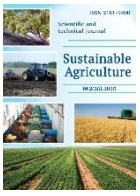
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Current State of Agricultural Development Based on the Introduction of Green Technologies

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a r t i c l e i n f o

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a b s t r a c t

In the article, taking into account the exceptional role of the widespread introduction of innovative technologies for the sustainable development of agriculture, it is proposed to develop and implement new organizational, economic and managerial mechanisms aimed at improving the scientific support of the agricultural sector, creating favorable conditions for further increasing innovative activity, and the inextricable link between science and production. All this will lead to an increase in the scientific and technical potential of agriculture, which is currently one of the most important problems. In our opinion, in order to achieve these goals, it is necessary to pay attention to the following, namely:

- the formation of a system that allows agricultural industries to quickly introduce innovative developments and the most advanced technologies; - rational and economical use of the existing technical and technological potential of the agricultural sector; - one can see the development of mechanisms to stimulate the participation of private sector representatives in the implementation of innovative technologies.

1. INTRODUCTION

As you know, in our country, along with all sectors of the economy, special attention is paid to the issue of developing the agricultural sector on an innovative basis. The harmonious implementation of scientific and technological achievements, organizational and economic measures to introduce advanced technologies in our country serves as the basis for more sustainable development of agriculture. In recent years, laws, a number of decrees and resolutions aimed at developing our economy on an innovative basis have been adopted and implemented. In particular, on April 7, 2020, the Law of the Republic of Uzbekistan "On Innovation Activity" was adopted. In accordance with the Decree of the President of the Republic of Uzbekistan dated November 29, 2017 No. PF-5264 "On the formation of the Ministry of Innovative Development of the Republic of Uzbekistan", one of the main tasks of the created ministry was the implementation of a unified state policy aimed at increasing the intellectual and technological potential of the country, namely, they are as follows:

– assessment of innovation activities based on their performance indicators, identification of key areas of development of relevant sectors and industries requiring priority implementation of advanced technologies;

– coordination of activities of government bodies, research and information and analytical institutions, and other organizations on issues of implementation of innovative ideas, developments, and technologies;

– is a single customer of government scientific and technical programs and projects implemented by scientific, educational, and other organizations;

– within the framework of the assigned tasks, study of the state of affairs in government bodies and other organizations, collection and generalization of proposals for improving innovation activities, etc.

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2. RESEARCH METHODOLOGY

In addition, the Resolutions of the President of the Republic of Uzbekistan dated April 27, 2018 No. PP-3682 “On measures to further improve the system of practical implementation of innovative ideas, technologies and projects”, dated May 5, 2018 No. PP-3697 “On additional measures to create conditions for the development of active entrepreneurship and innovation activities”, dated May 7, 2018 No. PP-3698 “On additional measures to improve the mechanisms for implementing innovations in industries and spheres of the economy” and dated July 14, 2018 No. PP-3855 “On additional measures to improve the efficiency of commercialization of the results of scientific and scientific-technical activities” define and are consistently implementing the following tasks in terms of stimulating the introduction of innovative developments into practice, including:

- "to ensure mutual cooperation between government agencies, free economic and small industrial zones, technology parks and private entrepreneurship entities, as well as academic and industry scientific institutions of the real sector of the economy with the participation of representatives of leading foreign investment funds, innovation centers and other interested organizations;

- Commercialization of domestic innovative ideas, technologies and projects through practical familiarization with the processes of technology transfer in the Republic of Uzbekistan and leading foreign countries, as well as the results of the implementation of developments in the real sectors of the economy and private enterprises";

- “formation of innovation funds of higher education organizations by directing at least 5 percent of payment and contractual funds after covering the income from the commercialization of innovative products, salaries, scholarships and other current expenses of higher education organizations. The funds of innovation funds are directed to: stimulating scientific research and innovative developments; acquisition of scientific and laboratory equipment, consumables and components; financing of small start-up projects; formation and updating of scientific infrastructure, material incentives for researchers”.

