

MZURI



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PROGRAM

of scientific support for the introduction

of the MZURI PRO-TILL Strip Farming System Technology

Under the Conditions of Natural and Artificial Humidification of

the Southern Steppe of Ukraine for 2022-2026.

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INTRODUCTION

The production of high-quality and safe food products is of strategic importance, since not only food and environmental security, but also the national security of the state depends on it. According to the FAO, Ukraine's agricultural resource potential allows feeding 450-500 million people, but due to climate change, inefficient use of land resources and modern technologies for growing agricultural crops, only a third of it is realized.

According to the forecasts of scientists, further climate changes will only worsen the conditions of natural moisture supply, therefore, in the conditions of climatic transformations, the introduction of technologies for the economical use of moisture and the restoration and development of irrigation is a determining factor in the development of the agrarian sector of the state's economy, increasing its export potential, etc.

In this regard, the system of strip farming based on the technology of the company "MZURI WORLD" is relevant for the south of Ukraine, which is implemented in more than 40 countries of the world, including in Ukraine. However, scientific research on the implementation of these technologies in the Southern region of Ukraine, especially on irrigation, was not conducted. In fulfillment of the Agreement "On Intentions for Scientific and Technical Cooperation" dated September 11, 2022, the Mykolaiv National Agrarian University (hereafter MNAU) together with the specialists of the company "MZURI WORLD" and their official dealer in the Mykolaiv region Agriprime LLC and in Odesa region "NAT MZURI", developed the Program of Scientific Support for the Implementation of the MZURI PRO-TILL Strip Farming System Technology under Natural and Artificial Humidification in the Southern Steppe of Ukraine for 2022-2026.

The Polish company "MZURI WORLD" is the developer of the newest strip farming system based on the Mzuri World Pro-Till technology, which consists in processing only narrow strips of soil. At the same time, 2/3 of the field area is not processed. For this, the Mzuri Pro-Till unit was developed, which in one pass loosens a strip of soil of 1/3 of the total area to a depth of up to 30 cm, applies mineral fertilizers, seeds of cultivated plants, provides re-compaction of loosened soil and elimination of air cavities, which creates favorable conditions for germination. Treatment of only narrow strips and low resistance during deep loosening leads to a low loss of moisture – 5 times less, compared to plowing, and almost twice as much mineral fertilizers, reduces the mechanical load on the soil.

In addition, after the unit passes through, loosened strips of soil quickly

absorb water after rain, drain its excess, and loose interrows protected by plant residues limit water evaporation and its retention in the soil, which has a positive effect on the biological activity of the soil.

Scientific and industrial cooperation between MNAU and the company "MZURI WORLD" will contribute to the introduction of the latest technology under the conditions of natural and artificial humidification in the Southern region of Ukraine.

1. Purpose and Objectives of the Program

The main idea of the Program of Scientific Support for the Implementation of the MZURI PRO-TILL Strip Farming System Technology under the Conditions of Natural and Artificial Humidification of the Southern Steppe of Ukraine for 2022-2026 is aimed at its adaptation to the conditions of the Southern Steppe of Ukraine, ensuring the improvement of the efficiency of the agricultural industry under the conditions of the use of non-renewable natural resources and the accelerated implementation of innovative scientific developments in production, which will ensure the sustainable development of the agro-industrial complex of the southern region, increase the volume of agricultural products, and increase its competitiveness in general.

During joint scientific research, the main attention will be paid to the research of the innovative ecologically safe technology MZURI PRO-TILL for growing agricultural crops in different crop rotations on the educational and scientific fields of the Educational, Scientific and Practical Center of the MNAU (hereinafter – MNAU ESPC). Taking into account the specifics of the region, the results of research on the development and implementation of innovative elements of technology, under the conditions of natural and artificial humidification in all agro-climatic zones of the Southern Steppe of Ukraine, will have important scientific and practical significance, which will significantly accelerate its implementation, reduce production costs, ensure reproduction and improvement soil fertility.

Close cooperation between scientists of the MNAU and specialists of the MZURI WORLD company will allow to improve the technology itself. With the participation of the Agroperspektyva (MNAU Science Park) and innovation clusters, innovative PRO-TILL technologies for growing field crops with elements of biologization and the use of bio- and nanopreparations, re-regulating substances of domestic and foreign production will be developed and implemented.

