FORESIGHTS -TECHNOLOGIES IN THE DEVELOPMENT OF LAND IMPROVEMENT PARKS IN THE COUNTRIES - PARTICIPANTS OF EURASEC

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ABSTRACT

The article deals with the development of agricultural production in the EurAsEC countries. It is shown that the further development of agriculture should be based on the introduction of new lands improvement. One of the innovative infrastructure objects of further development of agriculture can be – Land improvement Parks, the concept of which is developed by scientists of research institutes of Russia.

Keyword: Land improvement Park, Management Company, innovation, public-private partnership, renewable energy, EurAsEC, convergent platform.

1. INTRODUCTION

In recent years, within the framework of scientific foresights began to develop promising areas of the world economy, including agricultural production with a reclamation complex. Application of technology foresight in support of the vision of the future began at the end of the twentieth century. Today, these technologies are one of the important tools in the formation of scenarios for the development of national economies. According to the American scientist Ben Martin, foresight technology is «a process associated with a systematic attempt to look into the distant future of science, technology, Economics and society in order to identify areas of strategic research and technology» (I. Kuklina, 2013). Foresight is a tool to develop long-term views about the future (visions); and the image of the possible «destructive» events; and assess «effective» ways of nature conservation. In the practice of public administration uses such foresight technologies as: plan of measures, methods of priority selection, scenario planning of the future; and there are new ones that are just beginning their way in practice: technology «weak information signals» (V. Sokolov, 2012). An important factor that accelerates the emergence of new technologies for creating images of the future is the Internet with its tools of «smart solutions». The technology of foresight strategy allowed Russian scientists to «scan the horizons of development of agriculture», to predict the emergence of a new tool of economic growth – the Land improvement Parks.

Land improvement is a field of scientific knowledge that has come a long way in understanding the object and subject of their research. Today's understanding of land improvement is associated with the name of the land improvement scientist – A. N. Kostyakov, who understood lands improvement as «a system of organizational,

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economic and technical measures aimed at radical improvement of unfavorable natural (soil, climatic, hydrological) conditions of land improvement territories through appropriate changes and regulation of their water and associated air, food and thermal regimes» (S. Vasilyev, 2018). This interpretation of land improvement is fixed in the legal framework of the Russian state. In the Federal law of 10 January 1996 № 4- the Federal law «About Lands improvement» as the direct object of land improvement in Russia are of the earth (land and forest areas), including soil, drainage systems, separate hydraulic structures, protective forest plantations, as mediated by resource – air, subsoil, water, flora and fauna (the Federal law-4 «About Lands improvement», 1996).

Some of forms of irrigating systems which is used in agriculture it is micro irrigation and a drip irrigation system which provide watering of agricultural grounds or decorative plantings. Russia more uses drip irrigation apply on farmlands with Earth's surface biases to 0,35, with a pressure in network from 0,1 to 0,4 MPas and an expense of microwater outlets (droppers) from 2 to 6 l/h more. Low pressure drip irrigation provides supply of irrigation water in the form of drips or microstreams at a pressure in network in 1–1,5 m and an expense of droppers from 4 to 20 l/h. Restriction of applicability of drip irrigation are the soils containing no more than 0,4% of all salts and no more than 0,005% of chloride sodium (NaCl) in limits of a root zone. The technology of drip irrigation has a number of obvious advantages:

(i) possibility of application of drip irrigation practically in any climatic zones of growth of plants;

(ii) implementation of drip irrigation on any types and types of a soil cover and small water-retaining capacity;

(iii) relative balance of the water-air mode in a rhizosphere and exact introduction of the fertilizers and agrochemical medicines dissolved in irrigation water.

(iv) At the same time, the drip irrigation system has a number of drawbacks:

(v) problematic application of drip irrigation for irrigation of medium- and narrow-row crops, crops of continuous sowing and grasses;

(vi) high degree of saturation of the drip irrigation area with distribution, irrigation pipelines and other network engineering components, which limits the possibility of mechanized processing of farmland and requires appropriate farming techniques;

(vii) relatively high cost of sets of technological equipment and high requirements to the quality of irrigation water used during drip irrigation and the degree of its purification before feeding into irrigation network.

