

Improving the innovation process of sustainable development of agriculture

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Abstract. The article deals with the development of the agro-industrial complex in the context of the implementation of the concept of digitalization. The current state of the introduction of innovations in agriculture and the production of agricultural products is considered. The current state of the introduction of innovations in agriculture and the production of agricultural products is considered. It is proposed to expand the scope of digital technology at the expense of public funds. The main provisions of the agrarian policy, the objectives of its implementation and regulation of the markets for agricultural products, raw materials and food in the Republic of Tajikistan in the context of increasing labor productivity are considered. The purpose of the study is to substantiate the directions for introducing innovation and new technologies in agriculture. Due to the scale of their production, as well as high one-time capital costs for the transformation of the production process, small businesses will not be able to take advantage of new production technologies. Improving the efficiency of production activities based on the Internet of Things is possible by increasing crop yields, monitoring the condition of dairy cows or poultry houses, etc.

1 Introduction

In modern conditions, for the transition to sustainable development of the country, the state policy of the Republic of Tajikistan to ensure food independence is aimed at developing the agricultural sector not only in the form of goods, but also at the production of final products in order to ensure domestic markets and exports. Export of agricultural products, accelerating the development of horticulture, animal husbandry, beekeeping, fishing, as well as increasing cotton production, etc. This contributes not only to the production of agricultural products, but also to its industrial processing. However, the available facts in Tajikistan do not contribute to the establishment of scientific achievements in the field of agricultural food, and the mechanisms of state support for the agro-industrial complex, unfortunately, cannot provide the necessary pace of production development. Thus, we can conclude that it is expedient to introduce innovations in the sustainable development of the agricultural sector.

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The innovation process in the production of agricultural products should be considered as a single system, which is the transformation of scientific achievements into an effective technology for the production of agricultural products. Because today, in the process of historical progress, science has become the most important social institution, a great productive force that determines the state, prospects and development of all areas of production and culture [1]. N.A. Turaev asserts that the main principles of innovative activity in the field of agriculture are purposefulness, unity, interaction, movement, adaptation, efficiency, diversity of actions, regularity, regulation of actions, complexity, social and environmental safety [2].

In our opinion, in the current conditions of sustainable development of the agricultural sector and agricultural enterprises of the Republic of Tajikistan, the process of modernization and innovation is slow, which has a profound impact on the sustainable development of the agricultural sector. At the same time, it should be borne in mind that the use of innovations in the field of agriculture should be balanced. The dynamics of agricultural production in the Republic of Tajikistan shows that the introduction of innovative technologies in domestic agricultural enterprises is not carried out properly. In this regard, it should be noted that it is impossible to ensure the sustainable development of the agricultural sector and the production of agricultural products without the use of innovative technologies and equipping agricultural enterprises with digital technology.

Further sustainable development of agriculture in the republic can be ensured only in conditions of a complete transition to innovative industrial technology, in the conditions of the development of new agricultural lands, which includes the solution of complex organizational and technical issues and, above all, the introduction of new irrigation methods (synchronous and impulse, drip, rain, etc.), and also requires staff training and special technical skills.

2 Materials and methods

In the course of the study, the authors used such scientific methods as economic-statistical, monographic, mathematical, abstract, logical and comparative.

3 Results

Currently, developed countries are almost completing the process of industrialization and moving to a new stage of development, which is dominated by digital platforms and robots, which allows delegating some of the production and management functions to artificial intelligence. The new structure of production and logistics chains reduces production, management and other costs, improves the quality of products.

Agriculture is considered to be a high-risk industry, as it depends on weather conditions, has a long production cycle and low profitability [3]. All of the above hinders innovation in this industry. Innovations in agriculture, especially in irrigated agriculture, are not introduced as often as in other sectors of the economy, and therefore the development of promising reclamation technologies in an arid region largely depends on the intensification of agro-industrial production. In 2021, the share of the agricultural sector in the total domestic product amounted to 24.1 percent.

As can be seen from the data in Table 1, in recent years, an increase in agricultural production has been observed in all agricultural enterprises of the republic. This indicates the introduction of the process of applying innovations in the production of agricultural products. If the production of agricultural products in 2016 is 28808.4 million somoni, then this figure

in 2021 will be 39769.4 million somoni, which is 1096.1 million somoni more than in the same period in 2016.

Table 1. Gross agricultural output in Tajikistan million somoni.

Industries	2016	2017	2018	2019	2020	2021	2021/ 2016 %
In all categories of farms							
Crop production	20297.1	22498.2	23274.4	25062.6	27130.0	28743.9	141.6
Animal husbandry	7829.3	8267.8	8710.1	9202.2	10168.4	11025.5	140.8
Public sector							
Crop production	1342.4	1412.1	1531.0	1888.3	2136.0	2700.1	2 time
Animal husbandry	201.5	213.2	296.8	656.2	1185.6	1543.8	7.6 time
Households of the population							
Crop production	9388.0	8949.2	9143.9	9056.0	9591.1	10275.4	109.5
Animal husbandry	7386.6	7777.0	8101.7	8167.8	8661.0	8998.5	121.8
Farms							
Crop production	10248.7	12136.8	12599.5	14118.3	15402.9	15768.4	153.9
Animal husbandry	241.2	277.5	311.5	378.3	321.8	483.3	2 time
Calculated from: [4]							

In the field of crop production, the innovation process should lead to an increase in the volume of horticultural products by increasing land productivity, increasing crop yields, improving product quality, eliminating the processes of degradation and destruction of the natural environment, reducing the dependence of horticultural productivity on natural factors, increasing the efficiency of using water resources, saving labor and material costs, maintain and improve the ecology of the environment.

