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"MOBILE ENERGY TECHNOLOGICAL TOOLS BASED ON RENEWABLE ENERGY SOURCES"

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Annotation: *The article deals with the creation of a system of effective charges for the introduction of mobile energy technology tools based on renewable energy sources on the example of the Republic of Uzbekistan. The possibilities of a systematic approach for the introduction of mobile devices based on renewable energy sources (campaigning and on-site training, taking into account the peculiarities of natural and climatic conditions, the beginning of the development of equipment of lower power, the provision of high-level service, etc.) were studied through the development of appropriate machine systems.*

"Priority directions of the country's development in 2017-2021" adopted on February 7, 2017 contains the following items:

3.2. Increasing the competitiveness of the national economy by deepening structural transformations, modernization and diversification of its leading industries:

- *further modernization and diversification of industry by transferring it to a qualytively new level, aimed at advancing the development of high-tech manufacturing industries;*
- *mastering the production of fundamentally new types of products and technologies;*
- *continuation of the policy of stimulating localization of production and import substitution;*
- *reduction of energy intensity and resource intensity of the economy, widespread introduction of energy-saving technologies into production, expansion of the use of renewable energy sources;*

3.3. Modernization and intensive development of agriculture:

- *further improvement of the reclamation condition of irrigated lands, development of a network of reclamation and irrigation facilities, widespread introduction of intensive methods into agricultural production, primarily modern water- and resource-saving agricultural technologies, the use of high-performance agricultural machinery;*

In 2023, vegetables will be sown and more than 4.5 million tons of vegetables will be grown on 172 thousand hectares of dehkan farms and household plots of land in the Republic of Uzbekistan. The total volume of agricultural products grown, about 5 million tons will go to the domestic market, and 690 thousand tons will be exported. (5)

The problem of efficient and rational use of water, land, energy and other resources necessitate the continuous improvement of the machinery system in land reclamation based on the preservation of a favorable ecological and reclamation situation of the territory and environmental protection.

Recently, electrified technologies have become increasingly widespread when performing earthworks, row-to-row processing and low-volume irrigation, which provide more efficient and economical delivery of water and nutrients directly to the root zone of plants. [1]

As you know, the main consumers of energy in the agro-industrial complex are: industrial and communal facilities, rural population and rural infrastructure facilities. The power equipment of these

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facilities, as energy consumers, differ significantly from each other and form their own requirements for the energy source and the power supply system. (3)

The natural and climatic conditions of Uzbekistan allow the wider use of small hydro, wind and solar sources of electric energy in the field. As a result of all-round support from the state, the indicators of electric equipment in the agricultural sector have increased significantly in recent years. There is a gradual transition to full automation of water management in terms of water supply. If earlier producers were mainly engaged only in the cultivation of agricultural products, now they are gradually mastering new directions for processing, storage and transportation of grown products. There are new types of services in rural areas. All this together leads to an increase in the requirements on the part of consumers of transmitted electrical energy in quantitative and qualitative terms. [2]

A significant obstacle to the effective development of the agricultural sector at present is the issues of diversification of electricity supply and energy availability of farms. Also relevant is the problem of transferring agricultural machinery from organic fuel to electric traction using renewable energy sources. The reason for this is the following existing problems:

- In the field, due to the absence or remoteness from power supply systems, fertile lands are empty. For example, in the Beruniy, Turtkul and Ellikkala districts of Karakalpakstan, due to the lack of water resources, substantial fertile lands have gone out of circulation.
- In animal husbandry, there is an acute shortage of water resources in remote pastures in Kashkadarya, Navoi, Bukhara regions and in the Republic of Karakalpakstan.
- In many farms in remote regions, agricultural machinery is idle due to a shortage of fuel and lubricants. As a result, the sowing works are carried out late or manually, the processing of plants is not carried out enough.

