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THE MAIN DIRECTIONS OF APPLICATION OF DIGITAL TECHNOLOGIES IN THE AGRICULTURAL DEVELOPMENT OF MOUNTAINS AND FOOTHILL REGIONS

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ANNOTATION
The article describes the current state and dynamics of the agricultural network in the mountainous and foothill regions of the republic, analyzes the cultivation of agricultural products in economic entities and promising areas. One of the topical issues will also be discussed - the main trends in the digitalization of agriculture. The author's scientific proposals and practical recommendations on the use of digital technologies in agricultural production in mountainous and foothill regions, digitalization of agricultural management functions and the creation of "smart" production in agriculture are given. The article describes the current state and dynamics of the agricultural network in the mountainous and foothill regions of the republic, analyzes the cultivation of agricultural products in economic entities and promising areas. One of the topical issues will also be discussed - the main trends in the digitalization of agriculture. The author's scientific proposals and practical recommendations on the use of digital technologies in agricultural production in mountainous and foothill regions, digitalization of agricultural management functions and the creation of "smart" production in agriculture are given.

KEYWORDS: *digital technologies, monitoring, logistics, control, processes, advanced technologies, full cycle of work, digital transformation of agriculture.*

INTRODUCTION

Global climate change not only indicates that mountains and foothill regions are extremely important in the development of industries and sectors of the national economy of each country, as well as in solving socio-economic problems, but also indicates the relevance of scientific and practical research in this area. These considerations apply to agriculture in the mountainous regions of the Republic of Uzbekistan. The continuous and sustainable development of these regions and the rational use of their capabilities are of particular importance for increasing the competitiveness of agricultural products grown in them on world markets, as well as for the development of agriculture in the republic.

Modern agriculture is also influenced by global trends: population growth (by 2050 it will be 10 billion people); changes in consumer dietary preferences; growing urbanization; changing of the climate; globalization of trade; biodevelopment and nanotechnology; transition from a product model to a service model (the number of services in addition to traditional services provided by agricultural producers is increasing); integrated value chain (improvement of varieties and breeds using genomic methods); strengthening the role of standards and government regulation (increasing requirements for product quality). Combining technologies and changing the chains of interaction between farmers and food producers accelerates the transition to a new stage of development in the context of digitalization.

The main task of the digital transformation of agriculture in mountainous and mountainous regions is to ensure global planning in this area and provide clear recommendations to market participants, including on the use of artificial intelligence, activation of innovative processes using modern innovative control devices.

The range of application of digital technologies in agriculture in mountainous and foothill areas is very wide. Digital technologies are necessary to solve problems at every stage of activity in mountain and foothill agriculture, for example:

- Production of agricultural products;
- Processing of agricultural raw materials;
- Transportation and storage of products;
- Sales of received products;
- Promotion of products among consumers.

There are many problems in this area that can be effectively solved with the help of digital technologies at the stage of agricultural production.

The use of digital technologies in the agriculture of mountainous and mountainous regions for monitoring and timely correction of the presence of crop pests, diseases, plant productivity, the influence of weather conditions on yields, the use and timely repair of equipment, fuel consumption and other resources, which allows for the rational use of financial resources.

Although the use of digital technologies in the production of mountain and foothill agriculture has been considered by a number of scientists in their scientific research, today it is considered one of the most important issues both as an object of research and in the theory of agriculture; economic problems manifest themselves in the vital and economic interests of the country, as well as in the lifestyle of the population of the region, interstate economic relations and integration relations.

Mountainous and foothill areas are still lagging behind in the development of new technologies due to undeveloped infrastructure, low financial and physical availability of existing solutions and services, lack of digital skills and regulatory problems. Therefore, the issue of developing the digital economy in modern conditions in these regions becomes very relevant, because it affects various areas of activity of people living in mountainous and mountainous regions, i.e. infrastructure and communications, finance and trade. , marketing and advertising, public system, government and society, safety, training and personnel, etc. will be fundamentally changed.

THEMATIC LITERATURE ANALYSIS

A retrospective analysis of the state of development of mountain and highland agriculture shows that most studies over the past half century have been devoted to the issues of agricultural technology of crops grown in mountains and highland regions, and the influence of resources and factors used in this process, in which economic issues are covered in a broad context. very short and extremely narrow range.

However, the most frequent research and study of regions is carried out in accordance with specific directions. In the process of hydrology, the formation and use of water resources in mountain and pre-mountain regions, geological mining, biological diversity and ecological condition of the region, meteorological and meteorological temperature, the amount of precipitation and conditions, and related communication processes. - practical, interested in medicinal herbs and medicinal cultures, geographically clear landscape takih grass and culture, cattle breeders - low fertility levels and ego increase problems, foresters - problems of forestry and forestry, representative oblasts of economic geography - geographically clear upper regions of Uzbekistan [1]. The commonality of this and other studies is that in all of them the object of study is the mountain and foothill region.

