

REPUBLIC OF AZERBAIJAN

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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

**WAYS TO INCREASE ECONOMIC EFFICIENCY OF USE
OF IRRIGATED LAND IN MODERN CONDITIONS IN
AZERBAIJAN**

Speciality: **5312.01 - “Sectoral economy”**

Field of science: **Economic sciences**

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The dissertation work was carried out at the "Business Organization and Management" department of the "Economics and Management" faculty of Sumgayit State University.

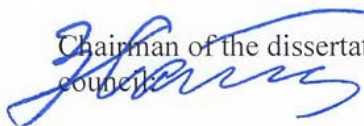
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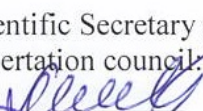
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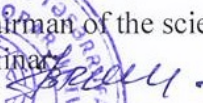
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GENERAL CHARACTERISTICS OF OF THE WORK

Relevance and development of the topic. In case of a significant increase in global problems, formation of the potential of the population to meet the demand for basic food products for the long-term cycle has strategic importance. In addition, the food safety of the population has been considered as an integral part of the national and economic security of each country. Similar approaches are very typical for Azerbaijan. Thus, increasing the population in the form of geometric series in our country leads to a steady increase in both food and agricultural product demand. As a consequence, there is a great need for further increasing agricultural land, improving the economic efficiency of their use and fertilizing the useless soils.

Although the country has the favorable soil and climate conditions, rich natural resources, sufficient energy and labor resources and highly qualified personnel for agricultural development, unfortunately, agricultural production in modern times is not appropriate to the existing potential. In addition, land use for personal purposes, lack of necessary measures for land amelioration, irrigation and erosion, determination of the water demand of individual households according to unbalanced norms and orders, inadequate selection of irrigation methods for agricultural plants, lack of comprehensive approaches to water resources and waste of use, decrease in productivity and quality of plants, failure to meet the water needs of arable land by distributing water resources unevenly throughout the year and in the region, decrease in productivity and other reasons result in a decrease in the economic efficiency of irrigated lands. These factors indicate the importance for agricultural reform, formation of new land-property relations, ways of water use efficiency for planting and solution of environmental and economic problems of soils intensive development of land, which is the main production tool in agriculture in all sectors of the economy, including the agrarian sector by focusing on economic and environmental problems. Comprehensive analysis of factors affecting productivity growth in irrigated lands, including parameters such as timely and quality irrigating the lands, developing melioration and water management systems, providing the necessary water balance of the

land according to the biological characteristics of the plant roots in irrigated lands, cultivating correctly selected plant species in favorable areas, fertilizing sown areas and feeding with other natural minerals should always be controlled. The implementation of these factors and the continuous growth of the country's economy significantly affect the efficiency of land resource management, especially irrigated land, and make their effectiveness more relevant. In this context, the economic assessment of irrigated lands, the solution of their environmental and economic problems, as well as the intensification of production on irrigated lands, improving the economic efficiency of land use and irrigation water use should be considered important. The necessity to solve all these factors in the dissertation confirms the relevance and practical importance of the subject. It should be noted that a historic event took place for the people of Azerbaijan in 2020, and our lands and 7 border regions, which had been occupied for 30 years during the 44-day Patriotic War that began on September 27, were liberated from occupation. These areas have strong natural resources, as well as mineral water and fresh water resources. Of course, in terms of these factors, the problems raised in the dissertation are related to the fresh water resources in the liberated territories, and it is important to study them. In total, there are 11 groundwater sources in the Karabakh region, with reserves of 1 million cubic meters. 968 thousand cubic meters / day means groundwater supply. The Sarsang Reservoir and the Khudafar Reservoir in Sugovushan, Jabrayil and Zangilan (with a capacity of 1.6 billion cubic meters and 75,000 hectares of irrigated land) have strong reserves to supply irrigated areas. The Sarsang reservoir allows irrigating 100,000 hectares of land in 6 districts, Tartar, Agdam, Barda, Goranboy, Yevlakh and Agjabadi, and the total water capacity is 560 million cubic meters. New opportunities and realities have emerged for the effective use of all this. In addition, in the new environment caused by the Covid-19 pandemic, mobilization of resources, their efficient use, strengthening food security and taking into account sanitary and hygienic requirements, in particular, ensuring the reliability of water sources, among measures to prevent global threats, including deadly viruses. Solving water supply problems is one of the important

conditions. Taking into account these factors, special attention should be paid to the economic assessment of irrigated lands, the solution of their ecological and economic problems, as well as the intensification of production on irrigated lands, increasing the economic efficiency of land use, the efficiency of irrigation water use. The need to address all these factors in the dissertation confirms the relevance and practical importance of the topic.