Although, solar and wind energy are present in sufficient volumes in the above-mentioned places. If earlier there were no appropriate technologies for the production of electric energy on the ground, then now such an opportunity has really appeared. Therefore, it is necessary to develop and implement a scientifically based system of machines that convert renewable energy sources into electrical energy and work on them. And this is impossible without effective science-production-consumer interactions.

The world has already accumulated experience in introducing renewable energy sources to remote facilities. Currently, more than two million electric vehicles are in operation and they are serviced by a corresponding network of gas stations.[3]

As you know, with the increase in the number of electric vehicles, the infrastructure for charging them should develop no less dynamically. In combination with the constant improvement of battery performance in electric cars, a turning point in the mass opening of solar stations should soon come. As with other similar innovative technologies, the transition to electric vehicles will gradually increase. In developed countries, the construction of new electric filling stations is rapidly developing and, according to forecasts, by 2020 the number of electric charging stations may well exceed the number of conventional gas stations. Moreover, in some countries, their mobile versions are already being used.

Agricultural machinery is also gradually starting from small tractors being converted to electric traction. And in the future, the transfer of more powerful tractors is expected.

To solve the above problems, a systematic approach is needed that involves the participation of all interested parties (University-Research Institute-Design bureau-Production-Regulatory and technical documentation-Service). Currently, a joint project is being prepared in this direction with the participation of the National Research University “Tashkent Institute of Irrigation and Agricultural Mechanization Engineers” (University, Research Institute), LLC “MIR SOLAR”

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(Design bureau, Production), the Association "Enterprises of Alternative fuels and energy" (Regulatory and technical documentation-Service). Based on the above, the purpose of the research corresponds to the priority areas of state programs. [4]

The main goal of the project is to create an effective science–production-consumer relationship for the introduction of innovative ideas through the development of "Solar-wind" mobile power plants in order to diversify the power supply of remote regions of the agricultural sector and mobile electromechanical devices for field work. Create conditions for the introduction of a system of effective interaction with innovation centers on the ground**.**

The main strategies that are planned to be applied –

- Taking into account the analysis of world experience and the scientific base in our republic, to determine and coordinate the sequence of necessary research with the involvement of innovation centers on the ground;
- An integrated approach to the introduction of renewable energy sources (campaigning and on-site training, taking into account the peculiarities of natural and climatic conditions, the beginning of the development of equipment of lower capacity, providing high-level service, etc.);
- effective use of technical personnel in the field through their professional development and retraining (creation of training classes in innovation centers in the field);
- creating the necessary conditions for the production of highly localized mobile electromechanical devices for field work and mobile gas stations, taking into account the prospects for the development of the region.

With the proper organization of measures for the introduction of modern equipment and technologies, the proposed mobile "Solar-wind" power plant and mobile electromechanical devices for field work are in demand in operation and can be used in all regions of the Republic of Uzbekistan. Since the above problems are typical for neighboring republics, it is gradually possible to organize the export of these products. Successful implementation of the proposed project creates conditions:

1. to gradually reduce the import of petroleum products for the needs of the agricultural sector;
2. to gradually reduce the import of petroleum products for the needs of the agricultural sector;
3. reduce the cost of transportation and storage of petroleum products;
4. timely implementation of agrotechnical measures;
5. to put into circulation remote fertile land resources;
6. develop animal husbandry in remote pastures;
7. the possibility of processing fruit and vegetable products and fruits directly in the field, without resorting to transporting raw materials over long distances;
8. to improve working conditions for workers in remote regions of the agricultural sector.

The results of the strategic analysis (advantages-disadvantages-opportunities-problems) for research and the main tasks are shown in Fig.1.