“From October 1, 2018, additional one-time bonuses are introduced, namely: to authors of patented intellectual property objects in the amount of ten times the basic calculated value at the expense of extra-budgetary funds of the institution; to authors and the research team participating in the creation and commercialization of the results of scientific and scientific-technical activities, in the amount of 40 and 30 percent of the funds received by the institution from their commercialization, respectively”. In particular, as a result of the consistent implementation of the adopted resolutions and decrees on the widespread introduction of innovations in the agricultural sector, a number of positive changes have been observed in recent years. As a result of the introduction of innovative agroclusters into the system of organization and management of industry farms, stimulation of the introduction of resource-saving technologies, the area of implementation of drip irrigation technology and its share in the total area of cotton crops are increasing from year to year.

3. RESULTS

In particular, the number of cotton-textile clusters increased from 15 to 134 in 2018–2022. Currently, cotton fields have been completely transferred to cluster management. As a result, cotton yields increased from 24.2 tons/ha in 2018 to 34 tons/ha in 2022. With the introduction of drip irrigation technology in 2018 on an area of just over 300 hectares. By 2022, it will be increased to 52.9 thousand hectares. Its share in the total area of cotton crops was 0.03% in 2018, and 5.1% in 2022. If we analyze this indicator by the area of land assigned to clusters, then in 2018, drip irrigation technology was introduced on 300 hectares or 1.4% of the 22.1 thousand hectares of cotton crops assigned to clusters, and by 2022, drip irrigation technology was introduced on 6.1 thousand hectares or 3.5% of the 176.6 thousand hectares of cotton crops assigned to clusters.

We can see that these indicators are slightly higher in farms than in clusters during the study period. In particular, in 2019, out of 983 thousand hectares of cotton crops, farmers implemented drip irrigation technology on 7 thousand hectares, or 0.7%, and by 2022, out of 856.2 thousand hectares of cotton crops, farmers implemented drip irrigation technology on 46.8 thousand hectares, or 5.5% (Table 1). It is known that the introduction of laser leveling technology is of great importance in the rational use of water resources. The scope of application of laser leveling technology in agriculture is also expanding over the years.

Table 1. Analysis of the implementation of drip irrigation technology in cotton cultivation in cotton textile clusters and farms, per thousand hectares.

Indicator name	Years				
	2018	2019	2020	2021	2022
Total number of clusters	15	77	85	122	134
Total cotton area	1071	1034	1034	1031,2	1032,2
Average yield, c/ha	24,2	27,4	29,6	32,4	34,0
Of this, area adjacent to clusters	22,1	51,2	86,2	140,3	176,6
Yield, c/ha	23,1	28,2	29,8	33,1	34,1
farm cotton field	1049	983	948	891,2	856,2
Yield, c/ha	21,8	27,3	29,4	32,2	33,8
Total area under drip irrigation	0,3	11,3	20,7	136,6	52,9
Share of total cotton crop area, %	0,03	1,1	2,0	13,2	5,1
of which in cluster	0,3	4,3	5,4	8,2	6,1
Share in total area of cluster, %	1,4	8,4	6,3	5,8	3,5
of which farmers	-	7	15,3	121,4	46,8
Share in total area of agricultural land, %	-	0,7	1,6	13,6	5,5

** Calculations were made by the author based on data from the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan.*

If in 2018, laser leveling using drip irrigation technology was carried out on 12.1 thousand hectares or 1.1% of the area, then by 2022, laser leveling work will be carried out on 112.2 thousand hectares or 10.9% of the area. An analysis of the implementation of laser leveling technology in cotton cultivation in cotton-textile clusters and farms showed that in 2018, laser leveling technology was implemented on an area of 0.3 thousand hectares or 1.4% of the 22.1 thousand hectares of cotton sown areas assigned to clusters, and by 2022, laser leveling technology was implemented on an area of 52.6 thousand hectares or 29.8% of the 176.6 thousand hectares of cotton sown areas assigned to clusters (Table 2).

We can see that in farms in 2018-2022 this indicator is slightly higher in volume than in clusters, and significantly lower in share in the total area. In particular, in 2019, out of 983 thousand hectares of cotton crops at the disposal of farmers, laser leveling covered 11.8 thousand hectares, or 1.1%, and by 2022, out of 856.2 thousand hectares of cotton crops at the disposal of farmers, laser leveling covered 59.6 thousand hectares, or only 7%.