Considerable attention will be paid to the introduction of precision agriculture as a way to optimize costs through the understanding of an individual field as a heterogeneous structure that requires a differentiated approach to the application of fertilizers and pesticides, tillage, etc. For this, the capabilities of the MZURI WORLD company, the National Innovation Cluster "Soil Fertility", the Center for Ecological Agriculture "Pivden Organic"

and the iMETOS weather station will be used, including satellite monitoring, drones, soil analyzes of the university's agrochemical laboratory, etc.

The purpose of the Program is to conduct joint scientific research that is relevant for the South of Ukraine, approbation of their results in all agro-climatic zones of the Steppe of Ukraine, in the fields of the MNAU ESPC with further implementation in agricultural enterprises.

In order to achieve this goal, the following tasks will be solved by the teaching staff, scientists and students of higher education:

- 1) creation of prerequisites for the founding of a scientific and educational complex with samples of modern agricultural machinery produced by the company "MZURI WORLD";
- 2) joining efforts and exploring opportunities for joint research and design work, testing of new models of agricultural machinery manufactured by the company "MZURI WORLD", as well as promotion of its products on the agricultural machinery market of Ukraine;
- 3) generalization, promotion of modern technologies, achievements of scientific and technical progress in crop production and introduction of progressive MZURI PRO-TILL technologies in the Southern region of Ukraine;
- 4) development of scientifically based recommendations on optimization of irrigation rates of agricultural crops by means of sprinkling and drip irrigation with the introduction of MZURI PRO-TILL technology;
- 5) organization of experimental and demonstration fields, training grounds, sites, exhibitions, express seminars, round tables, conferences regarding the introduction of MZURI PRO-TILL technology;
- 6) holding All-Ukrainian and International Field Days on the technology of growing grain and technical crops, demonstrations of the latest developments of the company "MZURI WORLD" according to their program;
- 7) equipping the appropriate classrooms and laboratories of the scientific and educational complex with the provided samples of equipment from the MZURI WORLD company and conducting classes for students according to the program of the appropriate special courses;
- 8) providing an opportunity for the specialists of the company "MZURI WORLD" and LLC "Agriprime" to conduct presentations and successful training of students, university employees, dealers, farmers and other specialists of the agricultural market on the basis of the created scientific and educational complex;
- 9) sharing the information on the holding of events, seminars, conferences for upgrading the qualifications of engineering and technical

workers, farmers, dealers, etc., inclusion of representatives of the company "MZURI WORLD" and LLC "Agriprime" as speakers, co-speakers, co-exhibitors;

10) invitation of representatives of the company "MZURI WORLD" and LLC "Agriprime" to joint participation in the organization and holding of International Field Days, scientific and practical conferences and exhibitions, which will be held on the basis of the university or with the participation of the university in order to present information about the company's new developments "MZURI WORLD" in the field of the latest technologies for growing agricultural crops;

11) participation of university specialists in tests of agricultural machinery manufactured by the company "MZURI WORLD" under irrigation and under natural humidification for the purpose of practical study of samples of new machinery and providing recommendations for its improvement;

12) consulting and providing advisory services related to the introduction of MZURI PRO-TILL technologies into agricultural production;

13) testing of new samples of modern agricultural machinery of the company "MZURI WORLD" to study the effect of technical means on the agrophysical properties of soils in the conditions of southern Ukraine, providing comments and recommendations for their serial production;

14) exchange between MNAU and the company "MZURI WORLD" of the results of the implementation of MZURI PRO-TILL technologies in different soil and climatic zones of Ukraine and the Republic of Poland;

15) conducting joint scientific research on resource-saving technologies;

16) training of scientific personnel, improvement of the quality of scientific and scientific-pedagogical workers, their obtaining the level of higher scientific qualification;

17) development of recommendations for the introduction of agricultural machinery produced by the company "MZURI WORLD", highlighting the results of cooperation in mass media, publications distributed by the university.

