Volume 4, Issue 11, November - 2026
ISSN (E): 2938-3781

Licensed under a Creative Commons Attribution 4.0 International License.

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

THE IMPORTANCE OF INTRODUCING INNOVATIVE TECHNOLOGIES AND THE EFFICIENT USE OF LAND AND WATER RESOURCES IN AGRICULTURE

Ismailova Khalavat Djabarovna
Professor, Candidate of Agricultural Sciences

Abstract
This article discusses the use of innovative technologies in agricultural development, the rational use of land and water resources, increasing crop yields and improving product quality. It also analyzes the scientific and practical aspects of applying modern irrigation technologies, maintaining soil fertility, using mineral and organic fertilizers efficiently and developing environmentally sustainable farming. The economic and environmental efficiency of introducing digital technologies, automated control systems and resource-saving methods in agriculture is substantiated.

Keywords: agriculture, innovative technologies, land resources, water-saving technologies, drip irrigation, soil fertility, crop yield, organic fertilizers, digitalization, environmental sustainability.

Introduction

Today, the growing world population, the rising demand for food products and the limited availability of natural resources call for further development of the agricultural sector. In particular, climate change, water scarcity, declining soil fertility and environmental problems create the need to develop new approaches in the agrarian sector. Agriculture is one of the most important sectors of the national economy. Its development is essential not only for ensuring food security but also for increasing employment, supplying industrial enterprises with raw materials and expanding export potential. In the conditions of Uzbekistan, the efficient use of land and water resources occupies a special place in agricultural development. The natural and climatic conditions of the country, the uneven distribution of precipitation across regions and the great importance of irrigated land require the wide introduction of water-saving technologies. For this reason, applying innovative technologies in agriculture, modernizing production processes and using scientific achievements are among the most urgent tasks of today.

The role of innovative technologies in agriculture. Innovative technologies make it possible to increase the efficiency of agricultural production, reduce labor costs and improve product quality. At present, modern technologies are widely applied in crop and livestock production in developed countries. In particular, GPS devices, drones, soil moisture sensors, automated irrigation systems and digital monitoring tools are becoming increasingly important in the activities of farms.

Drones can be used to monitor the condition of crop fields, assess the level of plant development and detect the spread of diseases and pests at an early stage. This helps to carry out agrotechnical measures on time and to prevent unnecessary costs.

Digital technologies make it possible to monitor soil moisture, temperature and salinity, as well as the nutrient requirements of plants. As a result, the efficiency of water and fertilizer use increases.

Volume 4, Issue 11, November - 2026
ISSN (E): 2938-3781
Licensed under a Creative Commons Attribution 4.0 International License.

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Rational use of land resources and improvement of soil fertility. Land is the main means of production in agriculture. Maintaining and increasing soil fertility is one of the key conditions for growing agricultural products. Soil fertility is influenced by the mechanical composition of the soil, its humus content, moisture, acidity and the mineral elements it contains. Nitrogen, phosphorus and potassium are especially necessary for the normal growth and development of plants. The use of organic fertilizers is of great importance for increasing soil fertility. Manure, compost and other organic substances increase the humus content of the soil, improve its physicochemical properties and activate beneficial microorganisms.

In addition, the introduction of crop rotation improves the supply of nutrients to the soil. Growing the same crop in one field for a long period may deplete certain elements in the soil and increase the spread of diseases. Including legumes in crop rotation helps enrich the soil with biological nitrogen. This, in turn, may reduce the need for mineral nitrogen fertilizers to a certain extent.

Use of water-saving technologies. Water resources are among the most important factors in agricultural production. Under irrigated farming conditions, inefficient water use can lead to soil salinization, water losses and lower crop yields. Therefore, the use of drip irrigation, sprinkler irrigation and automated irrigation systems is of great importance. In drip irrigation technology, water is delivered directly to the plant root zone through special pipes and emitters. This reduces evaporation and surface runoff, and plants are regularly supplied with the required amount of moisture.

The advantages of this technology include: economical use of water resources; improved water supply to plants; limited weed development; the possibility of applying fertilizers together with irrigation water; reduced labor and production costs; and higher yields and product quality for certain crops.

However, the efficient use of a drip irrigation system requires monitoring water quality, cleaning filters regularly and providing technical maintenance of the equipment.

Efficient use of mineral and organic fertilizers. Plants obtain the nutrients necessary for their growth and development from the soil. When the soil does not contain sufficient nutrients, crop growth slows down and yields decrease. Nitrogen, phosphorus and potassium contained in mineral fertilizers take part in the main physiological processes of plants. Nitrogen plays an important role in the formation of vegetative mass, phosphorus in root system development and energy metabolism, and potassium in water exchange and in increasing plant resistance to unfavorable conditions. Fertilizer application should be based on the results of agrochemical soil analysis, because excessive use of fertilizers may cause not only economic losses but also pollution of soil and water resources.

