Mechanisms for managing investments in the ecological and economic use of land resources of Tajikistan

F P Arabov, U A Sharipov, T O Samiev, E SH Mirzoeva, K A Sodikov and H F Sadiev

1 Tajik State Institute of Culture and Arts named after M. Tursunzade, Dushanbe, Republic of Tajikistan
2 Tajik State Financial and Economic University, Dushanbe, Republic of Tajikistan
3 Tajik State Pedagogical University named after S. Aini, Dushanbe, Republic of Tajikistan
4 Tajik National University, Dushanbe, Republic of Tajikistan

E-mail: firdavs300@mail.ru, umar4004@mail.ru

Abstract. Statement of the problem of service request for repair is formalized and algorithms of solution are presented. An algorithm is designed for the service of the greatest number of requests for repair within the established deadlines. An algorithm is proposed for constructing the optimal sequence of servicing repair requests. The optimal sequence is determined basing on the least total time of delays while completion of the requests service within the established deadlines. Usage of the optimization algorithms for the service of requests for repair in certain examples. The article discusses the development of a mechanism for managing investments in the ecological and economic use of land resources and its features in the areas of functioning of agricultural land use, while focusing on the degrading processes of land resources in Tajikistan, which today is the main problem for providing the country's rapidly growing population. The article presents the opinion of scientists about the rational use of irrigated lands and the opposition of the degrading processes of the lands of the regions of the country. An attempt is made to characterize land and water investments in the context of resource transformation, taking into account the specific goals of investors. An attempt was made to analyze the ameliorative state of land resources in the regions of the Republic of Tajikistan. The paper proposes modifications of land and water investments, which allow the activation of investments, based on the characteristics of the agricultural use of land investments.

The search for new mechanisms to improve the investment climate in the country's agriculture in recent years has acquired particular importance. In his message to the Leader of the Nation, the President of the Republic of Tajikistan, respected Emomali Rahmon in the Majlisi Oli of the Republic of Tajikistan this year emphasized that “... land, providing the agricultural sector with the necessary equipment, high-quality seeds and access to financing for business entities, 22 state investment projects were implemented worth more than 5.4 billion somoni. Currently, another 7 other projects are being implemented in the country worth 2.4 billion somoni. And in the future, increasing the production of agricultural products is one of the most important tasks, therefore, it is necessary to ensure the efficient use of water and irrigated lands, innovative technologies and developed agricultural technology, along with creating intensive gardens. In this regard, the heads of regions, cities and districts, dekhkan farms,
each farmer and each family need to ensure the effective use of land, first of all, household and presidential land, to harvest and use high-quality seeds in order to get up to 3 harvests a year, including in the current year 2021” [1].

Improving the investment climate and development of the agro-industrial complex and agricultural land use, attracting direct investments to ensure sustainable development of the agro-industrial complex should be one of the priority directions of the economic policy of our country.

It should be noted that today "... an effective mechanism for return on investment is one of the most important factors influencing the volume of investments in the industry" [2].

Today, in the context of decentralization of power, the problem of effective management of investment resources for the development of land resources and land use in Tajikistan remains urgent. Unfortunately, we have to admit that the modern management system does not demonstrate success in the quality and efficiency of use, reproduction and protection of natural, in particular land, resources, since there is still no adoption of appropriate management measures for land protection, which causes the development of soil degradation processes:

- the current state of ownership, use and disposal of agricultural land does not make it possible to make a transition to market mechanisms for the use of these resources, which leads to a reduced interest of investors in investing in the domestic economy;
- there are significant shortcomings in the system of levying rent for land, creates a deficit in local budgets;
- there is a low capitalization of land resources.

Thus, according to the estimates of a number of scientists and experts, in all the countries of the post-Soviet space there is an intensive process of degradation of agricultural land, primarily as a result of soil erosion and washing away of its humus layer. It is also important to take into account the fact that many anti-ecological tendencies that were characteristic of the Soviet period of development have not yet been overcome, and under the conditions of the now proclaimed strategy of transition to an industrial-agrarian development model, they may receive their further development. The preservation of nature-intensive man-made approaches in the development of the agro-industrial sector can lead to a deepening ecological crisis in agriculture in the near future, as well as to massive degradation of hundreds of thousands of hectares of land and fall, yield, which will negatively affect the food situation in the region [3, p.7].

Irrigated agriculture is the main direction of intensification of agricultural production, which is limited by two factors:

- Availability of land resources suitable for these purposes in terms of technical, economic, soil-reclamation and environmental conditions;
- Availability of water resources for water supply to irrigation systems, without prejudice to non-irrigation water users [4].