The key to solving the above-mentioned tasks is the powerful educational-scientific-practical base formed at MNAU, for the strengthening of which more than UAH 75 million has recently been invested and innovative infrastructure, which includes:

1) educational and scientific fields of MNAU ESPC (Research fields of the university recognized by the Ministry of Education and Science of Ukraine as the best among agricultural institutions of higher education);

2) Agroperspektyva (MNAU Scientific Park);

3) Scientific-educational-production consortium "Pivdenny" (hereinafter - SEPC "Pivdenny"), which unites 7 research institutions, 5 agricultural institutions of higher education and 22 production enterprises of Ukraine;

4) training ground for the transfer of modern technologies in the agricultural sector;

5) Innovative and educational cluster "Agrotechnics";

6) National innovation cluster "Soil fertility";

7) Center for Ecological Agriculture "Pivden Organic";

8) weather station with decision support system IMETOS, installed with the support of the Ukrainian-Canadian fruit and vegetable development project UHBDP.

The steppe zone, in which the experimental fields of ESPC are located, is characterized by a continental, hot, arid climate, where irrigation is one of the determining factors of the general state of agricultural production. Therefore, the system of modern sprinkler irrigation was built on 400 hectares of the MNAU ESPC lands thanks to the investments of the Monsanto Company and the funds of the European Union. Another 30 hectares are covered with the system of drip irrigation with the support of the Irrigator Company. In the future, it is planned to expand the area of experimental fields under modern sprinkler irrigation to 560 hectares.

All this makes it possible to develop modern and improve existing technologies for growing agricultural crops in the fields of the MNAU ESPC in conditions of increased man-made load on the agroecosystem, energy- and resource-saving technologies, including irrigation, to conduct scientific research on the study of adaptive characteristics of modern varieties and hybrids of grain and industrial crops of leading Ukrainian and foreign breeding centers, testing of new bio- and nanopreparations, plant protection products.

2. Peculiarities of the structure and components of conducting research

Joint scientific research and observations during the implementation of this Program will be conducted in the fields of the MNAU ESPC and its sectors located in different agro-climatic zones:

- in the zone of the Southern Steppe of Ukraine (841.1 ha, including 400.0 ha - under irrigation);
- in the zone of the Central Steppe of Ukraine (81.16 hectares);
- in the zone of the Northern Steppe of Ukraine (983.9 hectares).

3. The practical value of joint scientific research for the economy of the region

The practical value of joint scientific research consists in the development and implementation of innovative elements of the technology of growing agricultural crops using modern high-quality tillage and sowing equipment of the company "MZURI WORLD", aimed at meeting the needs of modern farms.

Joint research will be conducted under conditions of natural and artificial humidification. Priority attention will be paid to the study and implementation of modern technologies for growing grain and technical crops. Resource support for joint scientific research and their approval will be carried out at the expense of the university's own funds, the Agroperspektyva Science Park, AgriPrime LLC and the MZURI WORLD company.

As part of the implementation of the Program, it is envisaged to provide an ecologically oriented approach to the optimization of the structure of crop rotation, tillage and integrated systems of plant protection and nutrition, taking into account the biological characteristics of agricultural crops under conditions of natural and artificial humidification. This will allow to significantly increase their productivity, ensure food security, stable development of Mykolaiv region and Ukraine in general.

With the aim of preserving natural resources and improving the quality characteristics of agricultural products, reducing the impact on the environment, saving costs for fuel, labor, fertilizers, plant protection products, chemical and mechanical loads, the payback period of invested funds in the development of agricultural production without reducing the level of productivity of agricultural crops and with increasing soil fertility, the use of samples of modern agricultural machinery produced by the company "MZURI WORLD" will be investigated, the results of which will be implemented in the agricultural enterprises of the region in the future.

The introduction of MZURI PRO-TILL technology in the Southern region together with the use of the latest drought-resistant varieties and hybrids of grain and technical crops, improvement of knowledge and practical skills of agricultural producers will contribute to a significant increase in the yield of agricultural crops under conditions of natural moistening and irrigation.

MZURI PRO-TILL technologies will allow:

- 1) to save on the costs of fuel, labor, fertilizers, and plant protection products;
- 2) reduce the number of treatments and used equipment;
- 3) save on machine maintenance.

