

**THE LEVEL OF PROVISION OF AGRICULTURAL PRODUCERS OF SPRINKLERS AS A
FACTOR OF INCREASING ECONOMIC EFFICIENCY**

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Abstract. The reduction of park of sprinkling equipment during a number of years led to rundown of the area of irrigated lands, and the operating machines were practically not used, due to their moral and physical deterioration, the lack of spare parts for repairs and high energy costs. The use of sprinklers for the cultivation of crops in agriculture is prospective and economically justified. Modernization of irrigation equipment should consist in replacing imported, expensive spare parts, components by the parts cheaper and produced in Russia; the open irrigation systems with high efficiency and low energy consumption should be implemented. For performing these measures, state support is required. At the same time, the approved mechanism of state subsidizing of machinery manufacturing plants was adopted with a lack of subsidy. This can lead to further development of the situation, associated with the technical impoverishment of the agricultural sector. This assumption is proved by the forecast of the level of irrigation equipment for the Russian Federation until 2020, which takes into account the current trends in the development of park of sprinklers, irrigation machines and plants.

Keywords: amelioration, irrigation machines, new technologies, sprinklers, modernization.

1. INTRODUCTION

One of the little-used reserves of improving the efficiency of agriculture, by means of technical modernization is the development of amelioration (Snipich, 2007).

The extensive development of amelioration in Russia was in 1966-1990, that led to the decline of this direction of agricultural engineering, in connection with the refusal of measures for irrigation of lands (SnipichYu, 2011). Retardation of the development of land amelioration system in agriculture is connected with the lack of financing for the construction of new land irrigation systems, the lack of funds for the reconstruction and restoration of existing ones.

The reduction of park of sprinkling equipment led to rundown of the area of irrigated lands, and the operating machines were practically not used, due to their moral and physical deterioration, the lack of spare parts for repairs and high energy costs.

2. METHODS

The use of sprinkling equipment significantly increases the economic effect of agricultural production.

Table 1. Calculation of economic efficiency of production with the use of sprinkler systems

Items	Carrots		Cabba ges		Potato es		Onions	
	With	Without	With	Without	Withsprinkler	Withoutsprin	Withsprinkler	Withoutsprin
Gross yield, centner	21 80 ,0	9 0 0	12 00 ,0	-	4 2 0,0	1 6 0	25 ,0	5, 0
Manufacturing cost, thousand rubles.	59 4, 5	5 1 2, 0	54 9, 3	-	7 4, 4	5 7, 9	5, 6	1, 5

Full cost, thousand rubles.	63 0, 1	5 4 2, 7	58 2, 2	-	7 8, 8	6 1, 3	5, 9	1, 5
Full cost of 1 centner, rubles	28 9, 0	0 3, 0	48 5, 2	-	1 8, 6	3 8, 1	23 6, 0	30 0, 0
Cost of 1 centner, rubles *	90 0, 0	9 0 0	80 0, 0	-	8 0 0	8 0 0	12 00 ,0	12 00 ,0
Profit per 1centner, rubles	51 1, 0	9 7, 0	31 4, 8	-	6 1 2, 4	4 1 6, 9	96 4, 0	90 0, 0
Profitability of production, %	17 6, 8	3 2, 7	64 ,9	-	3 2 6, 4	1 0 8, 8	40 8, 5	30 0, 0

* average purchasing price in the markets of Kazan

Table 1 presents calculations of the economic efficiency of production and the economic effect of the use of sprinklers for irrigation of vegetables in the farms of the Republic of Tatarstan.

Analyzing the calculation of economic efficiency of production in the farms of the Republic of Tatarstan, we conclude, that due to the use of sprinkling equipment, an increase in the gross yield of all crops is observed. The increase in the manufacturing cost and full cost of carrots by 14.1% and 16.1%, led to an increase in profit per one centner of the product by 314 rubles. The increase in full cost of potatoes by 28.5%, onions - by a factor of 2, led to an increase in profit per centner of products by 199.5 rubles, and by 64 rubles, respectively. The profitability of carrot production increased by a factor of 5, potatoes - by a factor of 3, onions - by a factor of 1.5.

In this regard, there is a need for sprinklers selection and the costs for their use. Let's consider the competitive advantages of different sprinklers. The analysis of competitive advantages of sprinklers, according to their technological parameters shows, that the most competitive in terms of technological parameters is the sprinkling machine "Fregat". In second place is the SM "Dnepr", then the SM "Kuban" LK-1, followed by the SM "Kuban", due to the rain intensity. If its rain

intensity could be reduced to the intensity of tow line SHD 25/300, then the SM "Kuban" would be included in the number of ideal machines, according to its technological parameters (Snipich, 2011). The presence of irrigation equipment holds a special place in the agroindustrial complex, due to this, a federal program for the development of land reclamation system was established. So, in the federal program for the development of reclamation of lands, intended for agriculture in Russia for 2014-2020, 112.86 billion rubles is planned to allocate for technical re-equipment of irrigation zone, 294.96 billion rubles – for reconstruction, 129.38 billion rubles – for new constructions. In addition, it is planned to allocate 58.10 billion rubles for technical re-equipment of draining zone, 93.25 billion rubles - for reconstruction, 49.84 billion rubles - for new constructions, and 28.0 billion rubles - for amelioration on drainage project zones.