From this point of view, it is advisable to apply mineral fertilizers in combination with organic fertilizers. Such an approach helps to maintain soil fertility over the long term and to ensure ecological balance.

Ensuring environmental sustainability in agriculture. Taking environmental factors into account in agricultural activities is an important condition for protecting natural resources. Improper use of pesticides, mineral fertilizers and other chemicals can pollute the soil, water and atmospheric air. In environmentally sustainable farming, an important role belongs to biological protection agents, organic fertilizers, crop rotation and minimum tillage technologies. Biological protection methods are based on controlling pest populations with the help of natural enemies and biological

Volume 4, Issue 11, November - 2026
ISSN (E): 2938-3781
Licensed under a Creative Commons Attribution 4.0 International License.

preparations. These methods help reduce the need for chemical pesticides.

Moreover, composting plant residues and reusing them reduces the amount of organic waste. As a result, the opportunities for the integrated use of resources in the production process expand.

Promising directions for agricultural development. In the future, the development of the agricultural sector will be directly linked to science, innovation and modern technologies.

First, digital management systems need to be widely introduced in agriculture. This will allow farms to monitor the condition of crop fields and production processes promptly.

Second, the expansion of water-saving technologies will make it possible to use the available water resources more efficiently.

Third, soil fertility should be monitored regularly, and the fertilization system should be improved on the basis of agrochemical analyses.

Fourth, it is important to develop and use crop varieties that are adapted to local conditions and tolerant to drought and salinity.

Fifth, cooperation between research institutions, higher education institutions and production enterprises in agriculture should be strengthened.

The development of these directions will help to increase the volume of agricultural production, improve economic efficiency and strengthen food security.

CONCLUSION

In conclusion, developing agriculture on the basis of modern innovative technologies is one of the most important tasks of today. The rational use of land and water resources, the preservation of soil fertility, the application of mineral and organic fertilizers at scientifically based rates and the introduction of digital technologies into production make it possible to increase the efficiency of the agrarian sector. In particular, the use of drip irrigation and automated monitoring systems is important for saving water resources, improving crop growing conditions and reducing production costs. In addition, the development of environmentally safe agricultural technologies, the use of biological protection agents and the wide application of organic fertilizers help to maintain soil fertility over the long term.

In the future, the wide introduction of scientific achievements and innovative technologies in agriculture will make it possible to increase the efficiency of crop production, ensure food security and further strengthen the country's export potential.

REFERENCES

1. H.D.Ismoilova, G.E.Eshdavlatova. Analysis of soil composition in experimental areas where scientific research is conducted. E3S Web of Conferences 539, 01022 (2024). https://doi.org/10.1051/e3sconf/202453901022. RSE-III-2024.

2. G.Eshdavlatova, Kh.Ismailova, O.Rakhimov. Application of Strengthening Compositions in Floral Printing on Mixed Fiber. *AIP Conf. Proc.* 3243, 020022 (2024) https://doi.org/10.1063/5.0247303

3. Eshdavlatova G.E., Ismailova Kh.Dj. Effect of antifoaming reagents and their comparative study // Uzbek Chemical Journal. Tashkent, 2026. No. 3. pp. 113-118. (in Russian)

4. Bespalov N.F. Reclamation and irrigation of crops in cotton crop rotation. Tashkent, 1992. (in Russian)

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Licensed under a Creative Commons Attribution 4.0 International License.

5. Eshdavlatova G.E. Determination of the amount of hydrogen sulfide in alkanolamine during the purification of natural gas from acidic components. Universum: Technical Sciences. Issue 10(139). October 2025. Part 8. pp. 27-30. Moscow. (in Russian)
6. Eshdavlatova G.E., Ismoilova Kh.Dj. Determination of the content of heat-stable salts in alkanolamine solution // Scientific Bulletin of Namangan State University. Namangan, 2026. No. 3. pp. 213-217. (in Uzbek)
7. Eshdavlatova G.E., Kamalov L.S. Determination of the amount of carbon dioxide in various units in amine solutions. Universum: Technical Sciences. Issue: 10(127). October 2024. Part 4. 55-58 p. Moscow.
8. Allen R.G., Pereira L.S., Raes D., Smith M. Crop Evapotranspiration: Guidelines for Computing Crop Water Requirements. FAO Irrigation and Drainage Paper 56. Rome, 1998.

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8