Drip irrigation refers to technically complex and costly irrigation technologies and, under inadequate conditions of their application, can not only lead to inefficient use of enclosed financial, labor and material resources, but also to negative environmental consequences and, in particular, to a decrease in soil fertility. Land improvement creates conditions for more effective (productive) use of land without changing their purpose, improves the socio-economic conditions of people in rural areas. It can be concluded that land improvement is a complex expensive resource and energy – intensive activities carried out for a long time to improve the quality of land. (L. Medvedeva, 2016). Today on irrigated lands, which make up less than 20% of the arable land area, produce more than 40% of crop production. According to International Commission on irrigation and drainage (ICID) as of 01 January 2018, the agro-industrial complex is one of the most dynamic sectors of the world economy (annual volume – $1.4 trillion.). The main factors that influence the development of the world food market include: the growth of the population on Earth; improving the

welfare of the population in economically developed countries; increasing demand for quality food (organic farming); increasing demand for proteins and vitamins. One of the interstate entities – the Eurasian economic community (hereinafter – EurAsEC), which includes: the Republic of Armenia, the Republic of Belarus, the Republic of Kazakhstan. In economic terms, the EurAsEC is a large regional market (182.6 million people, or more than 3% of the world's population), located on the world's largest territory (15% of inhabited land), with a strong mineral resource base and significant agricultural potential. The share of the Community in the world Gross Domestic Product (GDP) is estimated at 4%, exports of goods – 3%. The total volume of agricultural products exported to third countries in January 2018 amounted to more than us $ 1.5 million (the Table 1) (EurAsEC, 2018).

Table 1. Exports of food products and agricultural raw materials from EurAsEC

The EurAsEC Countries	The volume of exports to third countries, in January 2018, million USD	Ratio of 2018 to 2017 years, in %
Armenia	21.7	173.5
Belarus	35.4	128.1
Kazakhstan	226.5	173.9
Kyrgyzstan	5.5	131.6
Russia	1266.0	116.4
Total	1555.1	123.2

Resource: Statistics of the Eurasian economic Union

Agriculture is one of the strategic sectors of the EurAsEC economy, ensuring food security of the countries. The dynamics of growth of agricultural production in the EurAsEC countries in 2017 is presented in the Tables 2 and 3.

Table 2. Dynamics of agricultural production growth in the EurAsEC countries

The EurAsEC Countries	The production of agricultural products, million USD	The volume index of production. Ratio of 2017 to 2016 years, in %
Armenia	1938.6	-2.9
Belarus	9437.6	4.1
Kazakhstan	12621.1	2.9
Kyrgyzstan	3011.2	2.2
Russia	96930.4	2.4
Total	123939	2.5

Resource: Statistics of the Eurasian economic Union

Table 3. Dynamics of production by country in the main agricultural crops, 2017 year, in %

The EurAsEC Countries	Cereals and legumes	Sugar beet	Potato	Vegetables	Oil crop
Armenia	-50		-10	-11	-25
Belarus	7	15	7	3	230
Kazakhstan	0	34	2	0	24
Kyrgyzstan	-2	1	2	2	-4
Russia	12	1	-5	1	1
Total	10	2	-3	0	6

Resource: Statistics of the Eurasian economic Union

Today the EurAsEC has adopted programs in the field of lands improvement aimed at: increasing the sustainability of agricultural production in a changing climate and natural anomalies; on the use of energy and resource-saving technologies; to use the mechanism of public-private partnership (V. Shchedrin, 2017; L. Medvedeva, 2017). The synergetic effect of the coordinated measures of support and development of agrarian and industrial complex can be more notable on the convergent platform which gives justifications for creation of the Land improvement Parks which concept is

developed by scientists to the Federal State Budgetary Scientific Institutions «Russian Research Institute of Land Improvement Problems» (Russia). The convergent platform is shown in the Figure 1.

