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## PROSPECTS OF ELECTRIFICATION OF MELIORATIVE TECHNICAL MEANS IN UZBEKISTAN

A. Bokiev - doctoral student, (DSc), A.N. Botirov - assistant, N.A. Nuralleeva - doctoral student, (PhD)  
Tashkent Institute of Irrigation and Agricultural Mechanization Engineers

### Abstract

The article deals with the issues of reclamation of meliorative technical means in the conditions of Uzbekistan. To this end, studied and analyzed the experiences of developed countries. Based on the results of the analysis, it was decided to jointly conduct research on the development of a mobile electromechanical device and the Sun-Wind mobile power station. The article considers the issue of reclamation of electrical and electronic equipment in the conditions of the Republic of Uzbekistan. For this purpose, the experience of developed countries has been studied and analyzed. Based on the results of the analysis, it was decided that the mobile electromechanical device and the solar-wind mobile power station should be combined.

**Key words:** agriculture, land improvement, efficiency, technologies, electric drive, electric car, electric tractor, renewable energy sources, mobile power station.

**Introduction.** The agricultural sector is considered as one of the priority directions in economics and the level of its development determines the provision for food security of the Republic of Uzbekistan. Based on the experience of developed countries, there is a necessity to find new approaches and mechanisms, to introduce innovative and energy efficient technologies and to change the structure of agricultural production in general so as to ensure the accelerated development of the agricultural sector.

The Program for the development of agriculture in 2016–2020 determines the main directions for the continuation of structural reforms in agricultural production, the introduction of advanced agricultural technologies, the comprehensive mechanization of agriculture and the intensification of raw resources processing [1]. Along with the optimization of the acreage, work has been organized in the republic to accelerate the introduction of modern intensive technologies and cultivation innovations in the field of fruit and vegetables sector development. In order to reclaim and introduce advanced technologies, the contacts have been established with researchers, specialists and representatives of business circles from China, Russia, Turkey, France, Japan, South Korea and a number of other countries [2].

Recently, as part of the implementation of comprehensive measures to further improve agricultural production, a special attention has been paid to the development of domestic agricultural machine-building industry. To this effect, the reorganization of the agricultural engineering system has been carried out.

As a result, only in 2017, the volume of production and provision of services for the leasing of agricultural machinery increased by 1.7 times, and the services of mechanization - by 2.5 times [3].

Research methodology. At the same time, serious shortcomings remain in the work on equipping agricultural producers with high-quality and affordable domestic equipment, renewing the fleet of vehicles and ensuring its timely service; these shortcomings include:

- the absence of market mechanisms for the formation of orders, contracts to supply agricultural machinery to machine-tractor parks, private organizations and farms considering real needs, time periods of agrotechnical operations and funding sources;
- the lack of self-propelled agricultural machinery for

carrying out mass agricultural work in the most optimal agrotechnical terms, the lack of systematic work on planning and organizing timely production;

- low level of localization of production and, as a result, non-competitive net cost of agricultural machinery produced, leading to an increase in the cost of mechanization services and final products;

- imperfect mechanism for financing the production of agricultural machinery, insufficient use of the leasing mechanism and attracting funds from private service organizations and farms [4]. A significant obstacle to the effective development of agricultural sector at present is the problem of diversification of electricity supply and the energy supply of farms. Also relevant is the problem of converting agricultural facilities from fossil fuels to electric traction using renewable energy sources. The reasons for these problems are the following aspects:

- At the local level, due to the lack or remoteness from the power supply systems, fertile land is not cultivated. Due to the shortage of water resources, more and more fertile land is coming out of circulation every year.

- The shortage of water resources on the remote pastures of the republic is acute in animal husbandry.

- In many remote farms, agricultural machinery is idle due to the lack of fuel and lubricants.

As a result, agrotechnical measures are carried out untimely or manually, and plant processing is not sufficiently carried out [6].

There is a plenty of solar and wind energy in sufficient volumes in the localities mentioned above. Earlier there were no appropriate technologies, but now such an opportunity has really appeared. It is necessary to develop and introduce a scientifically based system of machines converting renewable energy sources into electricity. This is impossible without an effective implementation of innovation technologies [7].

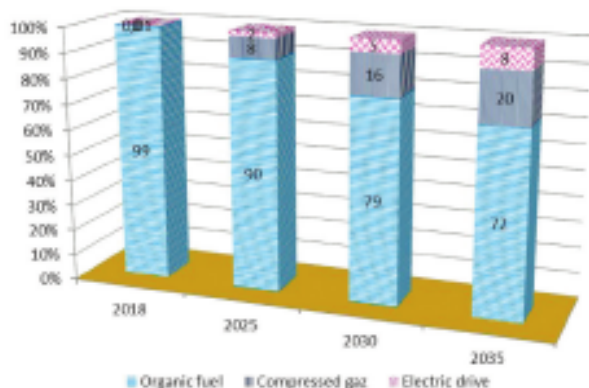
As is known, at present, when carrying out the majority of agrotechnical operations in row-spacings the tractors weighing more than 1.5-2 tons are used, with an average fuel consumption of 5 liter or more per hectare (l/ha). This in turn leads to increased maintenance costs and to a higher level of soil compaction.