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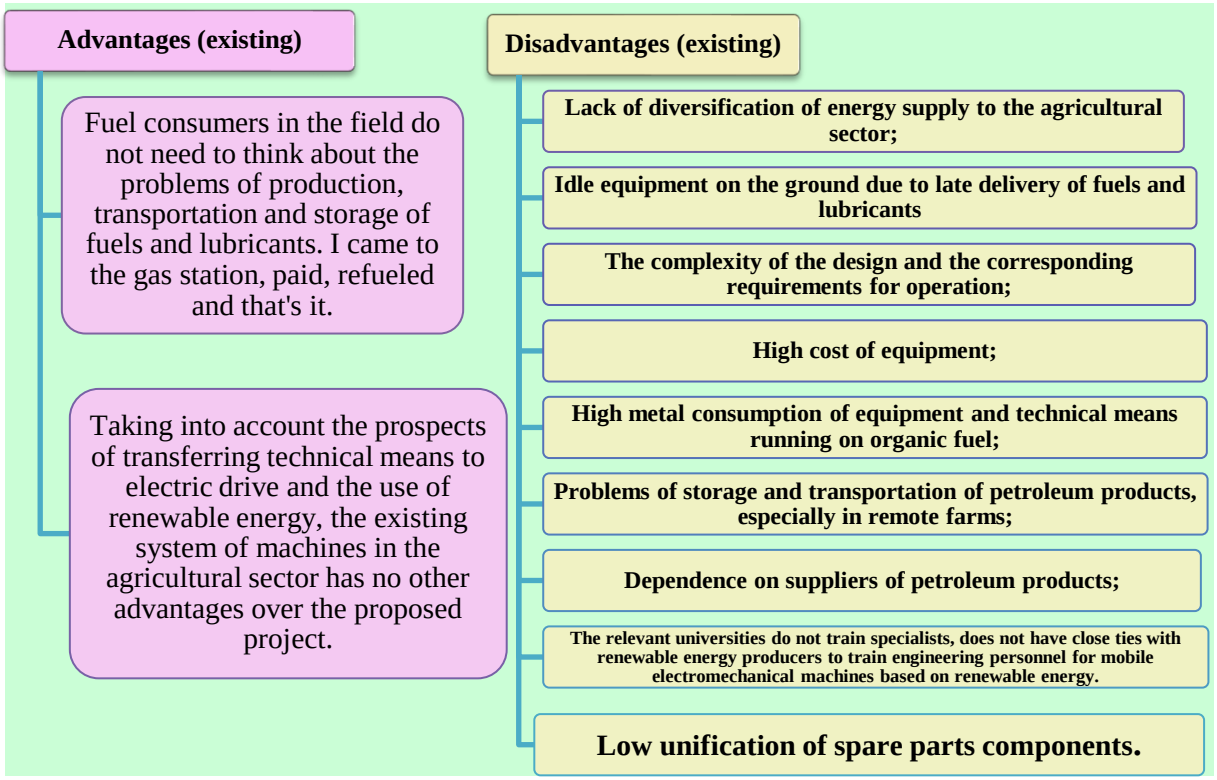

Fig.1. Advantages and disadvantages in the operation of existing mobile technical tools.