Table 2. Analysis of the implementation of laser alignment technology in cotton cultivation in cotton-textile clusters and farms, per thousand.

Indicator name	Years				
	2018	2019	2020	2021	2022
Total cotton area	1071	1034	1034	1031,2	1032,2
Of this, area adjacent to clusters	22,1	51,2	86,2	140,3	176,6
farm cotton field	1049	983	948	891,2	856,2
Total laser leveled area	12,1	25,4	49,8	103,3	112,2
Share of total cotton crop area, %	1,13	2,5	4,8	10,0	10,9
of which in cluster	0,3	4,4	8,4	48,2	52,6
Share in total area of cluster, %	1,4	8,6	9,7	34,4	29,8
of which farmers	11,8	21	41,4	55,1	59,6
Share in total area of agricultural land, %	1,1	2,1	4,4	6,2	7,0

** Calculations were made by the author based on data from the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan.*

As is known, one of the areas of modernization of gardening is the creation of intensive, high-yielding orchards of small and semi-small fruit trees. Over the past five years, more than 160 thousand hectares of intensive orchards have been created, and their share in the overall structure of orchards is also increasing. If in 2018 the share of intensive orchards in the total number of orchards was 9.1 thousand hectares or 3.4%, then by 2022 this figure will be 70.1 thousand hectares or 20.8% (table 3).

Table 3

State of intensive gardening in agriculture, per thousand.

Indicator name	Years				
	2018	2019	2020	2021	2022
Total area of the garden	266,5	273,9	336,2	342	337
what came out of it	212,1	218,3	241,1	233	234
Yield, c/ha	124,7	125,0	117,0	122,0	129,0
including:					
Area of intensive gardens created	9,1	19,5	24,3	39,3	70,1
Share in total area of the garden, %	3,4	7,1	7,2	11,5	20,8

** Calculations were made by the author based on data from the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan.*

As can be seen from the above, the modernization of agricultural production in our republic, the comprehensive stimulation of the widespread introduction of innovative technologies, the implementation of scientific research results in practice, and especially the stimulation of the introduction of resource-saving technologies by our government through individual decrees, ultimately made it possible to prevent a decrease in crop production.

That is, over the past five years, the trend of growth in the production of the main types of agricultural products has been maintained. In particular, in 2022, compared with 2018, the volume of cotton fiber production increased by 122.9%, wheat - by 114.4%, fruits and berries - by 110.2%, grapes - by 110.1%, potatoes - by 118.2%, melons - by 120.3% (table 4).

In recent years, the measures implemented in animal husbandry are aimed not only at increasing the livestock population, but also at scientific support for the industry, the introduction of innovative developments.

Table 4

Volume of production of the main types of agricultural products in our country, thousand tons.

Crop type	2018	2019	2020 y.	2021 y.	2022 y.	Ratio 2022 to 2018, %
Cotton	2856,1	2691,7	3057,7	3341,1	3509,5	122,9
Wheat	5410,8	6093,5	6986,8	5984,8	6191,0	114,4
Vegetable	9760,3	10215,1	10020,2	10850,2	11163,0	114,4
Fruits and berries	2706,2	2752,7	2812,6	2852,6	2983,5	110,2
Grapes	1599,1	1577,5	1606,9	1695,3	1760,6	110,1
Potatoes	2911,9	3089,7	3143,8	3285,6	3441,7	118,2
Melons	2011,6	2031,8	2134.4	2285,3	2420,7	120,3

** Calculation by the author based on data from the State Statistics Committee of the Republic of Uzbekistan.*

Therefore, the implementation of mechanisms to stimulate the widespread introduction of innovative developments in animal husbandry, the organization of veterinary services, cattle breeding methods, feed preparation technologies and other processes, and its comprehensive support from the state are yielding positive results. Of particular importance was the government's implementation of a number of decisions and measures aimed at stimulating the participation of the private sector in increasing the livestock population and the volume of livestock production.

