EPRA International Journal of Agriculture and Rural Economic Research (ARER)- Peer-Reviewed Journal
Volume: 14 | Issue: 2 | February 2026 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2026): 8.801| ISSN: 2321 – 7847

ANALYSIS OF FOREIGN EXPERIENCES IN PROVIDING TECHNICAL SERVICES TO IMPROVE THE TECHNICAL POTENTIAL OF AGRICULTURE

Shakhzod Madiev
International Center for Strategic Development and Research in Food and Agriculture, Tashkent, Uzbekistan

Article DOI: https://doi.org/10.36713/epra26239
DOI No: 10.36713/epra26239

ANNOTATION----------
This article analyzes the theoretical foundations of improving the technical service system and advanced foreign experiences in increasing the technical potential of agriculture. The study scientifically substantiates the impact of the effective use of equipment, the development of service infrastructure, and increasing the level of mechanization on production efficiency. Models from France, Senegal, Mali, Nigeria, India, Germany, China, and Japan were studied as foreign experiences. The results of the analysis show that increasing technical capacity is effectively carried out not only by expanding the fleet of equipment, but also by organizing service services on a centralized and cooperative basis, distributing costs, increasing the intensity of equipment use, and introducing digital management mechanisms. The article develops scientific and practical proposals for adapting these experiences to national conditions.

KEYWORDS: *Technical Potensial, Technical Support, Foreign Experience, Model, Technical Service, Machinery, Mechanization.----------*

INTRODUCTION

Today, the role of technical support in the sustainable development of the agricultural sector and increasing its competitiveness is incomparable. In particular, the full mechanization of all stages of agricultural production processes - from planting to harvesting, and the introduction of modern equipment and technologies allow increasing labor productivity and improving product quality (Madiyev, 2025). However, breakdowns of existing equipment, shortages of spare parts, and poor service negatively affect the efficiency of agricultural production. Therefore, establishing a system of fast and reliable service for equipment is one of the urgent tasks.

The Food and Agriculture Organization of the United Nations (FAO) says that sustainable mechanization helps develop food supply chains and ensures the sustainability of production (FAO, 2025).

A report by the Organization for Economic Cooperation and Development (OECD) notes that modern technology and innovation play an important role in ensuring environmental sustainability in agriculture (OECD, 2019).

Experts believe that the lack of agricultural machinery negatively affects production efficiency. According to Chayanov, the use of machinery in agricultural production allows expanding the production capacity of peasant farms, facilitating labor and saving time. He calls the introduction of machinery "a means of increasing labor efficiency" (Chayanov, 2014).

The experience of foreign countries shows that effective organization of technical maintenance ensures the continuity of production and increases efficiency. Along with the modernization of equipment, effective organization of technical maintenance is a key condition for increasing efficiency in agriculture.

MATERIALS AND METHODS

Today, in foreign countries, there are models of agrotechnical services for providing technical support to farmers and agricultural producers (Table 1).

The Coopérative d'Utilisation de Matériel Agricole (CUMA) model (Herbel et al., 2015) was originally developed in France and is currently widely used as a scientifically based and proven institutional mechanism for the use of machinery in agriculture. This model is aimed at increasing the level of mechanization of farms in conditions where individual ownership of agricultural machinery is limited, and involves organizing the joint purchase and use of machinery on a cooperative basis (Nouwogou, 2016). This allows increasing the level of equipment availability not at the level of individual farms, but at the cooperative level. In the CUMA model, the use of equipment is controlled on the basis of special schedules and internal regulations, which reduces seasonal idleness

Volume: 14 | Issue: 2 | February 2026 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2026): 8.801| ISSN: 2321 – 7847

of equipment and increases the intensity of its use. At the same time, the distribution of costs related to the purchase, depreciation, repair, service and insurance of equipment among cooperative members reduces production costs. In addition, the joint employment of permanent mechanics and technicians within the CUMA framework ensures the constant availability of equipment, reduces breakdowns and forced downtime, and creates conditions for the timely and high-quality implementation of agrotechnical measures. As a result, the French experience confirms that the CUMA model plays an important role in increasing the economic efficiency of agricultural production and achieving sustainable productivity growth by ensuring the interaction between the level of equipment availability, the intensity of equipment use and the service infrastructure.