Our research shows that not only in our republic, but also in the countries of the Commonwealth of Independent States, in the scientific and literary literature there are different views on mountain and foothill regions. A group of scientists of the republic, carrying out zoning of these territories, expressed their opinions on determining the population and labor resources and the potential of agricultural production [2].

Another group of scientists believes that the division of mountain and foothill territories into regions by height is necessary for the development of programs for the socio-economic development of regions; the mechanism for implementing activities within the framework of the program is necessary for the activities of all economic units, including agricultural enterprises, regardless of the form of ownership, created the conditions and stated that the use of resources serves to enhance camaraderie [3,4], others have argued that it is important for increasing agricultural specialization and camaraderie [5].

G. E. Avakyan, speaking about mountain regions, emphasized that differences in the state, nature and conditions of agricultural production in highland and mountainous regions are important factors in the formation of a system of mountain and foothill agricultural production [6].

There is also no consensus on the definition of the concept of “agriculture in mountain and foothill regions”, its sustainability and structural significance.

For example, Tajik scientist K.N. Faizullaeva notes that “we understand various forms of highly organized human economic activity during the development of “mountain agriculture” and “mountain agriculture in difficult conditions” when it comes to “mountain agriculture” or “mountain agriculture in mountains" (which is very different from valley agriculture), which is considered an integral part of the national economy" [7].

According to Mirzon Nekruz Mirzon, “sustainable development of mountain agriculture means stability in terms of financial and technological education, increased production, increased productivity, as well as ensuring harmonious formation taking into account the availability of natural resources” [8].

P.G. Abdulmanapov and M.A. Galbatsdibirova in their research studied the socio-economic development of mountain regions and demographic processes in these regions and their special forces [9].

Assessing the scientific, theoretical and practical significance of these studies, we considered it permissible to emphasize the following: the above-mentioned scientists, first of all, taking into account the territorial classification of mountains into high-mountain, mountain, compact-mountain and foothill, assessed all socio-economic processes as a state related to “mountain regions”; secondly, their research focuses on issues related to kayak farming in these regions and its impact on socio-economic aspects, and agriculture in mountainous areas and its role in the economy of the region has not been sufficiently studied; thirdly, as in many studies on the problems of mountainous areas of our republic, these studies did not study the form of agricultural management in mountainous areas and its capabilities, the spirit of camaraderie and prospects, as well as the main directions of the use of digital technologies in agricultural production.

MATERIALS AND METHODS

The increase in agricultural production in mountain and foothill regions depends on the factors that are involved in the production process and have a direct and indirect impact on it. Determining the degree of interdependence and interaction of these factors allows us to identify and select appropriate ways to rationally use existing resources and capabilities.

It is necessary to determine the interdependence and interaction of these factors, the future state and scale of the economic process or event using economic and mathematical modeling methods. These are not only factors influencing the volume of production by industry and region, but also by type of product, but also, firstly, the degree of influence, secondly, the volume and scale of influence, thirdly, the direction and mechanism of activation. the influence of a certain factor in order to increase the cultivation of a particular type of product., fourthly, it allows you to generate a limited amount of financial and material resources that ensure an optimal balance of factors, and, fifthly, it allows you to determine the future state of the use of material and labor resources.

As a result, the creation from a scientific and practical point of view will contribute to the adoption of necessary decisions aimed at sustainable functioning at the regional, sectoral and economic levels, and will also ensure the diversification and economic stability of industries.

According to research, today in the practice of global agro-economic research, economic-mathematical and econometric methods are used to optimize the cost-to-cost ratio in order to achieve set goals, reduce them, increase the effectiveness of planned measures, and also correctly assess situations that may arise. Scientific and academic directions and approaches aimed at using various models and methods of analysis [10] are sufficiently developed. As they are constantly improved, the scope and scope of their use is increasingly expanding.

In this process, the relationship and interrelationship between the goal and the factors influencing the development of the area or network are studied and clarified with the help of various models, conclusions are formed, appropriate decisions are made and certain measures are determined.

In particular, forecasting the development of agriculture based on simulation models using methods of economic-mathematical and econometric analysis, substantiation of directions to reduce local costs and prevent unpleasant social consequences [11], optimization of sales channels for agricultural products [12,13], and also a correlation model analysis of the relationships between agricultural networks [14], the impact of economic and, in areas such

as food demand [17], climate change [18] and the environmental situation [19], the emphasis is on justifying the prospects for agricultural development in different aspects that are increasing.