The Khatlon region, considered as an inseparable part of the single national housewifely complex of the country, is also characterized by the names of the socio- housewifely processes taking place in the whole republic. Huge agricultural land and water resources are now concentrated in the region, and agricultural enterprises need further reconstruction and modernization in order to transfer production and development of agricultural products to world standards to a qualitatively new level.

In recent years, the total volume of agricultural production in the Khatlon region (at constant prices) exceeded the figures for 1991 (at the beginning of a deep transformation of the agricultural production system). There is an upward trend in the productivity of the main agricultural crops and animal productivity. These positive changes were formed due to the development, and in many cases - the revival of the activities of agricultural enterprises.

Farms are the largest group of agricultural enterprises. Almost all of them belong to the category of small agricultural enterprises.

In agricultural enterprises, there is a fairly high variation in the profitability of certain types of products. It reflects the variability of conditions for housewifely activity and influences changes in the structure of production activities of enterprises in the industry. The latter are reflected in the dynamics of sown areas and livestock (Table 2).

Table 2. Dynamics of sown areas and livestock in agricultural enterprises of Khatlon region.

Indicators		Years						2021/ 2005 %
		2005	2010	2015	2020	2021		
Cultivated areas total thousand hec.		I	447.4	450.8	426.9	403.4	421.8	93.5
		II	100	100	100	100	100	100.0
Including:	- agricultural enterprises	I	142,5	92.9	46.3	45.4	43.6	46.9
		II	31,8	20.6	13.8	11.2	10.3	50.1
	- housewifely of the population	I	104,4	118.7	109.2	83.5	84.2	70.9
		II	24	26.3	25.5	20.7	19.6	75.9
	- farms	I	197.4	239.0	258.6	274.3	294.1	123.0
		II	44.2	43.0	60.5	68.0	69.7	162.1
Number of cattle at the end of the year, total thousand heads		I	541.2	749.9	898.6	981.2	994.2	132.5
		II	100	100	100	100	100	100.0
Including:	- agricultural enterprises	I	6.9	18.2	11.4	9.3	9.2	50.5
		II	1.2	2.43	1.2	0.9	0.9	38.1
	- housewifely of the population	I	521.1	714.8	815.5	895.1	906.5	126.8
		II	96.2	95.3	90.7	91.2	91.1	95.6
	- farms	I	13.2	61.9	71.7	76.7	78.7	127.1
		II	2.4	8.2	7.9	7.8	7.9	95.9
<i>Note: I - total, thousand hectares, thousand heads, II - in % of the total</i>								
Calculated from: [4]								

The sown area in Khatlon region in the total structure of sown area in the country is 50.2%. Over the past ten years, the sown area of the region has decreased by 20.5 thousand hectares. In 2005, the sown area of the region was 447.4 hectares. and in 2021, 421.8 hectares, which is less than in 2005 by 6.5% or 25.6 thousand hectares. The land constantly passes from the disposal of one subject to another. This trend will also not remain without consequences, given the condition of the land and the thrifty attitude towards it. Thus, during the period of independence, with the development of dekhkan farms, the ratio of owners of land resources is constantly changing in favor of the latter. Meanwhile, as noted above, not all dekhkan farms are able to carry out agrobiological activities in a timely manner due to lack of financial resources. Currently, more than 60% of sown areas in agriculture are at the disposal of dekhkan farms.

About half of the sown area in agricultural enterprises of the region falls on grain crops. There is a steady demand for the products of their cultivation, provided that a sufficient level of yield is ensured, it guarantees the achievement of housewifely efficiency of production. An important place in the structure of sown areas of enterprises is occupied by industrial crops, the share of which in 2015 amounted to 46.0% and in 2020 it increased by 50%, which increased by 4% compared to 2015.

In 2021, with the involvement of all innovators of the department of land use and agricultural technology of universities in this region, educational and practical work was carried out on 30 types of agricultural seedlings. The result of the work performed showed that such plants as cotton, Chinese beans, local beans, tomatoes, watermelons, melons, pumpkins, cucumbers, eggplants, bell peppers, bitter peppers, lentils, peas and grass (yunuchka) can show their productivity in soil conditions and climate of the Dangara region.

In the scientific-educational and production-innovation laboratory of the technology park of the Institute of Technology and Innovation Management in the city of Kulyab, 8 names of innovative projects exhibited at competitions and republican conferences were awarded diplomas and certificates. Another 15 innovative projects are in the process of being certified.

