experimental Base of the Research Institute of Rainfed Agriculture.

The soils of the experimental plot are typical gray soils, medium loamy typical gray soils. The content of organic matter (humus) in the 0-22 cm layer is 0.55-0.85%, gross nitrogen - 0.056-0.067%, 0.06-0.08% total nitrogen and potassium -0.9-1.4%. The soils are insufficiently provided with digestible forms of nitrogen, moderately provided with mobile phosphates and sufficiently provided with exchangeable potassium.

RESULTS

Research conducted in various soil and climatic conditions has established that during non-moldboard shallow tillage with flat cutters, disc harrows, the bulk density, microaggregate composition of the soil and other water-physical properties of the soil change slightly in comparison with moldboard plowing (N.R. Nikulin, V.N. Shamray, 1986; A. Kireev, 1989, etc.).

It is known that soil moisture under rainfed farming conditions is the main limiting factor in plant life.

A.I. Baraev (1968), I.E. Shcherbak (1974) note that soil-protective tillage with flat cutters and other implements contributes to more intensive absorption of precipitation by the soil and, consequently, the creation of higher moisture reserves.

The grain yield of wheat coming after chickpeas for all years of research was higher than the control variant by 0.38 t/ha (151%) and the second wheat in pure fallow.

The average wheat grain yield for a three-field grain-fallow crop rotation was 1.13 t/ha, which is 0.08 t/ha lower than for a two-field crop rotation. The efficiency of pure fallows was as high as in two-field crop rotation. The average wheat grain yield in pure fallow for 7 rotations of three-field crop rotation was 1.39 t/ha, which is 193% higher than monocultures. Chickpeas in this crop rotation scheme were also a good predecessor for wheat, providing an average increase in grain yield of 0.33 t/ha.

Direct sowing of wheat seeds, "Zero technology" (no till) without main treatment with direct sowing of winter and spring wheat seeds in the soil with a Turkish "AGROLEAD" seeder provided an increase in grain yield of 0.8 c/ha or 111% compared to the control option.

Based on three years of research, the following conclusions can be drawn:

CONCLUSIONS

1. In the conditions of a semi-sufficient rainfed zone, the use of zero tillage is effective only in the links of grain-fallow crop rotation with short rotation (pure fallow-wheat-wheat);

2. Relatively high yields of wheat grain with "Zero technology" (no till) without main treatment with direct sowing of winter and spring wheat seeds into the soil with a Turkish seeder "AGROLEAD" in comparison with moldboard plowing of 20-22 cm carried out in the fall is due to the greater density of plant standing and the water regime of the soil.

3. Leguminous crops (chickpeas) in the semi-sufficient rainfed zone are good predecessors for wheat due to their nitrogen-fixing ability.

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