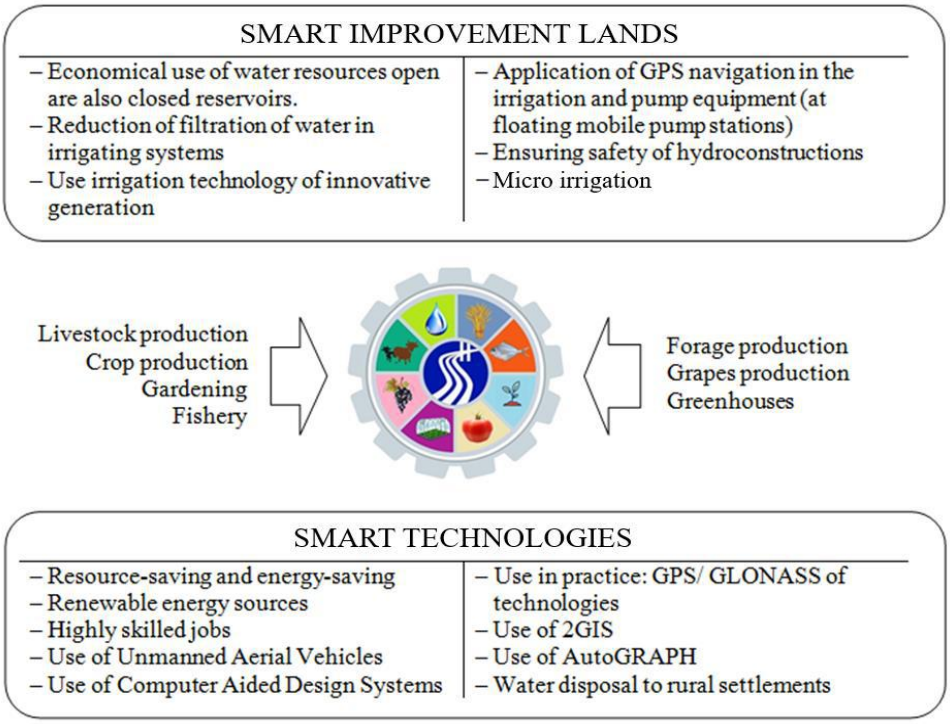

Figure 1. The convergent platform «Smart Agriculture» for the mechanism of providing the Land improvement Park

The convergent platform «Smart Agriculture» is a set of the technologies and products providing development of agriculture at the level of the organization. The convergent platform is created by means of the objective of the architecture guaranteeing compatibility of equipment rooms and software products which is specially developed for the decision. In the Land improvement Park this platform will combine clever technologies, «Smart Lands Improvement», GPS navigation, micro irrigation, and etc.

The Land improvement Parks (hereinafter – L.I.P.) is an effective local agro-clusters with clear competitive advantages in the production of agricultural products, oriented to the needs of the domestic market and export supplies. The relevance of the project is explained by the fact that the number of irrigated lands in the EurAsEC countries does not meet the requirements of the development of society and the economy. The objectives that determined the need for the creation of the «L.I.P.» are the following: the formation of a mechanism for the effective use of innovations and public-private partnership in land improvement; obtaining stable crop yields on lands improvement; strengthening the fodder base of the livestock sector; creation of highly qualified jobs. The «L.I.P » control algorithm is shown in the Figure 2.

Feature of functioning of «L.I.P» is existence: the Union of agricultural producers, a uniform complex of real estate objects (including irrigation and drainage systems), lands of agricultural purpose. The management companies of the «L.I.P», which can also be a Federal State Budgetary Institutions for land reclamation and agricultural water supply, provide management of the complex, the implementation of the reclamation investment project, the provision of services to residents of the Park to

promote agricultural products to the market and the use of resource-saving and energy-saving technologies, including energy production at renewable energy facilities (D. Belykh, 2018). EurAsEC countries can implement pilot projects to create «L.I.P » on old-irrigated lands, new irrigated, old-drained lands, and new drained lands. One of the regions of the pilot project – reclamation parks can be the South of Russia, namely, the Rostov region. Agro-industrial complex in the region is one of the leading in the country: 8.5 million hectares of agricultural grounds.