As a result, over the past five years, meat production has increased by 112.2%, milk - by 111.1%, eggs - by 109.0%, wool - by 107.8%, karakul - by 120.0% (table 5).

The volume of agricultural production per capita in the republic for 2018-2022 shows that this indicator is growing for all types of products.

Table 5

Main types of livestock products in our country Production volume, thousand tons.

Crop type	2018	2019	2020	2021	2022	Ratio 2022 to 2018, %
Meat (live weight)	2430,5	2473,6	2501,3	2635,1	2726,0	112,2
Milk	10466,4	10714,3	11004,1	11274,2	11629,4	111,1
Eggs, million pcs.	7459,3	7771,2	7833,2	7788,4	8129,3	109,0
Wool	34,6	35,1	37,4	36,3	37,3	107,8
Karakul skin, thousand pcs.	1085,2	1150,7	1201,2	1252,4	1302,3	120,0

** Calculation by the author based on data from the State Statistics Committee of the Republic of Uzbekistan.*

In particular, in 2022, compared to 2018, fruit production per capita increased from 82.1 kg to 84.6 kg, or by 103.0 percent, vegetables - from 296.2 kg to 316.5 kg, or by 106.9 percent, potatoes - from 88.4 kg to 97.6 kg, or by 110.4 percent, grapes - from 48.2 kg to 49.9 kg, or by 103.5 percent. We observe a similar situation with livestock products. That is, meat production in live weight per capita in 2018 was 73.7 kg, and by 2022 it increased to 77.3 kg, or 104.9%. It is evident that milk production increased from 317.6 kg to 329.7 kg, or by 103.8 percent, egg production – from 226 to 230.5 eggs, or by 102.1 percent, and fish production – from 2.8 kg to 5.0 kg, or by 178.6 percent (Table 6).

Thus, in a short period of time, the agricultural sector, along with all other industries, received an incentive for innovative development, fully satisfying the population's needs for food and the industry's needs for raw materials. In addition, it is worth noting that the volume of agricultural exports also increased several times.

Table 6

Volume of agricultural production per capita in the republic, kg Indicator name.

Indicator name	Yillar					2022 compared to 2018, %
	2018	2019	2020	2021	2022	
Fruits	82,1	82,0	82,9	82,5	84,6	103,0
Vegetable	296,2	304,2	335,5	314,0	316,5	106,9
Potatoes	88,4	92	92,7	95,1	97,6	110,4
Grapes	48,2	47,7	51,1	49,1	49,9	103,5
Meat (live weight)	73,7	73,7	74,8	76,2	77,3	104,9
Milk	317,6	319,1	321,4	326,2	329,7	103,8
Eggs, pcs.	226	231	241	225,4	230,5	102,1
Fish	2,8	3,6	3,9	4,9	5,0	178,6

** Calculation by the author based on data from the State Statistics Committee of the Republic of Uzbekistan.*

However, due to insufficient attention to the issue of financing fundamental, applied and innovative projects on current topics of agricultural science, insufficient stimulation of private sector participation in the implementation of innovations, weak integration of production, science and education, the need to develop and implement target programs to stimulate innovative activity in the agricultural sector and other factors, the widespread introduction of innovative developments in agriculture and increasing production efficiency are the main obstacles.

4. CONCLUSION

Given the exceptional role of the widespread introduction of innovative technologies for the sustainable development of agriculture, it is necessary to develop and implement new organizational, economic and managerial mechanisms aimed at improving the scientific support of the agricultural sector, creating favorable conditions for further increasing innovative activity, and the inextricable link between science and production . All this will lead to an increase in the scientific and technical potential of agriculture, which is currently one of the most important problems. In our opinion, to achieve these goals, it is necessary to pay attention to the following, namely:

- formation of a system that allows agricultural industries to quickly implement innovative developments and the most advanced technologies;
- rational and economical use of the existing technical and technological potential of the agricultural sector;
- development of mechanisms to stimulate the participation of representatives of the private sector in the implementation of innovative technologies;
- comprehensive support for the development of research institutes, information and consulting services, agro-technological parks and other necessary infrastructure entities that are important links in innovative activities, etc.

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