In order to achieve the set goals for import substitution, the Government of the Russian Federation should provide supporting measures for the development, production and implementation of new equipment, which is characterized by high technical and economic rates, into the economic turnover of the agro-industrial complex (Snipich Yu, n. d).

Table 2. Competitive advantages of various sprinklers

Types of sprinkling machines	Parameters								
	Materials consumption, t	The cost of SM, thousand rubles	Power consumption, kW	Consumption of SM, Q, l/s	Average rain intensity, j, mm/min	Average weighted diameter of droplet	Consumption managed by 1 person, q, l/s	Productivity of the machine per hectare, at m=	
SM of circular action									
Fregat B 434	24,5	7500	88,1	100	0,28	0,8	400	1,17	
SM "Kazanka-7"		5600		86		1		1,14	
Front SM									
SM "Kuban"	47,8	2000	125	180	1,1	0,6	720	2,1	
SM "Volzhanka"	26,7	2100	55,1	64	0,27	1,4	180	0,75	
Positional SM									
DDN-100	0,843	750	68	115	0,57	1,5	65	0,78	
DDA-100 VH	10,1	480	66	120	2,4	0,6	60	1,4	

The effectiveness of agricultural production largely depends on the availability of irrigation equipment, which holds a special place in the agroindustrial complex. Due to this, a federal program for the development of land reclamation system was established. So, in the federal program for the development of reclamation of lands, intended for agriculture in Russia for 2014-2020, 112.86 billion rubles is planned to allocate for technical re-equipment of irrigation zone, 294.96 billion rubles – for reconstruction, 129.38 billion rubles – for new constructions. In addition, it is planned to allocate 58.10 billion rubles for technical re-equipment of draining zone, 93.25 billion rubles - for reconstruction, 49.84 billion rubles - for new constructions, and 28.0 billion rubles - for amelioration on drainage project zones.

3. RESULTS

Under the conditions of import substitution, it is necessary to develop supporting measures for the development, production and implementation of new equipment, which is characterized by high technical and economic rates, into the economic turnover of the agro-industrial complex.

According to Yu. F. Snipich: "The main areas for further development of irrigation equipment should be the following: modernization of existing irrigation equipment; development, production and introduction into the economic turnover of the AIC of new equipment, with significantly higher technical and economic parameters". When creating new models of irrigation machines, it is necessary to use new advances in engineering, to expand areas with open irrigation system (Snipich Yu, n. d).

The modernization of irrigation equipment should consist in replacing imported, expensive spare parts, components by the parts cheaper and produced in Russia; open irrigation system with high efficiency and low energy consumption should be implemented.

4. DISCUSSION

To implement these measures, state support is required.

The data from Table 1 indicates that more than 7 billion rubles were allocated during the first years. In subsequent years this figure should be doubled, and by 2020 it should be amounted to 14.3 billion rubles. The reconstruction of the number of hydraulic

structures by 2020, compared to 2014, should increase by a factor of 4.

	2013	2014	2015	2016	2017	2018	2019	2020
Securing of state hydraulic engineering structures, units.	-	6	20	15	14	19	15	25
Volumes and sources of financing for the Program "Development of reclamation of agricultural lands of Russia for 2014-2020"								
The volume of budgetary allocations for the implementation of the Program, using the funds of federal budget, billion rubles.	-	7,8	8,5	9,9	12,5	14,4	14,0	14,3

Table 3. Planned amount of state support for land reclamation systems within the framework of the program "Development of agriculture and regulations of the market of agricultural products, raw materials and foodstuff for 2013-2020"

5. SUMMARY

However, the amount of equipment, which is planned to be subsidized, when the manufacturing plants will sell it to agricultural producers at preferential prices, is only 10%. In this regard, the approved mechanism of state subsidizing of machinery manufacturers with a lack of subsidies will lead to further development of the situation, associated with the technical impoverishment of the agricultural sector (Vodyannikov & Sereda, 2014), (Vodyannikov & Rubtsov, 2013), (Ochler, 1949). From this perspective, the adopted Program for the development of reclamation of lands, intended for agriculture in Russia for 2014-2020 may not be fulfilled.

To calculate the forecast for the provision of Russia with irrigation equipment, the trend model is used. The application of data for 2000-2014 showed a significant reduction in the provision of agricultural production with equipment, and that does not correspond to the actual trend, developed in recent years. As a result, the forecast for the provision of irrigation equipment was done on the basis of data for 2007-2015.

