

# MANAGEMENT OF AGRICULTURAL MACHINERY FLEET BASED ON INNOVATIVE SYSTEMS AND MECHANISMS

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**Abstract.** *This article provides recommendations for managing the fleet of agricultural machinery*

*based on innovative technical systems and improving the mechanism for providing technical services. In particular, the need to manage the fleet of agricultural machinery of clusters specializing in cotton and textile production based on innovative technical systems is recognized. Innovative technical systems are recommended to introduce technical service departments (operation of the agricultural machinery fleet, routine maintenance and storage), technical (dealer) service departments (provision of mobile and stationary services, provision of spare parts), service departments for the restoration of agricultural machinery and equipment (purchase, repair and resale of faulty machinery and equipment, restoration of resources of parts and spare parts, replacement of parts, spare parts and sale), departments of integration of science and production (application of innovative equipment and technologies in production, introduction of achievements of science and technology in production, advertising of new innovative equipment and technology).*

**Keywords:** *agricultural machinery park, technical system, cluster, service, resource, restoration, sale.*

**1. Introduction.** In the process of production of agricultural products, various agricultural techniques are used, taking into account the agrotechnics of each cultivated type of crop. In accordance with this, further improvement of agricultural production, providing agriculture with high-quality equipment, updating, maintenance, repair, diagnostics, long-term storage of agricultural equipment, providing the agricultural sector with modern agricultural equipment suitable for the natural climate and soil conditions of the regions, introduction of new models of agricultural machinery into production, full implementation of machinery service, ensuring the harmony of production with science, training of qualified personnel in the areas of agricultural machinery use and technical service, determining personnel needs, expanding the dealer network, rural.

The state is paying special attention to the organization of service centers serving the park of farm machinery.

Typically, agricultural machinery service consists of machinery sales, spare parts supply, logistics, maintenance and repair, and quality analysis services.

**Existing problems.** The problem in this matter lies in the fact that the service of agricultural machinery lacks sufficient technological equipment and specialists for maintenance and repair work, and its implementation in non-specialized conditions causes an increase in the cost of the work performed in this case, as low quality indicators of their suitability for work [1, 2].

Analyses indicate that the loss of 2/3 of working time in mechanized field work is due to poor organization of maintenance and repair of agricultural machinery [3, 4]. This requires qualified employees with a master's or engineer's qualification, who carry out service of modern agricultural machinery using IT-technologies.

In leading foreign countries, in particular, the European Union and the USA, agricultural machinery service is carried out by specialized companies. Most farmers in these countries do not have their own service facilities. Service of agricultural machinery is carried out by dealers.

In the conditions of Central Asia, including the Republic of Uzbekistan, improving the mechanisms for providing the agro-industrial complex with agricultural machinery, increasing the efficiency of the provision of mechanized and service services, high-performance, modern agricultural machinery that meets the climatic and soil conditions, fleet renewal, maintenance, repair, diagnostics, long-term storage, comprehensive maintenance, expansion of the dealer network, creation of regional service centers are topical issues.

Today, in the use of the park of agricultural machinery, it is first necessary to improve their usage indicators, to use the most modern methods of increasing work productivity, and to introduce new procedures and rules for the organization of the work to be performed.

It should be noted that a single interconnected system of production, delivery, technical service of agricultural machinery for the agricultural sector of our Republic and provision of mechanized technical services to producers of agricultural products has been created, and agricultural enterprises and organizations have achieved re-equipment of parks of agricultural machinery.

Nevertheless, improvement of technical and technological services of agricultural equipment parks is required. In addition, many problems such as full mechanization of agricultural production, effective use of machinery, timely and quality performance of agrotechnical measures, control, adjustment of aggregates to agrotechnical requirements, analysis of performance indicators, operative elimination of malfunctions, diagnostics and proper maintenance will not find their solution.

The solution to the problem. To increase the level of use, it is necessary to technologically and technically modernize the cultivation of crops based on innovative and digital technologies based on precision farming, introduce monitoring, determine and justify the optimal need for equipment, effectively use the fleet of vehicles, and improve the mechanism for providing technical services.