4) ensure effective use of fertilizers and soil resources and, as a result, obtain high-quality yields that will guarantee income and profits.

The jointly developed scientific and practical recommendations, the holding of International and All-Ukrainian Field Days, agroforums at the innovation and investment training ground on the transfer of modern technologies in the agricultural sector will become a permanent production school for specialists and managers of agricultural enterprises in Southern Ukraine. Modern technologies and approaches tested in production conditions will be proposed for inclusion in the Program of Economic and Social Development of Mykolaiv region.

4. Stages of Program implementation

The Program's measures include a set of interrelated actions aimed at achieving the program's goal, as well as at solving the most important current and prospective tasks to ensure food independence of the region (Table 1). Joint scientific research of the company "MZURI WORLD", the official dealer of the company "MZURI WORLD" LLC "AgriPrime" and MNAU under this Program covers the period from 2022 to 2026 (Table 2).

During the research, it is planned to use the equipment of "AgriPrime" LLC. Conducting research involves the creation of a material and technical base at MNAU for the implementation of the MZURI PRO-TILL technology in the fields of MNAU ESPC. For this purpose, the acquisition of the MZURI sowing complex is planned in 2023. During July-August 2023, the specialists of AgriPrime LLC will conduct training for the staff of the Mykolaiv NAU in working with agricultural machinery manufactured by the company "MZURI WORLD".

Table 1

Program implementation activities and their implementation dates

№ з/п	Activity	Deadline	Responsible executor
1	2	3	4
1.	Purchase of MZURI sowing complex	August 2023	MNAU, "MZURI WORLD" company, "AgriPrime" LLC
2.	Conducting of presentations and trainings for MNAU students and staff, dealers, farmers and other specialists of the agricultural market by specialists	August 2023	specialists and scientists of MNAU, "AgriPrime" LLC

	of the company "MZURI WORLD" and LLC "AgriPrime" on the basis of the created scientific and educational complex		
3.	Founding the scientific and educational complex with samples of modern agricultural and economic production equipment of the company "MZURI WORLD"	August 2023	Faculty of Engineering and Power Engineering/MNAU, "MZURI WORLD" company, "AgriPrime" LLC
4.	Equipping the appropriate classrooms and laboratories of the scientific and educational complex with the provided samples of the equipment of the company "MZURI WORLD"	September 2023	Faculty of Engineering and Power Engineering/MNAU, "MZURI WORLD" company, "AgriPrime" LLC
5.	Development of scientifically based recommendations on optimization of irrigation rates of agricultural crops by methods of sprinkling and drip irrigation and natural moistening with the introduction of MZURI PRO-TILL technology	2024	Faculty of Agricultural Technologies/MNAU, Scientific Park "Agroperspektyva", "MZURI WORLD" company, "AgriPrime" LLC
6.	Organization of experimental and demonstration fields, training grounds, sites, exhibitions, express seminars, round tables, conferences regarding the introduction of MZURI PRO-TILL technology	2023-2026	MNAU, Scientific Park "Agroperspektyva", "MZURI WORLD" company, "AgriPrime" LLC
1	2	3	4
7.	Holding All-Ukrainian and International Field Days on the technology of growing grain and technical crops with a demonstration of the latest developments of the MZURI WORLD company	May 2023 - December 2024	MNAU, Scientific Park "Agroperspektyva", "MZURI WORLD" company, "AgriPrime" LLC
8.	Participation of representatives of the company "MZURI WORLD" and LLC "AgriPrime" in the organization and holding of International Field Days, scientific and practical conferences and exhibitions, which will be held on the basis of MNAU or with the participation of the university in order to present information about	2023-2026	MNAU, "MZURI WORLD" company, "AgriPrime" LLC

	the new developments of the company "MZURI WORLD" in the field of the latest technologies for growing agricultural crops		
9.	Testing of new samples of modern agricultural machinery of the company "MZURI WORLD" to study the effect of technical means on the agrophysical properties of soils in the conditions of southern Ukraine, providing comments and recommendations for their serial production	2023-2024	MNAU, "MZURI WORLD" company, "AgriPrime" LLC