Lectures, practical, innovative and research classes for technological specialties are held in this technopark.

Table 3. Manufactured products of the Institute of Technology and Innovation Management in the city of Kulyab in 2021.

Product type	Quantity	Production products	
		Name	Product
1	100	Leek	Canned food
2	580	Cherry	Compote
3	200	Hawthorn	Compote
4	100	Tomatoes	Canned food
5	100	Cucumbers	Canned food
6	200	Healing herbs	Canned food
Calculated from: [5]			

In order to develop design and folk art, 50 units of a mattress, 10 models of dresses, 10 units of a chakan dress, 10 units of pillows, 30 units of skullcaps, and other types of folk crafts were produced, some of which were sent to student dormitories for use. In 2021, students and teachers received 5 invention patents. To this day, more than 200 people have completed training courses and received certificates in the technopark.

Table 4. Names of technological network items in the ITIM innovation park in Kulob.

Name	Quantity	Equipment cost (somoni)
Equipment for the production of dumplings and pasta	1	83750
Jewelry desktop	10	5000
Equipment and apparatus for the production of jewelry	-	4800
Food testing equipment and apparatus (milk and meat)	-	200000
Microscope	10	18300
Steam boiler	2	5400
Mechanical equipment for canning	1	2000
Projectors	2	7358
Electronic boards	2	11200
Printing machines	1	29350
Equipment for knitting fabric "ad-ras"	3	8100
Sewing machines	10	9500
TOTAL	42	384758
Calculated from: [5]		

It should be noted that an important task for scientific organizations, including those subordinate to the National Academy of Sciences, is the commercialization of their developments. Various structures are engaged in ensuring the transfer of scientific and technological achievements into production, which form an important component of the infrastructure support for the innovative development of the agricultural sector of the housewifely. Among them are agricultural advisory services, which are widely represented by various organizational forms in world practice and whose network elements have been created in Tajikistan.

It should be noted that in order to reduce the impact of adverse environmental factors in the agro-industrial complex, it is necessary to implement the following areas of state support and incentives in the direction of innovation:

- increasing the efficiency of scientific developments and the agro-industrial complex;

- provision of a legal framework for innovation activity, protection of intellectual property objects and their introduction into housewifely (housewifely) circulation;
- accelerating the introduction of the achievements of science, technology and best practices in agricultural production;
- development of infrastructure for the innovation process, a system of certification and promotion of scientific and technical developments, training and advanced training of personnel;
- development and improvement of information activities;
- state support for agricultural producers in order to restore their liquidity and the possibility of implementing innovative activities;
- formation of an housewifely mechanism for managing and stimulating innovative projects in all sectors of the agro-industrial complex.
- Innovative activity in the sustainable development of agriculture is focused on solving the following tasks:
 - ensuring the competitiveness of agricultural products by improving its quality;
 - cost reduction in the production of agricultural products;
 - introduction of resource-saving technologies, technical equipment and improvement of the agricultural sector;
 - creation of innovative infrastructure in the agro-industrial complex;
 - support for the innovation activities of the institutes of the Academy of Agricultural Sciences of Tajikistan;
 - introduction of agricultural technologies that provide high yields and environmentally friendly agricultural products;
 - increasing the efficiency of scientific research aimed at creating new, competitive varieties of agricultural crops, developing technologies for intensifying agricultural production, increasing soil fertility, and applying integrated pest control methods;
 - development of biotechnology and the use of its achievements in the agro-industrial complex;
 - support for the development and use of veterinary technologies;
 - development of innovative projects in priority areas of development of the agro-industrial complex.

In general, as the above arguments show, in the implementation and practical application of the above complex innovative technologies, it is necessary to follow the principles of an integrated approach, i.e. implement them in an integrated (complex) form, which may involve the coverage of all housewifely activities of the agroecosystem. This is explained by the fact that the integrated implementation of the above proposed activities can help minimize anthropogenic pressures on the ecosystem, reduce dependence on the use of extensive farming methods, and make irrigated farming environmentally friendly and housewifely profitable.

4 Discussion

Studies show that the gradual introduction of scientific and technological achievements in the development of promising technologies is at an early stage [6]. Therefore, agriculture needs to find ways to intensify activities by traditional means and begin a phased transition to the development of innovative reclamation technologies [7]. At the same time, special attention should be paid to supporting small and medium-sized agricultural businesses in the implementation of innovative land reclamation technologies.

Innovation in the irrigated sector implies the adoption of a new scientific and technological policy, which should be aimed at combining science, education and agricultural

enterprises by organizing research institutes in the agricultural regions of the country; the use of public-private partnerships for the development and implementation of research results in production; development of a center for information and consulting services.

5 Conclusion

The development of innovation is possible through the creation of a public-private company for the development and implementation of innovations in irrigated agriculture and the Fund for the Scientific and Technical Development of All Agriculture. The creation and functioning of such institutions is practiced in many countries. Specially created organizations to promote the innovative development of agriculture exist in the USA, Germany, Brazil, etc. Most often, large-scale institutions for innovative development of agriculture are created under the ministries of this sector of the economy.

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