ANNOTATION

Of dissertation abstract by Aidos Tolekov on the topic: «Technologies of winter wheat cultivation in the condition of the foothill zone of the Almaty region» submitted for the Doctor of Philosophy (PhD) degree in the educational program 8D08101 – «Agronomy»

Relevance of the research topic. In modern agricultural development environment, increasing the efficiency of agricultural production through the rational use of irrigated lands and implementation of innovative technologies is particularly urgent. Given global climate change, limited water resources, and rising agricultural production costs, the development and implementation of resource- and water-saving crop cultivation technologies is particularly important.

The President of the Republic of Kazakhstan Kassym-Jomart Tokayev emphasized the need to elevate the agricultural sector to a qualitatively new level in his Address to the Nation, "Kazakhstan in the Era of Artificial Intelligence: Current Challenges and Their Solutions through Digital Transformation" from September 8, 2025. He noted that long-term and sustainable development of the agro-industrial complex is impossible without accelerated progress in applied agricultural science. One of the key conditions for the stable development of the agro-industrial complex is the effective resolution of water issues. According to the President, water is a strategically important resource, without which life is impossible. Therefore, the water sector should become a priority for agricultural development. A shortage of natural water resources is already observed, and their rational use remains insufficient. Furthermore, the implementation of water-saving technologies in agriculture is slow and has not yielded significant results. Irrigated land and water resources are used inefficiently, and in practice, water-intensive crops are still widely cultivated.

In recent years, the issue of rational water use in agriculture has become increasingly important. Traditional irrigation methods often result in significant water losses due to evaporation, surface runoff, and uneven soil moisture distribution. Therefore, special attention is being paid to the implementation of modern water-saving technologies, one of which is drip irrigation. This technology delivers water directly to the soil's root zone, significantly increasing the water use efficiency of plants and reducing water loss.

Winter wheat is one of the most important grain crops in global agriculture, occupying a leading position in the cropping area of many countries. It plays a key role in ensuring food security for the population and is the main source of food grain production. Increasing the yield and sustainability of this crop is a priority for the modern agricultural sector.

One promising area for improving agricultural cultivation technology is the use of ridge-and-furrow sowing. This technology improves the hydrophysical properties of the soil, increases aeration, and promotes more efficient water use by plants. Forming

permanent ridges reduces the number of technological operations, lowers soil tillage costs, and creates favorable conditions for plant growth and development.

Furthermore, the use of permanent ridges opens up additional opportunities for more efficient use of agricultural land. Specifically, after harvesting the main crop, the formed ridges can be used for sowing intermediate crops, which contributes to increased land use efficiency, improved soil structure, and increased overall productivity of the agroecosystem.

Therefore, the development and scientific substantiation of a technology for cultivating winter wheat on permanent raised beds using drip irrigation is of significant scientific and practical interest. Studying the growth, development, and yield characteristics of winter wheat using this technology will help determine its effectiveness and potential for implementation in modern farming systems.

The aim of thesis research:

To scientifically substantiate the effectiveness of ridge-and-furrow sowing of winter wheat and intermediate crops using water-saving technology.

Research objectives:

1. To determine the characteristics of the main development phases of winter wheat;
2. To study the growth and development characteristics of the studied winter wheat varieties under ridge-and-furrow sowing;
3. To evaluate the effect of drip irrigation on soil water balance and winter wheat plant productivity;
4. To study the biomass accumulation characteristics of the studied winter wheat varieties under various ridge-and-furrow sowing methods;
5. Monitor weed infestation;
6. Develop specific features of intercrop cultivation under intensive irrigated land use.
7. Disseminate knowledge among farmers and farms on ridge-and-furrow cultivation;
8. Provide an economic assessment of innovative cultivation technologies for the studied winter wheat varieties and intercrops.