It should be noted that the total potential area of irrigated land in the Republic of Tajikistan is 1425.5 thousand hectares. Irrigated land is mainly located in the plains, in the mountains, in the valleys and rivers. According to the State Committee for Land Management and Geodesy, the area of irrigated land in the Republic of Tajikistan is 752.5 thousand hectares. Including the area of irrigated land under reclamation control-692.6 thousand hectares or 92% of the area of irrigated land, lands with provided drainage-324.1 thousand hectares or 43%, including with closed drainage 80.4 thousand hectares or 11%.

Analysis of the current state of land and water resources, especially irrigated lands, shows that in some regions of the republic the tendency of their deterioration persists. The soil cover, especially farmland, in most cases confirmed by degradation and pollution, loses its resistance to destruction, the ability to restore properties, reproduction of its fertility as a result of wasteful land use. So, at present,
more than 60% of the irrigated lands of the republic are subject to erosion, soil salinity is observed on 190 thousand hectares, an increased level of groundwater is observed on 23% of arable land. According to the Institute of Agriculture of the Republic of Tajikistan, the damage from erosion is 150 million somoni/year, the shortfall in harvest due to soil salinity is more than 156 thousand tons in the amount of 388 million somoni (or nearly 40 million US dollars). The cost of the loss of raw cotton on average is more than 1.5 thousand somoni per hectare. In general, the annual increase in the area of unused land, desertification, lack of water and droughts are becoming the reasons for an ever-increasing decline in crop yields. At the same time, annually more than 40 thousand hectares of land remain in an unsatisfactory reclamation state [5].

The problem of land degradation is caused by both natural and climatic factors and anthropogenic activities. A significant part of the region's land resources is affected by the processes of desertification and is associated with the change and loss of vegetation cover, deflation of sands, water and wind erosion, soil salinization, soil and water pollution with industrial, household waste, pesticides, etc. Together, these factors lead to a change in the function of soils, reducing their natural and economic significance.

Today, one of the global problems in agriculture in Central Asia, and in particular in the Republic of Tajikistan, is the salinization of irrigated lands. One of the reasons for the increase in the area of land salinization is the rise in the level of groundwater. “… Also, at least 200 thousand hectares of valley lands suffer from a very undesirable rise in the level of groundwater in Tajikistan. In Uzbekistan and Turkmenistan, millions of hectares of land are also in this state. Only in the Khatlon region of the Republic of Tajikistan, more than 7.1 thousand hectares of land are affected by the rise of water to a depth of 1.0 meters, and 135.3 thousand hectares - to a depth of 1 to 3 meters. After the growing season, the water level decreases, but the salt remains in the soil. The process of land salinization is also facilitated by over-standard irrigation. As a result, the area of saline lands currently reaches 15% of the total area of irrigated land tracts, i.e. over 130 thousand hectares of land. Research shows that every year more than 2,500 hectares of valuable irrigated land are converted to salt marshes, i.e. completely withdraw from agricultural use. By itself, such a situation should be viewed by society as a natural disaster. According to its final results, it is a social catastrophe” [6].

Table 1. Reclamation state of land resources in the Republic of Tajikistan as of 01.01.2020.

| Indicators                        | Total area of reclamation lands, hectare | Reclamation state of irrigated lands, hectare | Including |
|----------------------------------|-----------------------------------------|---------------------------------------------|-----------|
| Regions                          | Total area of reclamation lands, hectare| Good | Satisfactory | Unsatisfactory |
|                                  |                                         | Dangerous depth of groundwater | Salinization of soils | Dangerous depth of groundwater and soil salinization |
| Kurgan-Tyubinsk zone             | 252580                                  | 158353 | 80567 | 13660 | 7703 | 4936 | 1021 |
| Kulob zone                       | 85617                                   | 42839 | 40347 | 2431 | 1564 | 735 | 132 |
| Total                            | 338197                                  | 201192 | 120914 | 16091 | 9267 | 5671 | 1153 |
| Khatlon region                   | 288922                                  | 211536 | 58333 | 19053 | 10093 | 6075 | 2885 |
| Sughd region                     |                                         | 98059  | 8398  | 439  | 386  | 23  | 30  |
| region of republican subordinates| 106896                                  | 16484  | 2027  | -    | -    | -   | -   |
| GBAO                             | 18511                                   | 16484  | 2027  | -    | -    | -   | -   |
| Total in the Republic            | 752526                                  | 527271 | 189672| 35583| 19746| 11769| 4068|

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As the data in Table 1 show, the total area of reclamation lands with an unsatisfactory condition in the Republic is 35583 hectares, which is 5% of the total area, in the Sughd region 19053 hectares, in the Khatlon region 16091, including: in the Kurgan-Tyubinsk zone 13660 hectares, the Kulyab zone 2431 hectares, RRS-439 hectares. The problem of reclamation of irrigated lands remains acute in the regions of N. Khusrav, Yavan, Shakhrisat, Vakhsh, Farkhor, Asht, Kanibadam, Mastchok and Isfara.
In the Kulyab zones, the share of lands with a good ameliorative condition is low - 51-52%. With an average value of lands with an unsatisfactory condition of 39.1%, in the Hamadoni, Farhari, Voseysky districts it reaches 58-60%. Thus, the land reclamation state is not uniform.