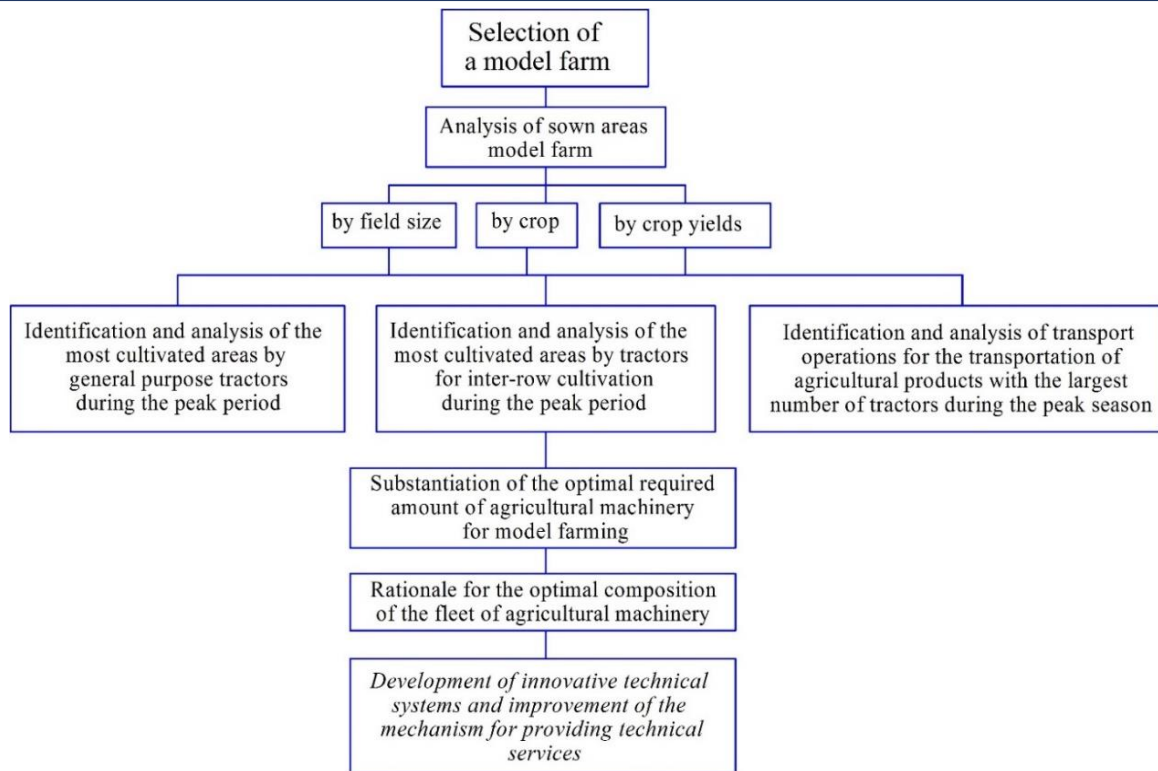
To do this, it is necessary to manage the fleet of foreign and domestic agricultural machinery based on innovative technical systems, create and manage new service systems.

To this end, a model for the efficient use of the agricultural machinery fleet and an improved technical service delivery mechanism is recommended (Fig.1).

#### **Analyzes and results.**

The research work was carried out in Sirdarya district of Sirdarya province. At the first stage, taking into account soil and climatic conditions, economic and organizational orientation of farms of the district growing agricultural products the land areas determining the volume of mechanized works were analyzed (Table 1).

In the second stage, the most cultivated areas with general-purpose tractors during the peak period were analysed on the basis of standard flow charts (Table 2).



**Table 1**

***Land of the Syrdarya district determining the amount of mechanized works***

№	Types of crops	Allocated area, ha
1.	Cotton	8000
2.	Open areas for cereal crops	4903
3.	Cotton intercropping areas for cereal crops	5097
4	Areas for repeated crops, including:	10000
-	vegetables	1900
-	potatoes	100
-	gourds	500
-	legumes	4400
-	rice	1500
-	forages	1600

**Table 2**

***The most cultivated areas with general-purpose tractors during the peak period (production process-autumn ploughing)***

№	Types of crops	Total area, ha	Tillage area, ha
1.	Cotton	8000	2900
2.	Cereals	10000	-
3.	Repeat crops under cereals		
-	maize	1600	1600
-	vegetables	1900	1900
-	gourds + potatoes	600	600
-	other crops	5900	5900
	<b>Total:</b>	<b>18000</b>	<b>12900</b>

The third stage analysed the most cultivated areas with inter-row cultivation tractors during the peak working period in the inter-row cultivation of cotton and maize (Table 3).