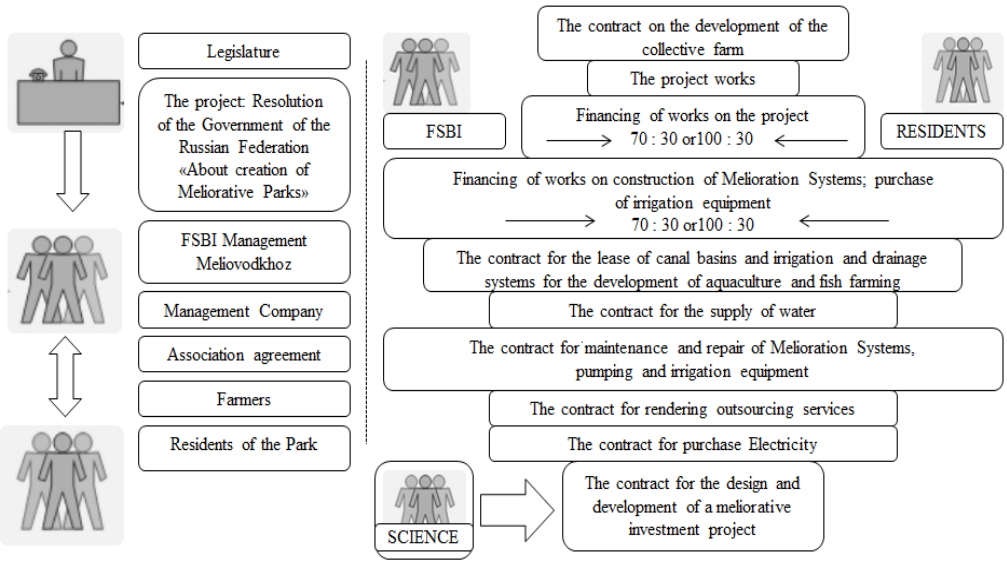

Figure 2. The algorithm for management of the «L.I.P »

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Figure 3. Areas of development irrigation lands Improvement in the Rostov region
Resource: The Russian Research Institute of Land Improvement Problems, 2017

The first zone of the area – 306.3 thousand hectares includes the Azov and Aksay districts; the second – Bagaevsky, Veselovsky, Martynovsky, Semikarakorsky districts (431.1 thousand hectares). The third zone includes: Volgodonsk and Zimovnikovsky districts (559,000 ha); the fourth zone – Konstantinovsky district (180.1 thousand hectares); The fifth zone is the Orel, Proletarian and Salsk districts (853,000 ha) (are shown in the Table 4). One of the most promising areas for the creation of the «L.I.P» is the second one. The legislative and Executive power may introduce the regime of «territory of advanced development» in the territory of the «L.I.P» (D. Belykh, 2018). The technical and technological activities of the «L.I.P» could include the application of BAT in agriculture and irrigation; processing, storage and marketing of products; and the use of renewable energy sources. Scientists of the Federal State Budgetary Scientific Institutions «Russian Research Institute of Land Improvement Problems» proposed to use of renewable sources of energy for land reclamation (L. Medvedeva, A. Roskoshnaya, S. Mangina, 2018).

Table 4. Promising areas for the creation of the «L.I.P»

District name	Area of the district, thousand hectares	Area of arable land, thousand hectares	Lands improvement, thousand hectares		Population, thousand people	Zones
			Irrigated lands	Actually being irrigated		
The first zone						
Azovsky	211.4	179.4	12.8	7.1	96.8	Cattle-breeding and grain
Aksaysky	94.9	56.1	5.9	4.4	110.5	
The second zone						
Bagaevsky	71.8	47.6	17.2	8.6	34.6	Cattle-breeding and vegetable-growing (with developed viticulture)
Veselovsky	112.0	89.6	18.8	6.4	25.6	
Martynovsky	158.1	123.0	13.8	6.3	34.7	
Semikarakorsky	89.2	65.5	18.2	7.2	49.6	
The third zone						
Volgodonsky	102.0	67.9	24.3	11.5	34.2	Cattle-breeding, vegetable-growing and grain
Zimovnikovsky	457.0	283.5	4.6	0.1	36.7	
The fourth zone						
Konstantinovsky	180.1	135.7	–	–	31.8	Cattle-breeding and grain
The fifth zone						
Orovsky	300.7	198.7	0.8	0.6	38.7	Sheep-breeding and grain (with the developed meat cattle breeding)
Proletarsky	232.0	157.6	20.4	13.0	34.9	
Salsky	320.3	256.3	12.8	2.1	103.5	