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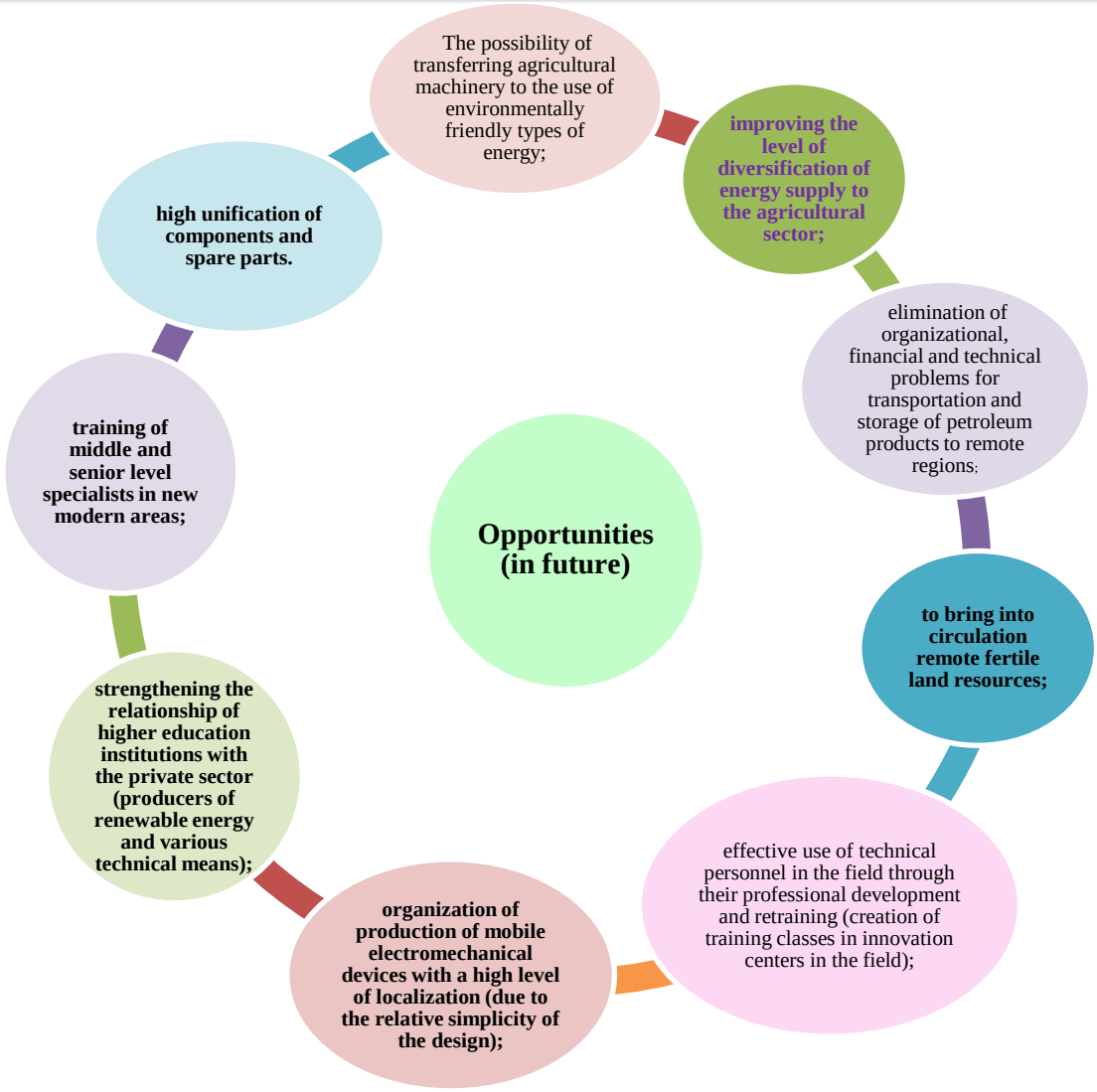

Fig .2 (A)

It will be necessary for (consumers) themselves to solve financing issues for the acquisition, operation and organization of service on electromechanical technical tools based on RES

Problems (in future)

Local fuel consumers will have to learn to think about the problems of production, transportation and storage using renewable energy.

Fig.2 (B)

Fig.2 (A and B) Future opportunities and challenges in the operation of electric mobile tools based on RES.

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Based on the results of comparative studies of the achievements of developed countries and the results of research by leading scientists in the field of developing effective systems of interaction in the introduction of mobile energy technology based on renewable energy sources, the following conclusions can be drawn on the example of the Republic of Uzbekistan:

• It is necessary to carry out a systematic analysis of the state of operation of agricultural machinery in order to transfer them to an electric drive;

• A systematic approach is needed involving the participation of all interested parties (University-Research Institute-Design bureau-Production-Regulatory and technical documentation-Service)

• To determine the possibilities of organizing the production and service of electrical equipment components and accumulating batteries in the conditions of the Republic of Uzbekistan. [6]

In agriculture, the introduction of small electromechanical tools is relevant, and if we take into account that today's advanced technological devices are effectively used, then with the help of new technologies it is possible to save fuel resources, prevent emissions of harmful substances into the atmosphere, reduce operating costs and the degree of soil compaction.[7]

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