Indices	2007	2008	2009	2010	2011	2012	2013	2014	2015
Sprinklers, irrigation machines and plants, thous.pcs.	6,7	6,0	5,7	5,4	5,3	5,2	5,2	5,7	5,9

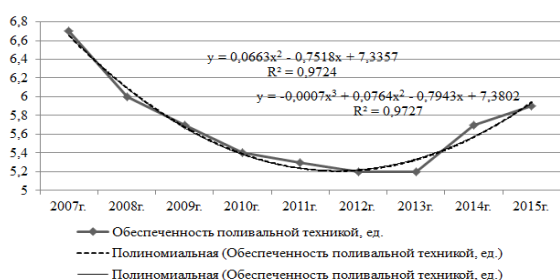
Table 4. Initial data for forecasting the provision of irrigation equipment for agricultural producers in the Russian Federation until 2020

Table 5 presents the forecast of the level of provision with irrigation equipment for the Russian Federation until 2020. This forecast takes into account the current trends in development of the park of sprinkler and irrigation machines and plants (Subaeva, 2016), (Subaeva & Zamaidinov, 2015), (Ochler, 1966).

Indices	2016	2017	2018	2019	2020	2025
Sprinklers, irrigation machines and plants, thous. pcs.	6,3	6,9	7,6	8,4	9,3	11,0

Table 5. The forecast of provision of irrigation equipment for the Russian Federation until 2020

According to the analytical alignment, the provision of irrigation equipment in the region in the short term will increase to 7.6 units, in the long-term period - up to 11.0 units. The forecast of provision of irrigation equipment was made taking into account the analytical alignment of the indicator's dynamics, according to the data of 2007-2015, using the parabola equation of the third order, characterized by a high value of the determination coefficient $R^2=0.9727$. In this case, the determination coefficient shows a strong functional relationship between the variables and characterizes a high degree of data feasibility.



Обеспеченность поливальной техникой, ед.	The provision of irrigation equipment, units
---- Полиномиальная (Обеспеченность поливальной техникой, ед.)	Polynomial (provision of irrigation equipment, units)

Полиномиальная (Обеспеченность поливальной техникой, ед.)	Polynomial (provision of irrigation equipment, units)
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Figure 1. Analytical alignment of dynamics of the irrigation equipment provision, units

6. CONCLUSIONS

The introduction of new technologies, the implementation of new organization forms of the irrigation equipment use, can be possible with the proper organization of the work of service departments, the introduction of new irrigation technologies, the opening under the Ministry of the Russian Federation and the ministries of the regions, the particular direction in the activities of information and consulting services, for the creation of wholesale engineering and technical markets for the AIC (Subaeva, 2016), (Okamura, 1971), (Okamura & Teoretikal, 1968). With all these measures, the main factor in the introduction and use of modern irrigation systems is the state support of agricultural producers in the form of subsidies, for reimbursement of expenses, using budget funds.

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REFERENCES

- Ochler G. Grundlagen der Wasserverteilung durch Beregnungerte. München. Neunter, 1949.
- Ochler G. Untersuchungen über die Verringerung der Sprahwasserverluste bei Schwinghebelregner. Landtechnische Forschung, 1966. 16, № 6.
- Okamura S. Rozdelenie fikstivodnich kapek v papzsku z postrikovase. Vodni hospodazstvi, Chechoslovakii, 1971, vol. 21, № 2, p. 52-55.

Okamura S. Teoretikal study on sprinkler sprays. Ночудомокучаккайронбунсю, Japan, 1968, №26. М.,1972, p. 49.

Snipich, Yu.F. Choice and assessment of irrigation technologies / Yu.F.Snipich // Nature management.-2011. -№1.- Pp.16-21.

Snipich, Yu.F. Improvement of technological tools of irrigation by sprinklers/ Yu.F.Snipich. - Novocherkassk: Helikon, LLC,2007. -110 p.

SnipichYu.F. Optimization of the load on irrigation equipment/ Yu. F. Snipich, L.A.Voevodina, A.N.Chekunov // Scientific journal of KubSAU [Electronic resource. Identification number of the registration form: 0421100012010]. - Krasnodar: KubSAU, 2011. - №65 (01).

SnipichYu.F.Technologies and agrotechnical requirements for sprinkling machines/ Yu.F.Snipich// Scientific journal of KubSAU [Electronic resource. Identification number of the registration form: 0421100012117]. - Krasnodar: KubSAU, 2011. - № 68 (04).

Subaeva A.K., Zamaidinov A.A. Methods of agricultural machinery market regulation / A.K. Subaeva, A.A. Zamaidinov A.A. // International Business Management 2015; 9(7): 1780-1784. ISSN: 1993-5250.

Subaeva, A.K. Economic mechanism of technical support of agriculture (monograph)/ A.K.Subayev//Monograph - Kazan. Publishing house "Brig", 2016.– 216p.

Vodyannikov, V.T., Rubtsov, P.A. The analysis of the provision of equipment the agricultural organizations in the Republic of Mordovia / V.T. Vodyannikov, P.A. Rubtsov// Bulletin of the Federal State Educational Institution of Higher Professional Education "Moscow State Agroengineering University named after V.P. Goryachkin." - 2013. - №3. - Pp. 79-82.

Vodyannikov, V.T., Sereda, N.A. Reproduction of technical potential of agriculture in the conditions of innovative development: monograph / V.T. Vodyannikov, N.A. Sereda. - Karavaevo: Kostroma State Agricultural Academy, 2014. - 228 p.