**Table 3**

***The most cultivated areas with inter-row cultivation tractors during the peak period  
(production process - inter-row cultivation)***

№	Types of crops	Total area, ha	Sown area, ha
1.	Cotton	8000	8000
2.	Cereals	10000	-
3.	Repeat crops under cereals		
-	maize	1600	1600
-	vegetables	1900	-
-	gourds + potatoes	600	
-	other crops	5900	
	Total:	18000	9600

**Table 4**

***Identification and analysis of transport operations for the transport of agricultural products  
with the highest number of tractors in the peak season***

№	Types of crops	Total area, ha	Harvest, tonne	Transported within the specified time, tonnes
1.	Cotton	8000	24500	24500
2.	Cereals	10000	49200	-
3.	Repeat crops under cereals			
-	maize	1600	41600	-
-	vegetables	1900	34200	-
-	gourds + potatoes	600	11500	-
-	other crops	5900	8900	8900
	Total:	18000		33400

Agriculture in our republic has switched to the "Cluster" system. The existing fleet of agricultural machinery has been renewed, with modern, powerful and efficient agricultural machinery. In short, the Clusters are fully formed with modern fleet of agricultural machinery. These new, modern, powerful and efficient machines are equipped with a more extensive automatic control system and electronics with hydraulic and electric transmission (on-board computer), which, technically, have a very sophisticated design. The actual problem can be effectively solved by managing the fleet of agricultural machinery on the basis of innovative technical systems and improving the mechanism of technical services. It is known that the quantity and quality of the fleet of agricultural machinery depends on the land area, location of the operating farm, soil and climatic conditions.

It is known that agricultural clusters play an important role in the economies of countries. It is analyzed and based on the works of such scientists as A.A. Nastin, A.S. Khukhrin, V.N. Samarukh, including the works of Doctor of Economic Sciences, Professor M. Rakhmatov.

However, it should be noted that the fleet, quantity, composition and efficient use of agricultural machinery necessary for the cultivation of crops in newly created and existing clusters in our country, including the creation of machine-tractor units at the level of the capabilities of

powerful tractors and modern agricultural machinery, remains sufficient questions, how to calculate the optimal composition of an energy-saving unit with an agricultural machine, how to choose an energy-saving unit and an agricultural machine for aggregation, the required quality of a technological operation, which should be carried out under certain working conditions, ensuring maximum productivity and minimum fuel consumption, i.e., the possibility of achieving minimum energy consumption, are not considered [5].

Therefore, the cluster system requires a deeper integration of science, education and production of a set of enterprises united in a single technological chain, and the rapid introduction of new innovative technologies into practice.

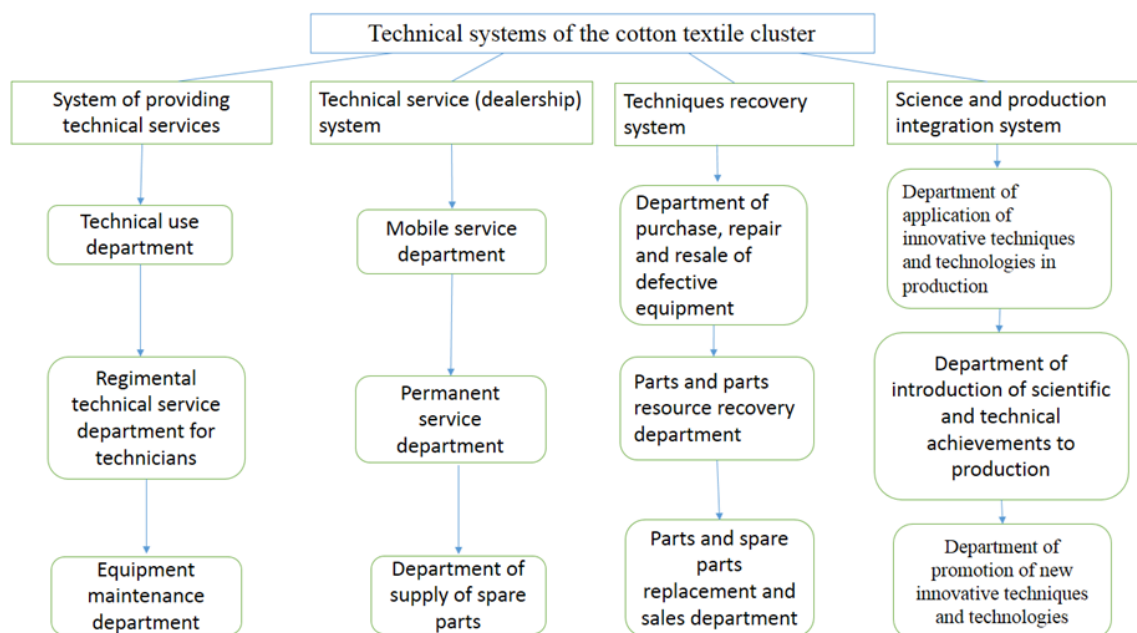
In particular, the topical issue is the creation of new systems of technological and maintenance, the development of norms and rules for the management of foreign and existing agricultural machinery based on innovative technical systems and an increase in the level of their use.