Methods of research

During the course of the thesis work, field and laboratory studies were conducted, which included the following records, observations and analyses: Phenological observations of plant growth and development in the main phases of development were determined using the generally accepted method; Determination of soil moisture reserves was determined using the thermostat-weight method; The lowest soil moisture capacity was determined using the flooded plot method; Accounting for plant density, dynamics of plant biomass accumulation and accounting for weed infestation of crops were carried out using generally accepted methods; Analysis of soil samples included determination of the content of humus, nitrogen, mobile forms of phosphorus and potassium; Bulk density according to A.S. Kachinsky; Structural and aggregate

composition according to N.I. Savvinov; Vegetation irrigation rates were determined by using the formula of A.N. Kostyakov; Crop accounting was carried out in plots by direct combining and the method of test plots; Processing of crop data according to the method of B.A. Dospekhov; The economic efficiency of cultivation methods for the studied crops was determined based on the accepted costs per unit of produced output per hectare in accordance with the accepted methodology for performing agricultural work using generally accepted methods.

Key points to be defended:

1. Features of winter wheat cultivation using ridge-and-furrow sowing;
2. Growth and development of different winter wheat varieties using ridge-and-furrow sowing;
3. Features of drip irrigation using the ridge-and-furrow sowing method;
4. Elements of drip irrigation technique and total water consumption;
5. The impact of different sowing methods on winter wheat yield;
6. The possibility of using permanent ridges for sowing intermediate crops;
7. Economic evaluation of the innovative ridge-and-furrow technology for cultivating the studied winter wheat varieties and intermediate crops.

Justification of the novelty and practical significance of the obtained results.

Scientific novelty. The novelty of the technology we are developing is based on cultivating winter wheat using ridge-and-furrow seeding with water-saving technology, followed by using these ridges for direct seeding of intermediate crops.

The scientific and practical value of this work lies in the implementation of a water-saving technology for cultivating winter wheat on permanent ridges using drip irrigation. This technology ensures more efficient use of irrigated land and irrigation water, increases winter wheat yields, and improves the efficient use of land and water resources through the sowing of intermediate crops.

Description of the main results of the study.

Based on the results of field studies investigating innovative winter wheat cultivation technology under irrigated conditions, the following recommendations for agricultural production are proposed:

In irrigated agriculture, the adoption of a two-row ridge sowing method for winter wheat (Intensive variety) is recommended as the most effective agricultural technique. Optimal sowing parameters: - row spacing in the ribbon – 20 cm; - row spacing – 70 cm.

For winter wheat crops with ridge sowing, drip irrigation is more effective, reducing irrigation water consumption by up to 38.8% compared to the traditional furrow method.

To improve the efficiency of irrigated land use, it is recommended to sow intermediate crops after winter wheat harvesting. The most effective are: - corn for silage; - rapeseed for green forage.

It has been established that the use of the ridge-based, two-row sowing method for the Intensive variety is the most economically feasible, providing: - net income of up to 44,483 tenge/ha; - profitability of up to 161.2%.

The introduction of this technology into production contributes to increased efficiency in the use of material and water resources.

Therefore, for farms operating under irrigated conditions, it is recommended to implement an integrated winter wheat cultivation technology that includes the ridge-based, two-row sowing method, the use of adapted varieties, an optimized irrigation regime, and the sowing of catch crops. This ensures increased yields, rational use of irrigated land and water resources, and increased economic efficiency.

The doctorate's contribution to each publication's preparation. The author of the dissertation contributed fully to defining the purpose of the work, defining the research problem, collecting, analyzing, and summarizing experimental and literary data, statistically processing the results, and personally creating the illustrations.

Nine scientific papers based on the dissertation materials have been published, including 2 articles in journals indexed in the Scopus database, 4 articles in journals recommended by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Higher Education of the Republic of Kazakhstan, and 3 articles in the proceedings of international scientific and practical conferences. Based on the research results, 1 recommendation for production was issued and 3 utility model patents of the Republic of Kazakhstan were obtained.

Compliance with scientific development areas or state programs: The research was conducted within the framework of budget program 217 "Science Development" and 102 "Grant Financing of Scientific Research" on the topic: "IRN: AP09259400 Selection of Non-Traditional Crops for Intensive Use of Irrigated Lands and Creation of a Green Conveyor Belt Depending on the Bioclimatic Potential of Growing Zones" under an agreement concluded with the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan.

Thesis structure and length: The dissertation consists of an introduction, 5 chapters, a conclusion, a list of references, and contains 27 tables and 30 figures. The total length of the dissertation is 121 printed pages (including 104 pages of the main text and 17 pages of appendices).