The deterioration of the land reclamation condition in the Sughd region can be judged by the decline in crop yields and the gross harvest of products. Thus, the average annual production of raw cotton for 1986-1990, there were 245 thousand tons, grain-105, vegetables-129, melons-18 thousand tons, and by 1995-2015 it was respectively: 123, 83, 86 and 11 thousand tons, or on average, the decline in the production of basic products ranged from 21 up to 50%.

The unsatisfactory technical condition of the facilities of the engineering infrastructure of reclamation systems and the low efficiency of agricultural production on reclaimed lands are primarily due to the lack of incentives for efficient farming and the conditions for its implementation as a result of an imperfect system of economic relations between agricultural and water management enterprises.

One of such examples, it can be emphasized, is the irrigation system of the Yavan-Obikinskaya valley of the Khatlon region. “...In this region, gully formation of 50 km² is the result of miscalculations in the design of the development of the massif and irrational irrigation. In general, one fifth of this system with a total area of 6 thousand hectares, created in the 60s, is covered by 350 ravines (some of them reach 25 m deep and 100 m wide) and cannot be used due to erosion (207. 10²-10³). According to official data, now 82.3% of all land, 97.9% of agricultural land, and partly 60% of irrigated land are subject to erosion” [7].

It should be noted that “...for the development of new irrigated lands, the restoration of lands left out of agricultural use and the development of agriculture in various regions of the country, 12 state investment projects in the amount of almost 2 billion somoni have been carried out, and at present, the implementation of such projects for a total million somoni. Despite this, annually more than 40 thousand hectares of land remain in an unsatisfactory reclamation state” [8].

In the Republic of Tajikistan, up to 42% of irrigated lands, about 301 thousand hectares are served by pumping stations. This zone is home to about 2 million people. There are about: about 515 pumping stations; with a total length of 26194 km of small and large irrigation canals, 8320.2 km, various types of drainage networks and structures, 1823 units of reclamation and irrigation wells, 377 units of substations and 145.6 km of power lines, 10 reservoirs of irrigation and energy value, other auxiliary infrastructure. Gravity irrigation lands make up about 60%. Irrigation systems with hydraulic structures built in the middle of the last century, which are physically worn out by more than 50%. About 40% of irrigated land is located in the command zone of pumping stations and wells. However, due to wear and tear, about a third of the pumping and power equipment, pressure pipelines, high cost of electricity and its shortage in spring, in fact, pumps irrigate about 262.0 thousand hectares. About 74% of the existing 1,823 vertical drainage wells are inoperative. The poor condition of maintenance roads and communication systems make it difficult to manage irrigation systems.

The results of assessing the effectiveness of investments in the land use system showed that the existing farming system does not ensure the rational use of land and water resources and the conservation of biological diversity and the quality of the natural environment. In this regard, there is a need for “...the development and implementation of comprehensive reclamation measures and the reconstruction of the irrigation system, in which in the process of using agricultural land in order to obtain high-quality agricultural products, there will be no serious violations of the basic properties and changes in the state of the components of the natural environment, including land for agricultural purposes” [9].

Thus, “...the current situation with investment processes necessitates the improvement of existing mechanisms for managing regional investment policy in the direction of increasing its level of scientific support” [10].

That is why it is necessary to correctly determine the priority tasks for the development of investment activities in the agriculture of the republic, taking into account the strengths and weaknesses, namely:

- implementation of a system of measures to improve the institutional support for the implementation of investment activities;
• provision of infrastructure preparation of potentially attractive land plots for placement of investment objects, completion of the creation of industrial (industrial) parks;
• activation of cooperation of the region with trade and economic representations in Tajikistan and abroad, aimed at assisting in the search for investors and organizing presentation events;
• introduction of new forms of establishing contacts between domestic and foreign investors, organizational and informational support of domestic agricultural entrepreneurs, search for strategic partners;
• assistance to business entities in attracting investments aimed at modernizing the production potential of agricultural entrepreneurship in the region in order to produce high-tech products;
• advanced training of specialists in investment and innovation activities.

The implementation of the tasks should be carried out on the basis of “...pursuing a purposeful, consistent policy towards creating conditions for enhancing investment activities in agricultural land use in the region, improving mechanisms for mobilizing, attracting and using financial resources at the expense of budgetary and extra-budgetary funds, alternative sources of investment” [11]. Consequently, despite the limited state investment in the land reclamation sector, it is advisable to use the internal and external financial resources of the country. Only in the case of allocating significant funds from the state budget, further foreign investments in the land reclamation sector, comprehensive state support for the land reclamation and water management system, and increasing the economic efficiency of land reclamation are possible.

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