**The list of research directions for the implementation
of the MZURI PRO-TILL technology in the fields of the MNAU ESPC
under conditions of natural and artificial humidification in 2022-2026**

Research directions	Executors	Deadline, year		Area, ha
		Start	completion	
1	2	3	4	5
1. Study of the impact of technology on soil structure: - irrigated lands; - under the conditions of natural soil moisture	MNAU ESPC, Scientific Park "Agroperspektyva", Faculty of Agricultural Technologies/MNAU, "AgriPrime" LLC	01.10. 2022	31.12. 2026	65,0
				100,0
2. Study of the influence of the MZURI PRO-TILL technology on the biological activity of the soil: - under irrigation conditions; - in conditions of natural humidification	MNAU ESPC, Scientific Park "Agroperspektyva", Faculty of Agricultural Technologies/MNAU, "AgriPrime" LLC	01.08. 2023	01.10. 2026	80,0
				100,0
3. Determination of optimal sowing rates of grain and technical crops: - on irrigation; - in conditions of natural humidification	MNAU ESPC, Faculty of Agricultural Technologies/MNAU, "AgriPrime" LLC	01.08. 2023	01.10. 2026	80,0
				100,0
1	2	3	4	5

4. Research on determining optimal doses of mineral fertilizers: - on irrigation; - in conditions of natural humidification	MNAU ESPC, Scientific Park "Agroperspektyva", Faculty of Agricultural Technologies/MNAU, "AgriPrime" LLC	01.08. 2023	01.10. 2026	80,0 100,0
5. The effect of MZURI PRO-TILL technology on moisture evaporation from the soil after grain harvest.	MNAU ESPC, Scientific Park "Agroperspektyva", Faculty of Agricultural Technologies/MNAU, "AgriPrime" LLC	01.08. 2023	01.10. 2026	80,0 100,0
6. Study of the influence of the MZURI PRO-TILL technology on the acceleration of the decomposition of plant residues: - on irrigation; - - in conditions of natural humidification	MNAU ESPC, Scientific Park "Agroperspektyva", Faculty of Agricultural Technologies/MNAU, "AgriPrime" LLC	01.08. 2023	01.10. 2026	80,0 100,0
7. Study of the optimal rate of watering when applying the MZURI PRO-TILL technology for irrigation	MNAU ESPC, Scientific Park "Agroperspektyva", Faculty of Agricultural Technologies/MNAU, "AgriPrime" LLC	01.08. 2023	01.10. 2026	80,0
8. Research on the economic effectiveness of the application of the MZURI PRO-TILL technology in irrigation conditions, in particular due to savings:	MNAU ESPC, Scientific Park "Agroperspektyva",	01.08. 2023	01.10. 2026	80,0

<ul style="list-style-type: none"> - PMM; - irrigation water 	Faculty of Agricultural Technologies/MNAU, "AgriPrime" LLC			
<p>9. Research on the economic efficiency of using the MZURI PRO-TILL technology in conditions of natural humidification, in particular due to the reduction of the use of:</p> <ul style="list-style-type: none"> - mineral fertilizers; - plant protection products 	MNAU ESPC, Scientific Park "Agroperspektyva", Faculty of Agricultural Technologies/MNAU, "AgriPrime" LLC	01.09. 2023	01.10. 2026	100,0

5. Expected final results from the implementation of the Program

The implementation of the Program of joint scientific research of the company "MZURI WORLD" and the Mykolaiv National Agrarian University will ensure the development of recommendations and the introduction into production of the latest PRO-Till technologies for growing agricultural crops, will satisfy the demand of agricultural producers in the South of Ukraine for high-quality agricultural equipment, will increase the level of training of specialists, will promote the integration of science, education and production and sustainable development of the agro-industrial complex of the Southern region of Ukraine.

The spread of advanced PRO-Till technologies based on the use of modern agrochemical, biological and nanopreparations of new models of agricultural machinery adapted to the agroclimatic conditions of the steppe zone, varieties and hybrids, grain and industrial crops will significantly reduce production costs, ensure the reproduction and improvement of soil fertility, contribute to the increase gross fees of agricultural products, reducing their cost price and increasing the competitiveness of agricultural production.