To eliminate these drawbacks, it is necessary to introduce some technological changes. One of them is the transfer of agricultural machinery to electric drive (Fig.1).

The world has already gained experience in the implementation of renewable energy sources in remote

regions. Currently, more than two million electric vehicles are in operation, serviced by the corresponding network of electric charging stations.

As is known, with the increase in number of electric vehicles, the infrastructure for charging them should develop correspondingly. In combination with the constant improvement of the batteries in electric



(fossil fuel; compressed gas; electric drive)

**Fig. 1. Prospects for the transfer of agricultural tractors to electric drive in the Republic of Uzbekistan up to 2035**

vehicles, a turning point should soon be a massive opening of EV-stations. As in the case of other similar innovation technologies, the transfer to electric vehicles will gradually increase. In developed countries, the construction of new electric charging stations is booming and according to forecasts, by 2020 the number of electric charging stations may well exceed the number of conventional refueling gas stations. Moreover, in some countries mobile versions are already being exploited. Agricultural machinery is also gradually being converted to electric traction starting with mini-tractors. In the future, transfer of more powerful tractors is expected [8].

First of all, it is necessary to transfer mini tractors (class - 0, 4) to electric drive, as in this case the expenses for conducting field tests to refine the design, operational parameters and safety conditions are significantly reduced. With proper organization of research, design, implementation works, a scientifically based system of operation and service in the conditions of the republic, the share of mobile technological machines with electric drive of 0.4 class, can be increased to 70%. Further, with some lag, the transfer to electric drive is provided for other classes of machines. Figure 2.

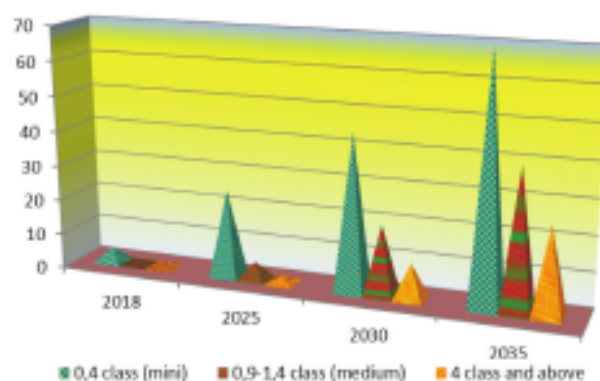
**Research results.** Taking into account the above data, we have analyzed the world experience and scientific basis in our republic. The sequence of required exploratory research has been specified.

Having studied the experience of developed countries, and taking into account the scientific and technical basis of the republic, a project has been developed aimed at solving the problem of efficient use of technical potential and land resources using renewable energy sources.

The main objective of the project is to develop a multifunctional electromechanical device - BAA-1E, in combination with a mobile electric charging station operating on renewable energy sources.

BAA-1E is designed to perform the following agrotechnical operations:

- Reclamation works in irrigation systems.



(0,4 class (mini); 0,9-1,4 class (medium); 4th class and higher)

**Fig.2. Dynamics of transfer of agricultural tractors to electric drive until 2035**

- Autumn and spring additional dressing of grain and cotton fields.
- Agrotechnical measures for plant protection.

The shortcomings of known small mobile devices are: they are not adapted to move between the rows, they do not have combined drives [9].

The solution of the problem lies in the fact that the dimensions of the wheels and the casing of mobile electromechanical device meet the agrotechnical requirements acting in the Republic of Uzbekistan and are equipped with a combined (mechanical and electrical) drive. Figure 2 shows the design and parameters of a mobile electromechanical device [10].

In the future, it is planned to develop an unmanned version of BAA-1E, which will make it possible to save up to 70 kg of payload, for example, instead of 100 liters of fuel, you can fill up to 200 liters when performing agrotechnical operations on plant nutrition and protection. This, in turn, increases the performance of the unit, at the same time improving labor conditions.

**Summary.** Efficient use of mobile agricultural facilities requires mobile chargers for recharging in field conditions. Figs. 4a and 4b show the design of the "Solar-wind" mobile power station BAA-2 and its working position.

With proper organization of measures for the introduction of modern technology, the proposed multifunctional electromechanical device BAA-1E and "Solar-Wind" mobile electric station-BAA-2 will be in demand and could be used in all regions of the Republic of Uzbekistan. Since the above problems are characteristic for the neighboring republics as well, the export of these products can be organized [12].

According to the results of static, comparative studies of the achievements in developed countries and the results of study by leading researchers in the field of equipping mobile technical facilities with electric drive, we can draw the following conclusions:

- It is necessary to conduct a systematic analysis of the state of operation of mobile agricultural equipment;
- To provide the possibilities of organizing the production and service of the components of electric machines and their drives in the conditions of our republic;
- It is necessary to develop the initial requirements and design documentation of a multifunctional electromechanical device - BAA-1E and "Solar-wind" mobile power plants.



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