

INNOVATIVE SOLUTIONS IN THE AGRICULTURAL SECTOR OF UKRAINE

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Abstract. *The directions of promoting the spread of innovative solutions in the agricultural sector of Ukraine are substantiated. It is established that the spread of systems of wet- and soil-saving agriculture will allow to rationalize the use of natural resources by ecological and economic components. The main advantages of soil-preserving systems are outlined. The prospects for the development of the organic direction in agriculture as an alternative resource-saving production system that increase the competitiveness of domestic farmers are noted.*

Key words: agrarian innovations; resource saving; soil-saving farming systems; organic production.

In the world, innovative technologies of agricultural production are currently used mainly in the field of tillage, drainage and irrigation, breeding and keeping of livestock, harvesting and storage of products, its transportation and sale, production of agricultural machinery and equipment.

One of the most defining current trends in world agricultural production is the widespread growth of resource-saving agriculture. Many governments are allocating considerable funds for this. For example, the US Department of Agriculture's Natural Resources Protection Service (USDA NRCS) allocates up to \$ 25 million annually for on-farm testing (on-farm trials). Funding goes directly to partners, which in turn provide technical assistance and incentive payments to producers to implement innovative approaches on their lands. Producers receiving On-Farm Trials payments must be eligible to participate in the Environmental Quality Incentives Program (EQIP). The maximum On-Farm Trials award for 2020 is \$5 million. The minimum award is \$250,000 [1]. In 2014-2020, out of almost 161 billion euros allocated for rural development, the EU SAP spent 44% on maintaining ecosystems in agriculture and forestry (biodiversity, water and soil management, climate change mitigation) [2].

In the agricultural sector of Ukraine, the process of resource conservation is not so large. Moreover, it can be stated that it is unsystematic, as well as insufficient emphasis on the innovation component. This, in particular, is a consequence of the actual self-removal of the state from the proper regulation of such activities. At the same time, further neglect of solving the problem of conservation and restoration of land and water resources of the country threatens to reduce levels of agricultural production and overall sustainability. The more so because it takes place in the background of the irresistible desire of a large number of domestic farmers to increase monoculture production.

Over the past 30 years, the area of eroded arable land in the country has increased by almost 2 million hectares (annual losses - 64 thousand hectares) and according to various estimates now amounts from 10 to 15 million hectares. Depleting land use threatens a soil-ecological crisis. Currently, there is a systemic excess of removal of substances from the soil over their receipt. Most (43%) of lands suffered due to loss of humus and nutrients as a result of improper cultivation of plants, 39% - due to over-compaction, and from siltation and crusting - 38% [3]. Compensation of nutrient removal for many years was provided by chemicalization, which led to reduced fertility and soil degradation. Today in Ukraine only half of the sown area is fertilized, and the doses of mineral fertilizers are 4-6 times less than technologically necessary, and organic - fifteen. This requires the widespread use of wet- and soil-saving farming systems, which allow to rationalize the use of natural resources in both environmental and economic components.

The main advantages of soil-preserving systems are:

- increasing of crop yields by 20% – 150% while reducing the cost of all resources;
- reducing the rate of application of mineral fertilizers and pesticides;
- strengthening the natural immunity of plants to pests and diseases;
- restoration of soil fertility;
- increasing the overall profitability of production;
- cultivation of ecologically clean crops that meet the standards of the European Union.

Economical technologies are not limited to abandoning plowing. In order to protect the soil from erosion and retain moisture, they also provide for the use of crop residues, special equipment, crop rotation

optimization, selection of mineral fertilizers and high-quality seed material. Equally important is taking into account the peculiarities of each field. Thus, along with the reduction of anthropogenic load on water and soil resources provides increased production efficiency by reducing production costs (by reducing the number and depth of tillage, combining several technological operations, saving material and technical means, etc.) and increasing crop yields (not least because of the improvement of soil structure).

The main soil protection technologies used in Ukraine and around the world are as follows.

Controlled Traffic Farming (controlled movement of equipment in the field) is the repeated use of a constant technological track of machinery, which allows a single paved track to work for several years, providing an accuracy of 2 to 3 cm. In areas where there was no travel of machinery, there is a tendency to slow but stable improvement of soil properties: formation of its looser structure, increase of water infiltration, unimpeded gas exchange, improvement of field germination and yield stabilization.