In terms of study degree of the problem, issues such as economic evaluation and use of soil and water as a means of production in agriculture and increase efficiency in their use, land ownership and use rights, soil fertility, mechanical composition, soil formation, land cadastre, plant nutrition and in general, formation, management and regulation of land and water relations researched by Azerbaijani economists such as Z.A.Samadzadeh, I.H.Ibrahimov, M.M.Farzaliyev, F.S.Adigozalov, A.J.Hashimov, V.R..Rzayev, I.H.Aliyev, B.Kh.Atashov, R.A.Balayev, V.H.Abbasov, A.J.Hashimov, V.I.Ismayilov, A.H.Valiyev, N.A.Javadov, E.A.Mammadova and others, and scientists from foreign countries such as V.V.Dokuchayev, L.I.Abalkin, I.A.Krupenikov, V.A.Tikhonov, P.A.Koitchyev, A.N.Kostakov, V.P.Williams, V.A.Kovda, Q.V.Dobrovolski, Y.D.Nikitin and others. In addition, there is a need for more extensive research on these issues.

Object and subject of the research. The object of research is the lands irrigated from the Samur-Absheron canal of the republic and various forms of economy. The subject of the research is the ways to increase the economic efficiency of the use of irrigated lands and irrigation water in agriculture and the mechanisms for their improvement.

Goals and tasks of the research. The main purpose of the study is to develop scientifically substantiated proposals on the theoretical and methodological aspects of the economic efficiency of the use of irrigated agricultural lands and irrigation water, as well as ways to improve the economic efficiency of irrigated lands. A group of tasks were taken to study in accordance with the purpose of the study, and they were performed sequentially:

- To study theoretical and methodological aspects of economic efficiency of irrigated lands;
- Determine and evaluate the conceptual basis of the system of indicators characterizing the economic efficiency of irrigated lands;
- To study and analyze the current state of irrigated lands, ecological and economic problems and complex control measures against them;
- Substantiate the formation of an agricultural system on irrigated lands and the application of an expert system of databases for the establishment of arable lands;
- Analyze the factors influencing the increase of economic efficiency of the use of irrigated lands;
- To substantiate the application of intellectual information system in increasing the economic efficiency of irrigated lands; □
- Determine and analyze the directions of increasing productivity in irrigated lands in modern conditions;
- Determine ways to increase the economic efficiency of irrigation water use;
- Assess the reclamation condition of irrigated lands in modern conditions;
- Determine the directions of innovative development of modern irrigation systems in improving the water supply of lands, as well as substantiate the role of the Samur-Absheron irrigation system and the need for its reconstruction project;
- To draw conclusions and draw conclusions, to develop proposals and recommendations to identify ways to increase the economic efficiency of the use of irrigated lands in agriculture.

Research methods. In the research process, economic, statistical and mathematical calculations, comparative analysis, systematic approaches, data and knowledge base concepts, programming, automatic management, planning, diagnostics and control, logical generalization, observation and other methods have been used.

The main provisions of the defense are as follows:

- The system of natural and value indicators plays a decisive role in assessing the economic efficiency of the use of irrigated lands in the conditions of objective realities of modern times;
- Kompleks Comprehensive consideration of environmental and economic problems in the productive use of irrigated lands is a necessity;

- In order to increase the efficiency of irrigated land use, it is important to have a developed database on the potential of arable lands;
- Sistem Systematic consideration of the factors that allow to increase the economic efficiency of the use of irrigated lands and intensive implementation of high technologies should be considered as a topical approach of the present time;
- There is a need to systematically identify and assess the factors that affect the growth of productivity in irrigated lands allocated for the development of agricultural areas;
 - Objective assessment of the reclamation situation in the irrigated lands of the country and ensuring an innovative approach in this area is one of the decisive approaches in achieving high results;
- Real assessment of the resources of the Samur-Absheron irrigation system with high potential and identification of the main directions of their use can be more effective;
- At a time when economic transformations and global food security are quite relevant, there is a serious need to develop a system of indicators for the efficient use of irrigated lands and irrigation water and to make substantiated recommendations and proposals on priority areas of activity, etc.