In the "Cluster" system, it is necessary to train highly qualified mechanical engineers who manage the equipment equipped with modern computer and control systems based on innovative technical systems to effectively manage the park of agricultural machinery on the basis of innovative technical systems. During the transition of agricultural production to a new stage, it is inevitable that the demand of employers, including the "Cluster" system, for personnel of this level will increase significantly.

The results of the analysis of production conditions show that the need for highly qualified specialists in this field is predicted to be at least 5-10 people per year in each cluster and have a steady growth trend.

It is recommended that the technical systems of the clusters specialized in cotton-textile production include the provision of technical services, technical service (dealership), restoration of equipment, science and production integration systems.

Each system has its own departments that ensure the perfect functioning of the systems.



The system of technical services includes departments of using equipment, regular maintenance of equipment and maintenance of equipment. The Department of Equipment Use is engaged in contract performance of energy-intensive agrotechnical activities (ploughing,

harrowing, deep loosening, harvesting, etc.) with the help of high-efficiency (tractors, grain harvesters, cotton picking machines, etc.) aggregates in the park. The department of regulatory maintenance of equipment is engaged in the activity of ensuring the serviceability of the fleet of equipment, malfunctions that occurred during use, and the operative execution of required adjustments. Equipment maintenance department is engaged in the preparation of tractors and agricultural machines in the park for short or long term storage after the end of the season, during the storage period and during the removal from storage.

Technical service (dealership) system includes departments of mobile and stationary service and provision of spare parts. The mobile service department is engaged in operative elimination of breakdowns, breakages, and malfunctions of high-performance (tractors, grain harvesters, cotton picking machines and other) aggregates during the performance of agrotechnical activities in field conditions with the help of specially equipped mobile workshops and vehicles. The permanent service department is engaged in the elimination of difficult and complex malfunctions in stationary conditions with the help of qualified specialists, modern equipment and tools. The spare parts supply department monitors, analyzes and manages the full supply of spare parts stock in the agricultural machinery fleet and their causes.

The machinery restoration system includes the departments of buying, repairing, repairing and reselling defective machinery, restoring parts and spare parts resources, and replacing and selling parts and spare parts. Purchase, assembly and resale of defective equipment is a fully specialized, all-material technical base, engaged in the purchase, disassembly, assembly, assembly and resale of defective equipment. The parts and spare parts recovery department is fully specialized and engaged in the necessary parts and spare parts recovery activities in the disassembly, assembly, repair and assembly of defective machinery, provided with all material technical base. Parts and spare parts replacement and sales department carries out the sale of remanufactured parts and spare parts and the collection of remanufactured parts and spare parts.

The system of integration of science and production includes departments of application of innovative techniques and technologies in production, implementation of scientific and technical achievements in production, and promotion of new innovative techniques and technologies. The Department of Application of Innovative Techniques and Technologies in Production is engaged in economic and technical analysis, selection and application in production of new innovative techniques and technologies suitable for the natural climatic conditions of the region, parameters of land areas and types of agricultural products produced. The Department of Implementation of Science and Technology Achievements in Production deals with the activities of finding, examining, sorting, selecting and introducing new technical solutions based on energy and resource efficiency. The Department of Promotion of New Innovative Technologies and Technologies is engaged in the activities of promoting (advertising) innovative technologies and technologies created in our country and abroad, organizing exhibitions, concluding contracts for the purchase and delivery of technologies.

The number of systems, the number of departments in the systems may be improved, new departments may be opened or reduced, and the requirements for qualified personnel may change, depending on the experience gained during the period of activity, the level of technical, economic, and social activity.

### **Conclusions**

In the conditions of the clusters of our republic, it is necessary to create a model service system, such as managing the park of agricultural machinery based on innovative technical systems and improving the technical service provision mechanism.

In improving the management system of the park of agricultural machinery, it is necessary to specialize the activities of technical services, expand the technical service (dealership) network, rehabilitate equipment, and integrate science and production.

Effective management of the park of agricultural machinery with a technically modern, highly complex design should be carried out on the basis of technical service and innovative technologies.

It is recommended to manage the park of agricultural machinery on the basis of innovative technical systems, to improve the mechanism of providing technological and technical services, and to introduce the mechanism of attracting qualified personnel in model Service Centers at the district level.

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