It should be noted here that the research carried out in recent years on the econometric analysis of the development of agricultural production in general and the development of a particular industry in our republic deserves attention. [20,21]

This study is a logical continuation of research based on the above-mentioned scientific and academic approaches. It includes the development of agricultural production in mountain and foothill regions, an analysis of the interaction and dependence of the factors influencing it, and its future state.

Mountain and foothill areas, in contrast to lowland agricultural farming, are extremely vulnerable to various external factors, primarily such as severe weather and temperature changes during the day, global climate manifested in the form of hail, heavy rains, floods, storms, high and low temperatures, as well as changes in environmental conditions. There are also factors such as the nature of arable land and the duration of agrotechnological processes in horticulture when growing products, as well as the duration of the optimal time allowing them to be carried out, which affect the volume of value of agricultural products grown in mountainous areas, as well as the created chain of creation of added cost.

The study selected the final outcome, such as the cultivation area, the number of farms and the number of employed population, affecting the volume of agricultural production by gross area and sectors, and the relationship between them was studied. Depending on the conditions of efficiency, taking into account the positive and negative influence of Factors on efficiency, they were conditionally defined as “factors of strong influence”. At the same time, scientific and practical blocks of each of them were used to form a factor analysis model, conduct multifactor analysis of economic and mathematical modeling and adjust the forecast parameters of agricultural development of mountain and foothill territories. areas were included in a computer algorithm and calculations were made.

When making econometric assessments and assessing the prospects for agricultural production in mountainous and foothill regions, Stata software and scientific, theoretical and practical developments on econometric analysis by experienced scientists in our republic and foreign countries were used [22].

The scientific and practical significance of the proposed econometric model of agricultural development of mountain and foothill regions lies in the fact that this model takes into account variable factors that can have a positive and negative impact on the final result - the chamber and the volume of production, taking into account the degree of interdependence and influence between them , which allows you to make changes and corrections, as well as extract characteristically unreported data from a dynamic array, correct statistical errors and process them.

When developing forecast parameters for the future based on an econometric model of multifactor analysis of agricultural development in mountainous and foothill regions, a database is used to describe “positive or negative effects on a scale, a network of scientifically and practically integrated levels is used.” Calculations were made based on information from agricultural enterprises operating in the mountainous and foothill areas of the Surkhandarya region.

ANALYSIS AND RESULT

It is known that the gross agricultural product at the macro, micro and meso levels is a part of the gross domestic product generated at the national level and represents the product grown in a certain unit of time in agriculture and livestock, and is usually expressed in the form of value. The change in this indicator over the course of a year or years is a general criterion for assessing the state of the agricultural economy, the production activities of all forms of management involved in the cultivation of agricultural products, regardless of the form of ownership.

In practice, this criterion is used to evaluate the development of a field and determine its promising indicators. Gross agricultural output is calculated in the form of value in current and estimated prices, and analyzes and proposals are prepared on their basis.

In our calculations in the econometric model of agricultural development of mountain and foothill regions, the factors influencing the production of regional gross agricultural product (Y(t)) are considered as the final goal and

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result of multifactor analysis, its structural structure is determined, the final result of the research process is assessed and determined , scientific proposals and practical recommendations have been developed.

The rapid penetration of the digital economy in combination with IT technologies into agricultural production allows analysis using a system of large and complex indicators. To carry out such an analysis, a group of indicators necessary for the formation of a multivariate analysis and econometric model was determined based on the goals and objectives identified during the study, a database was generated, an algorithm was developed and the indicators were included in the database.

Table 1.

Prospective indicators of agricultural production in mountain and foothill regions [1]

Years	Gross regional product trl. sum	Agricultural products million soums	Production of livestock products, million soums	Number of DF, thousand units	DF employs thousands of people.	Cultivated area DF, thousand hectares	Livestock products grown in farms, trillion. sum
2018	12,01	6,52	5,48	343,0	131,5	80,1	1,14
2019	15,12	8,47	6,65	353,5	150,0	89,0	1,31
2020	13,95	9,47	5,90	356,1	165,8	93,4	1,41
2021	15,89	9,82	6,68	367,7	166,7	101,0	1,55
2022	17,96	10,17	7,52	380,0	167,5	109,0	1,71
2023	18,59	10,52	8,37	393,0	168,3	117,2	1,87
2024	20,41	10,86	9,30	406,6	169,1	126,1	2,04
2025	21,93	11,21	10,28	420,8	169,8	135,4	2,22

Explanation. DF – peasant farms; FX - farms.