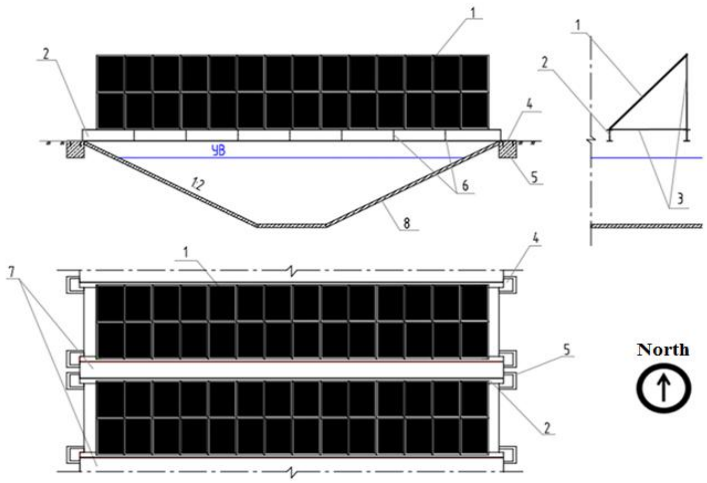
The Veselovsky district is located in a temperate climatic zone. The main branch of the district's economy is agriculture (95.6% of the total output). The district has 108.5 thousand hectares of agricultural land, including 20.171 thousand hectares of irrigated land. At the end of 2017, 1623 hectares of grain crops, 1366 hectares of vegetables and 403 hectares of fodder were irrigated from 3,392 hectares of land. Every year, farmers produce 140–150 thousand tons of grain, leguminous crops and corn with an average yield of 35.0 t / ha (Veselovsky district, 2018). The structure of «L.I.P. Veselovsky» will include: management company, residents (agricultural producers), a branch of Federal State Budgetary

Institution «Management of land improvement and agricultural water supply across the Rostov region», organizations providing services for processing, storage and sale of products, research and educational institutions and business structures.

The structure of the production complex «Veselovsky» in various forms of relationships will include: distribution channel, inter-farm irrigation and drainage and discharge network; agricultural land and production facilities of residents located in the area of «L.I.P.», facilities for storage, processing of agricultural products.

The integrated complex of L.I.P.» should provide the management company and residents of the Park with information on BAT, statistical and accounting reporting; offer solutions in the field of planning and supply of products to the market.

The technical and technological activities of the «L.I.P.» could include the application of BAT in agriculture and irrigation; processing, storage and marketing of products; and the use of renewable energy sources. Scientists of the Federal State Budgetary Scientific Institutions «Russian Research Institute of Land Improvement Problems» proposals for the use of renewable sources of energy in land reclamation (L. N. Medvedeva, 2018; A. S. Roskoshnaya, 2018; S. A. Mangina, 2018). An example of placing solar panels on the main canal of the main canal is shown in Figure 5



1 – solar panel (south direction, angle 45o); 2 – I-beam 35B1; 3 – panel mounting (Sigma profile); 4 – embedded part MI1-22; 5 – concrete foundation; 6 – transverse edge of I-beam; 7 – technological transition (wooden bridge); 8 – concrete facing of the canal

Figure 5. The construction of solar panels on the main canal of suburban irrigation system

On the introduced irrigated lands can be used as autonomous energy sources for sprinklers – wind generators. The park's residents can use them as a main or hybrid source of energy and apply it in irrigation technology, lighting field contours. Developed by scientists of the Federal State Budgetary Scientific Institutions «Russian Research Institute of Land Improvement Problems» the concept of «L.I.P » is aimed at the development of innovative capacity of land reclamation sector and the sustainable development of agriculture, expansion of irrigated land, high yields, creation of new jobs, increased tax revenues to the budgets of different levels. The use of the mechanism of public-private partnership will increase the area of irrigated land, ensure the production of competitive environmentally friendly products, apply resource-saving technologies and innovations; increase the profitability of agricultural production and contribute to the growth of rural employment and quality of life.

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