Technologies for growing agricultural crops using modern sprinkler and drip irrigation will be of particular importance in the face of global warming.

In particular, the implementation of the measures planned in the Program will allow:

1) to improve existing soil fertility in scientific and research fields, to avoid the harmful effects of diseases, pests, and weeds, and to reduce the costs of growing agricultural crops by 15-20%;

2) to create prerequisites for the organization on the basis of MNAU of a scientific and educational complex with samples of modern agricultural machinery produced by the company "MZURI WORLD";

3) to ensure scientifically based adaptation of the modern MZURI PRO-Till strip tillage system in the conditions of the Southern Steppe of Ukraine, to meet the needs of modern farming with innovative technology, equipment and service;

4) increase the yield of wheat by 15%, rape – by 18%, and on irrigation: wheat – by 30-40%, corn seeds – by 15-20%, sunflower yield – by 30% due to the introduction of PRO-Till technology at cultivation of agricultural crops in conditions of natural moisture without taking into account the quality of seeds;

5) to increase the level of profitability of the production of high-quality environmentally safe wheat grain by 100-150% in comparison with generally

accepted technologies while preserving the natural fertility of the soil;

6) reduce the chemical and mechanical load on the soil by 30-35%;

7) to develop and introduce into production modern technologies for growing grain and technical crops under irrigation and under conditions of natural moisture;

8) to develop a multifactor optimization model for the production of ecologically safe winter wheat grain for the needs of sustainable economic development of Ukraine;

9) to determine the intensity and dynamics of the formation of biomass, leaf surface area, raw mass and dry matter of the studied field crops;

10) to determine the duration of straw decomposition of the winter wheat species studied;

11) to investigate the effect of MZURI PRO-Till technology on the yield of field crops, the phytosanitary condition of the soil and its fertility;

12) to present to scientists and specialists of agricultural formations the advantages of innovative developments and the possibilities of modern agricultural machinery of domestic and foreign production;

13) to significantly improve the quality of training and retraining of agribusiness specialists of the Southern region, their competitiveness;

14) to improve the quality of scientific and scientific-pedagogical staff, to raise the level of higher scientific qualifications by obtaining scientific degrees and academic titles;

15) obtain documents for objects of intellectual property law (patents, copyright certificate of Ukraine or other countries);

16) to gain practical skills in the future specialty by MNAU students;

17) to hold Field Days on the technology of growing new varieties and hybrids of agricultural crops with a demonstration of modern equipment, exhibitions of the latest agrochemical products, technical means of navigation and precision agriculture.

Based on the results of joint research in the field of crop production, land reclamation, etc., products will be developed for producers in the region:

1) recommendations for growing the most productive varieties and hybrids of agricultural crops, bio- and nanopreparations and their optimal concentrations for each agro-climatic zone of the Mykolaiv region;

2) recommendations on increasing the resistance of field crops to adverse environmental conditions and the possibility of stable formation of their

productivity regardless of weather conditions, at the expense of new agricultural technologies, which will ensure the possibility for producers to stably obtain crops 15-20% higher than traditional technologies;

3) operational and technological maps of growing crops using new PRO-Till technologies;

4) methodical recommendations with a biologized orientation of the PRO-Till innovative technology for growing agricultural crops with an explanation of economic and bioenergy indicators;

5) practical recommendations on the use of modern agricultural machinery of domestic and foreign production by farms engaged in the implementation of precision agriculture, PRO-Till technologies in the Steppe zone of Ukraine;

6) methodological recommendations for the use of unmanned aircraft for precision agriculture.

6. Resource provision of the Program

For the implementation of the Program of joint scientific research, the financial, intellectual and material resources of the Mykolaiv National Agrarian University, the company "MZURI WORLD", the official dealer of the company "MZURI WORLD",- LLC "AgriPrime", the Scientific Park "Agroperspektyva", the capabilities of the Innovative and educational cluster "Agrotechnics", the National innovation cluster "Soil Fertility", SEPC "Pivdenny", Training ground for transfer of modern technologies in agriculture, weather station with iMETOS decision-making support system.

Funds received from the implementation of joint scientific developments will be used to strengthen the scientific, educational and production base of Mykolaiv National Agrarian University.