Table 1
Models of technical support for farmers and agricultural producers in foreign countries

№	Model name	Countries	Year of implementation	Today's activity status	Brief working mechanism
1	Cooperative d'usage de matérial agricole (CUMA)	France	1997	Active, widespread	Farmers join together in a cooperative to jointly purchase and use machinery; operators are owned by the cooperative; maintenance and planning are centralized
2	Center for Mechanized Services (CEMA)	Senegal	2014	Active (public + private sector)	Technical services are provided through mechanization service centers on a paid basis; equipment is the property of the center.
		Mali	2014	Active (regional)	Just like in Senegal: small farmers don't buy machinery, they use it as a service
3	“Hello Tractor”	Nigeria	2014	Active, has some drawbacks	Digital platform: farmer creates an order for technical service via SMS/app; payment is made remotely
4	Custom Hiring Centers (CHC)	India	2011	Very active, supported by the state	Farmers do not buy machinery, but rent it from the public or private sector.
5	Machinery Rings (Mashinenringe)	Germany, Austria	1958	Very stable and widespread	Farmers rent their equipment to others through the association, and the center plans and coordinates maintenance.
6	Agricultural Machinery Service Centers (AMSC)	China	2004	Very large-scale, state-subsidized	The technical center is owned by the center, and agrotechnical work is provided as a full service.
7	JA Group Machinery Sharing System	Japan	1990	Very effective	The cooperative purchases the equipment and distributes it among farmers according to a plan, and technical maintenance is the responsibility of the cooperative.

The Center for Mechanized Services (CEMA) model involves managing machinery through specially organized mechanization centers rather than at the level of individual farmers. This model has been implemented in Senegal and Mali since 2014 with the participation of government and international organizations, and aims to meet the demand for machinery in areas where small farms are located. In the CEMA model, tractors and their corresponding aggregates are concentrated in a fleet of equipment formed on the basis of the state or public-private partnership, and services are provided to farmers for basic agrotechnical work such as plowing, sowing and harvesting at fixed rates, as a result of which the need for the purchase of equipment requiring high capital costs for farms is eliminated. The fact that the equipment is owned by CEMA centers and operated by specially trained mechanics ensures the continuity of technical service.

The low level of effective use of machinery in agriculture in many countries is explained, first of all, not by a lack of machinery, but by the economic and organizational inadequacy of the existing machinery in a given region for production processes. This problem is especially evident in African countries, where a large part of the machinery is concentrated in the possession of large farms, while small farmers are forced to perform agricultural work

Volume: 14 | Issue: 2 | February 2026 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2026): 8.801| ISSN: 2321 – 7847

manually. In such conditions, the "Hello Tractor" model has been formed as another alternative, which offers an approach to the above-mentioned problems through a digital platform.

This model was first introduced in Nigeria, and its conceptual basis is not cooperative ownership of machinery, but rather an effective connecting mechanism between existing machinery owners and small farmers or producers. The Hello Tractor platform uses a mobile application and GPS technology to record the movement of machinery (Sims and Kienzle, 2017), operating time and the volume of work performed in real time, making the service economically attractive for machinery owners and significantly expanding the possibilities for farmers to easily implement mechanization work.

Real indicators show that by 2022-2023, more than 3 million small farms will have used mechanization services through the Hello Tractor system, and the number of tractors connected to the platform will exceed twelve thousand. In this regard, the Hello Tractor model is distinguished by the fact that it increases technical capacity not by expanding the fleet of equipment, but by digital coordination and eliminating information asymmetry.

In areas with small land areas or seasonal income, the purchase and ownership of machinery is associated with high financial risk, which leads to low levels of mechanization. This problem is also typical for Indian agriculture, and it is in this context that the state-run Custom Hiring Centers (CHC) model was introduced.

The CHC model is established on the basis of state initiative and financial support, in which tractors, combines and other basic agricultural machinery are centrally purchased and provided to farmers as a service for agrotechnical work. In this model, the ownership of the machinery is not imposed on the farmer, but the use of the machinery is carried out through subsidized tariffs set on a hectare or hourly basis, which makes mechanization work an economically viable option for small farmers. These centers are established mainly in rural areas.

