

**SCIENTIFIC AND TECHNICAL SOLUTIONS FOR THE MAINTENANCE OF  
AGRICULTURAL MACHINERY IN UZBEKISTAN IN ACCORDANCE WITH MODERN  
REQUIREMENTS**

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**Abstract:** Research on scientific and technical solutions for the maintenance of agricultural machinery holds significant importance in the field of modern agrotechnology. In order to ensure the efficient performance and uninterrupted operation of agricultural machinery, modern methods, technologies, and tools for technical maintenance have been developed. These studies discuss scientific analyses aimed at servicing processes during the production phase of machinery, their repair, modernization, and preventive inspections, as well as the application of innovative technologies and automation.

The objective is to effectively organize all technical maintenance processes during the production and operational phases of agricultural machinery, ensuring continuity and reliability in their usage. Furthermore, the research focuses on developing and implementing new, user-friendly, environmentally safe, and adaptable technical solutions suited to changing conditions.

**Keywords:** machine-tractor fleet, classification, basic and regional models, malfunctions, service, technical maintenance, maintenance point, quantity, repair.

## **Introduction**

In many countries around the world, scientific, practical, and innovative research is being conducted to address the challenges of ensuring the efficient year-round use of mechanized tools in agricultural production. Scientific and technical solutions for the maintenance of agricultural machinery are crucial for meeting the needs of evolving agricultural practices. In Uzbekistan, solutions tailored to the modern era can be grounded in the following key aspects.

## **Automation and digitalization**

Automating and digitalizing the technical maintenance of agricultural machinery significantly improves operational efficiency. Through modern monitoring systems and cloud-based technologies, accurate data on the condition of machinery can be obtained in real time. This enables rapid response, effective technical servicing, and the timely organization of preventive maintenance tasks.

## **Region-specific maintenance services**

Due to the diverse climate and terrain in various regions of Uzbekistan, regionally adapted solutions are necessary. Mechanical service and repair centers must be designed to meet local conditions and requirements, which includes the implementation of specialized tools and technical equipment suited for regional use.

### **Ensuring uninterrupted operation of machine aggregates**

To guarantee the uninterrupted operation of agricultural machinery, timely preventive maintenance, the use of modern equipment, and high-quality spare parts that meet current standards are essential. Incorporating electronic systems and advanced materials helps reduce operational failures and increase overall efficiency.

### **Training and Professional Development of Personnel**

The effective organization of technical maintenance services requires highly qualified specialists. Therefore, training and retraining processes for personnel must be scientifically guided. Collaboration with higher education institutions is necessary for integrating modern technologies into practical training and service provision.

### **Energy efficiency and reducing environmental impact**

Agricultural machinery must comply with energy-saving requirements and environmental standards. The use of new technologies, cyber-physical systems, and energy-efficient equipment represents one of the most promising directions for minimizing environmental impact while maximizing operational productivity.

### **Improving the logistics system of maintenance services**

Efficient logistics systems are critical for the timely repair of machinery and the delivery of spare parts. Such systems ensure effective and uninterrupted maintenance services, thereby enhancing the reliability and sustainability of agricultural operations.

### **Innovative methods in technical maintenance**

Newly introduced technologies such as 3D printing, robotic repair systems, and intelligent guidance software are transforming the way agricultural machinery is serviced. Integrating these innovations with scientific research and industrial applications can significantly enhance the effectiveness and sustainability of technical maintenance systems.

## **CONCLUSION**

In the context of Uzbekistan, providing modern maintenance services for agricultural machinery requires a focus on automation, the adoption of innovative technologies, adherence to environmental standards, and adaptation to local conditions. Achieving these goals necessitates a coordinated system of operations and the involvement of highly qualified professionals.

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