Strip Tillage involves only loosening the strip (usually in spring or autumn), in which sown crops. At the same time, about two thirds of the field remains uncultivated and conserve its natural structure. Successfully used in the United States and Canada mainly for row crops such as corn and soybeans. In recent years, this technology is gaining relevance in Germany.

No-Till and Mini-Till (zero and minimum tillage). With the use of such system, which is rather popular in Ukraine, the soil is not cultivated (or minimally cultivated), and its surface is covered with crushed plant residues (mulch). Absence of loosening of the soil prevents its water and wind erosion, promotes water preservation. With a certain decrease in yield compared to traditional agriculture, there is a reduction in labor and fuel costs. Requires special equipment.

Precision agriculture is characterized by crop productivity management taking into account the state of land resources and agricultural plants. Includes global positioning technologies, geographic information systems, technologies for yield assessment, variable rationing, remote sensing of the earth. According to forecasts, by 2050 precision agriculture will spread around the world, especially in regions with a large amount of arable land. In Ukraine, due to high initial investment, this technology is widely used mainly by large agricultural enterprises and holding companies, which are also directly involved in the development of related technological solutions, in particular, IT systems. The medium in size agribusiness mostly uses certain elements of such technologies.

Since a third of all arable land in Ukraine is eroded, the introduction of the above technologies is critical due to the risk of losing these lands as a productive resource. In addition, even when in use, these lands have lower productivity.

In the context of resource conservation and increasing the competitiveness of farmers, such a type of alternative management as organic production is of interest. In 2019 world organic agricultural land reached 72,3 million hectares that is 1,6% more, than in 2018. Besides almost 35 million hectares of non-agricultural areas are organic. Now 1,5 percent of the world agricultural land is occupied by organic production. This area increases mainly due to additional 0,9 million hectares in Europe. There were 3,1 million organic producers in 187 countries. The global organic market is growing to more than 106 billion euros and consumer demand is increasing [4].

In Ukraine, according to the Ministry for Development of Economy, Trade and Agriculture, in 2019 the total area of agricultural land with organic and transitional status was about 468 thousand hectares (or 1.1% of the total area of agricultural land), including agricultural lands with organic status - 384.5 thousand hectares. There were 617 operators of the organic market, 470 of them were agricultural producers. The capacity of the domestic market for organic products in 2019 was estimated at 36 million euros [5]. Domestic organic products are mainly export, in particular, European, orientation. The limited land resources suitable for organic production in the EU determine the presence of significant potential for the development of the sector in Ukraine.

It is estimated that increasing the share of organic crops to 7% in all agricultural lands of the country while maintaining the existing structure of sown areas will allow producers, in particular, cereals and legumes, which are reoriented to organic, to receive at least 60-160 euros of profit per 1 hectare of crops. The total amount of additional income will exceed 200 million euros.

The state is gradually adapting the legal regulation of production, circulation and labeling of organic products to the requirements of European organic legislation. Thus, in 2018 the relevant law was adopted and in 2019 put into effect, the normative legal acts envisaged by it are developed and implemented.

In summary, the problem of widespread distribution of economical farming systems in Ukraine is mainly the availability of sufficient financial resources and the ability of agricultural management to make

the right choice of alternative agricultural technologies, preferring not only the most cost-effective but environmentally friendly production processes.

Increasing the production of organic products, along with purely health and environmental effects, can significantly increase the incomes of Ukrainian farmers, their competitiveness and ability to further innovative development, as well as improve the balance of payments.

REFERENCES

1. CIG on-farm conservation innovation trials. URL: <https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/financial/cig/?cid=nrcseprd1459039>
2. Rural development programs 2014-2020. URL: https://ec.europa.eu/agriculture/sites/agriculture/files/rural-development-2014-2020/country-files/common/rdp-list_en.pdf
3. Natsionalna dopovid pro stan navkolyshnoho pryrodnoho seredovyscha v Ukraini u 2018 rotsi. URL: <https://mepr.gov.ua/news/35937.html> [National report on the state of the environment in Ukraine in 2018] [in Ukrainian].
4. World of organic agriculture. URL: <https://www.ifoam.bio/sites/default/files/2021-02/World%20of%20Organic%20Agriculture.pdf>
5. Orhanichne vyrobnytstvo v Ukraini. URL: <https://agro.me.gov.ua/ua/napryamki/organichne-virobnictvo/organichne-virobnictvo-v-ukrayini> [Organic production in Ukraine] [in Ukrainian].

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