The Machinery Rings (Maschinenringe) model, introduced in Germany to ensure the efficient use of agricultural machinery, is a service system organized on a cooperative basis. This model was formed in Bavaria in the 1950s and currently operates in almost all parts of Germany, with approximately 230 local machinery rings with 192,000 members (Hastedt, 2016). In the Machinery Rings system, farmers voluntarily join a regional "ring" and offer their machinery or labor resources as a service to other members. The main essence of the system is aimed at sharing machinery, increasing its load and reducing costs. The "ring" center coordinates orders, draws up a service schedule and makes financial calculations. This ensures full and efficient use of machinery. The advantage of this model is that it allows farmers to use machinery that requires large investments without purchasing them individually. This is especially important for small and medium-sized farms. At the same time, the level of utilization of machinery increases, depreciation costs are reduced, and the quality of service improves. In some regions, "rings" additionally provide services in the fields of logistics, construction and energy, which strengthens their economic stability.

Agricultural Machinery Service Centers (AMSC) are a system aimed at organizing the use of agricultural machinery on a centralized service basis, which has been introduced and is actively operating in China. The AMSC model gained institutional support in China in 2004 with the adoption of the Law on the Promotion of Agricultural Mechanization (Zou et al., 2024). Since 2008, it has been expanded through state subsidies. As a result, mechanization services have become economically viable for small and medium-sized farms. The main essence of this model is that farms do not purchase expensive tractors, combines and other agricultural machinery. Instead, they order agrotechnical work from specially organized mechanization service centers. The centers perform plowing, sowing, fertilizing, harvesting, transportation and other mechanized work on a fee-based basis.

RESULTS AND DISCUSSION

Having studied the mechanism of foreign practices above and other service systems, the introduction of an escrow system can be an effective solution to solving existing problems. The escrow system is a system of guaranteed financial settlements between a service provider and a client (farm) through a third party (bank or special organization). This system is defined in the sources as follows: "Escrow is derived from the English word "escrow" and means the storage of money or property. Its essence is a legal mechanism that provides for the freezing of funds paid by the customer of the work, the customer of the service or the recipient of the goods, and the storage of funds paid by the other party until its obligation is properly fulfilled.

In this way, the risk of the person performing the work, performing the service, or delivering the goods being unable to receive payment for the work, service, or delivery of the goods is reduced. In turn, the risk of the other party being left without the work, service, or goods after paying for them is reduced."

Volume: 14 | Issue: 2 | February 2026 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2026): 8.801| ISSN: 2321 – 7847

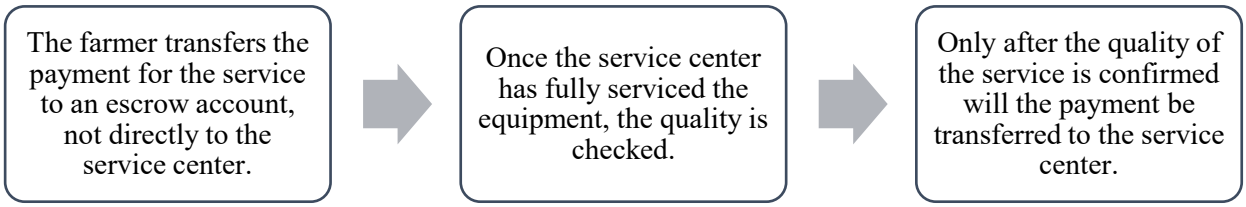
To address this issue, it is proposed to introduce an escrow mechanism into the agricultural technical service system, based on the guaranteed implementation of financial obligations through a third party. This mechanism is based on a tripartite institutional relationship: the farm (customer), the technical service provider (executor), and a bank or authorized financial institution (escrow agent).

The proposed mechanism is implemented in 3 stages.
At the first stage, a contract is concluded between the farm and the service organization, which clearly defines the volume, duration, price and quality of technical services. The contract specifies the criteria for evaluating the results of the service, the procedure for accepting it, and the mechanism for resolving disputes. The funds allocated by the farmer are transferred not directly to the service organization, but to a bank account, and these funds are kept in the account until the service is completed.

In the second stage, the service organization performs technical maintenance based on the established deadlines and requirements, and the work performed is documented with appropriate documents.

In the third stage, when the quality of service is deemed to be in accordance with the contract requirements, the bank transfers funds to the service organization. If the quality of service is not up to the required level, the funds are returned or reviewed in accordance with the procedure specified in the contract.

The following mechanism works:



As a result, a guarantee of service quality will be created for farms, service centers will strive to fulfill their obligations on time and in full, the problem of "cheap but poor-quality" repairs when equipment breaks down will be reduced, and a transparent financial mechanism will be established in cooperation between the public and private sectors.