Based on the results of our regression analysis, promising parameters for increasing agricultural production in the analyzed mountain and foothill regions for the period 2021-2025 were determined. (Table 1).

From the data in this table 1 it is clear that in 2025, compared to 2019, the production of gross agricultural output in mountainous and mountainous regions is projected to increase by 45.0%, including agricultural products - more than 1.3 times, products livestock - more than 1.5 times. (Picture 1).

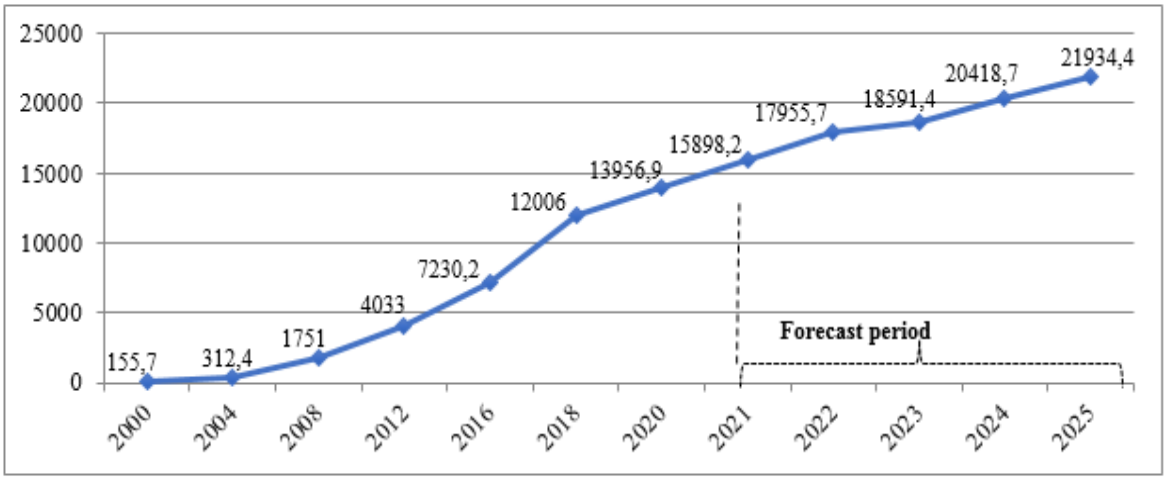

Figure 1. Forecast parameters of agricultural production in mountain and foothill regions[1]

As a result of innovative and innovative measures to provide the population with food and further increase the role and importance of agricultural farms in strengthening the country's food security, by 2025 the volume of

agricultural products in agricultural farms in mountainous regions will increase by 1.4 times, their share in the gross agricultural output economy is expected to reach 71.3 percent by 2025 from 67.7 percent in 2019.

Over the period on which the projections are based, more than 19,800 new jobs will be created in this area, and total employment is projected to increase by 13.2 percent.

A retrospective analysis of the state of agricultural development in mountainous regions and an assessment based on it indicate that, as in some mountainous regions of the Republic, dynamic changes in the development of agriculture are observed in the mountainous Surkhandarya region and mountainous regions of the Republic.

CONCLUSIONS AND OFFERS

According to the results determined using our econometric assessment of the factors influencing the increase in agricultural production in mountainous regions, agricultural production indicators in these regions are showing growth rates, with average annual growth rates for 2021-2025 projected to be between 5.0 and 6.5 percent . That is, according to the results of the analysis, it is expected that the number of peasant (farm) farm products in agricultural products will increase by 1.3 times compared to 2019 compared to 2025, and the number of peasant (farm) farms will increase by 17%. Accordingly, it is expected that the area of land for peasant (farm) farms in 2025 will increase by 1.11 times compared to 2019.

This approach will focus on prioritizing people and local action in mountainous areas to ensure digital affordability and equitable access to digital technologies as a means of accelerating sustainable transformation of agricultural food systems by rural communities and smallholder farmers. The goal of this is to introduce digital technologies into all software development activities, taking into account two main priorities:

1. Create an enabling environment for the development of e-agriculture in the region by helping to evaluate, collect best practices, develop strategies and initiatives to improve digital literacy;
2. Accelerate the development and implementation of scalable digital public products such as solutions, services and data for digital mountain agriculture.

This is embodied in the following three interrelated but independent areas of work:

1. Addressing agricultural and food system challenges at the community level through the Digital Villages initiative;
2. Development of e-government systems aimed at increasing the transparency, efficiency and accessibility of agricultural management and administrative processes in the mountains and the mountain region;
3. Support the National Strategy for the Digitalization of Agriculture, aimed at countries transforming agricultural systems at the national level.

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