What is different from foreign experience is that, along with the development of the service system in Uzbekistan, the use of the escrow mechanism ensures transparency and reliability in technical maintenance.

CONCLUSION

The effective use of technical potential in agricultural production is one of the main factors determining productivity and production efficiency. The conducted analyses show that the majority of existing equipment is somewhat outdated, and in order to increase its efficiency, it is necessary to improve the processes of regular maintenance and repair.

An analysis of foreign experience shows that in developed countries, the process of using agricultural equipment is highly organized through service centers, dealer services and leasing equipment. In this case, the breakdown of equipment has a minimal impact on the production process.

Based on this research, the following conclusions and recommendations were developed:

- The efficiency of technical maintenance can be increased by adapting foreign practices to local conditions;
- It is necessary to expand service centers and mobile technical maintenance teams for agricultural machinery;
- Implementing an escrow system for purchasing and servicing equipment, i.e. a mechanism where funds are transferred to the supplier only after the service is fully performed. This system will protect the interests of farmers and lead to an increase in the quality of service.;
- It is necessary to expand the participation of the private sector in the implementation of the new escrow system and organize this activity on the basis of public-private partnerships.

Thus, the introduction of an escrow system, along with the adaptation of foreign experience to local conditions, will increase the efficiency of technical maintenance in agriculture and ensure the continuity of production.

Volume: 14 | Issue: 2 | February 2026 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2026): 8.801| ISSN: 2321 – 7847

REFERENCES

1. *Bundesverband der Maschinenringe e.V. (2023).* Was sind Maschinenringe? *https://www.maschinenring.de*
2. *Chayanov, A. V. Essays on the Theory of Labor Economy / A. V. Chayanov. - St. Petersburg: Lan, 2014. - 487 p. - ISBN 978-5-507-39837-9.*
3. *Food and Agriculture Organization of the United Nations. "What Is Sustainable Mechanization?" FAO, https://www.fao.org/sustainable-agricultural-mechanization/overview/what-is-sustainable-mechanization/en/. Accessed 4 June 2025.*
4. *Government of India, Ministry of Agriculture & Farmers Welfare. (2018). Operational guidelines for Custom Hiring Centres under Sub-Mission on Agricultural Mechanization (SMAM). Department of Agriculture, Cooperation & Farmers Welfare.*
5. *Hastedt, A. German machinery rings: Experiences and lesson learnt. In Proceedings of the Consultative Meeting on Mechanization Strategy: New Models for Sustainable Agricultural Mechanization in Sub-Saharan Africa, Nairobi, Kenya, 1–3 December 2016.*
6. *Herbel, D.; Rocchigiani, M.; Ferrier, C. The role of the social and organisational capital in agricultural cooperatives' development: Practical lessons from the CUMA movement. J. Co-op. Organ. Manag. 2015, 3, 24–31.*
7. *Madiyev Sh.Sh. Qishloq xo'jaligida texnik salohiyatni oshirish yo'nalishlari. "O'zbekistonda barqaror rivojlanish maqsadlariga erishish va yashil iqtisodiyotni rivojlantirishning istiqbolli yo'nalishlari" mavzusidagi Xalqaro ilmiy-amaliy anjuman materiallari to'plami. 2025-yil 14-15-aprel. Buxoro. BuxDU.*
8. *Nouwogou, K. Promouvoir la mécanisation agricole à travers les coopératives agricoles: Cas de CUMAS au Benin. In Proceedings of the Consultative Meeting on Mechanization Strategy: New Models for Sustainable Agricultural Mechanization in Sub-Saharan Africa, Nairobi, Kenya, 1–3 December 2016.*
9. *OECD (2019), Innovation, Productivity and Sustainability in Food and Agriculture: Main Findings from Country Reviews and Policy Lessons, OECD Food and Agricultural Reviews, OECD Publishing, Paris, https://doi.org/10.1787/c9c4ec1d-en.*
10. *Sims, B., & Kienzle, J. (2017). Sustainable Agricultural Mechanization for Smallholders: What Is It and How Can We Implement It? Agriculture, 7(6), 50. https://doi.org/10.3390/agriculture7060050*
11. *Zou, B., Chen, Y., Mishra, A. K., & Hirsch, S. (2024). Agricultural mechanization and the performance of the local Chinese economy. Food Policy, 125, 102648. https://doi.org/10.1016/j.foodpol.2024.102648*