The scientific novelty of the research is as follows:

- Economic efficiency of the use of irrigated lands has been studied in accordance with modern conditions and a system of indicators characterizing their economic efficiency has been developed;
- The essence of ecological and economic problems revealed by analyzing the current condition of irrigated lands and the ways to solve them were identified;
- The condition of the agricultural system on irrigated lands was assessed and the importance of establishing a database and expert assessment on the characteristics of the areas for planting was substantiated;
- Factors influencing the economic efficiency of irrigated land use and increasing productivity have been substantiated, systematized and evaluated;

- The creation of a complex intellectual information system (IIIS) with the application of information technology and new means of computer technology is justified;
- Based on the current situation of irrigation water use in agriculture, ways to increase the economic efficiency of irrigation water use in farms have been identified;
- Reclamation condition of irrigated lands in modern conditions was assessed and innovative development directions of application of irrigation systems in land irrigation were substantiated;
- The role of Samur-Absheron irrigation system in improving soil water supply and its reconstruction project is substantiated;
- Recommendations and proposals have been made to increase the economic efficiency of irrigated lands and irrigation water in agriculture by approaching the current situation and comparing the indicators of their efficient use.

Theoretical and practical significance of research. The results of the research, suggestions and recommendations could be widely used in the development of appropriate measures on assessment of economic efficiency of irrigated land in various agricultural enterprises, improvement of land amelioration condition and water supply, as well as in the determination of potential productivity of irrigated lands for different crops and in predicting productivity. The main provisions of the dissertation can be used in the teaching process of some subjects such as “Farming”, “Organization of the region against erosion”, “Modeling of land structure”, “Area economy”, “Land amelioration” and etc in higher education institutions

Approbation and application. On the subject of dissertation, 22 scientific articles and theses in total, including 3 scientific articles and 2 theses abroad, as well as 1 textbook have been published by candidate. The main provisions and results of the research have been reported at international and republican scientific-practical conferences and symposiums: International Scientific Conference on “Sustainable economic development: challenges, perspectives” (Sumgait, 2016), XVII Republican scientific conference of doctoral students and young researchers, Ministry of Education of the Republic of Azerbaijan (Baku, 2016) and others.

The main provisions of the dissertation have been applied by “Sara Adasi (Island)” LLC located in Lankaran district of Azerbaijan Republic (Reference No. 08/141 dated 23.02.2018).

Name of the organization where the dissertation work is performed. Dissertation has been implemented at chair of “Economics” at the faculty of “Economics and management” of Sumgait State University.

The total volume of the dissertation with a sign, indicating the volume of the structural units of the dissertation separately. The volume of the dissertation is 301076 symbols with cover and contents (3092 symbols), introduction (13544 symbols), chapter I (47770 symbols), chapter II (84904 symbols), chapter III (91888 symbols), conclusion (13638 symbols) and a list of literature (23607 symbols). The number of symbols in the dissertation is 279067 without a list of literature.

MAIN CONTENT OF THE WORK

In the “**Introduction**”, actuality and study degree of the subject, the purpose and objective of research, research methods, basic provisions defended, the scientific novelty of the research, the theoretical and practical significance of the research, approbation and implementation of research, name of institution where dissertation has been implemented, the total volume of the dissertation with the separate volume of the sections has been stated.

In the first chapter of the dissertation, "Scientific - theoretical and methodological bases of economic efficiency of use of irrigated lands"Theoretical bases of approaches to the concept of land and economic efficiency and methodological aspects of economic efficiency of irrigated lands, as well as the conceptual bases of the system of indicators characterizing the economic efficiency of irrigated lands have been evaluated in accordance with modern conditions. Based on the results of the research, it was determined that since land is the main source of income for the state, both natural and economic factors are taken into account in its valuation. However, a separate assessment of these factors may not yield realistic results. Based on all this, we can say that the assessment of natural and

economic factors affecting the production of agricultural products on irrigated lands, as well as all indicators affecting the efficiency of production should be carried out comprehensively. However, it is not possible to make a generalized assessment of the economic efficiency of land use on the basis of natural indicators alone, but a number of other indicators must be taken into account: gross output, gross income, net income and profit per unit of land, potential land productivity, labor and gross output per unit of material costs, cost, level of profitability, labor productivity, etc. In general, the efficiency of the use of irrigated land in agriculture can be determined by these two systems of economic indicators: natural indicators and value indicators. Value indicators that characterize the economic efficiency of irrigated lands can be grouped as follows: gross output; gross income; net income; profit per unit of land; potential soil fertility opportunities; gross output per unit of labor and material costs; cost; level of profitability; labor productivity and efficiency of capital investment. On the other hand, the economic assessment of these indicators can be carried out in two ways: 1) special assessment: the efficiency of individual crops (a group of plants) on perennial crops and 2) general assessment: on overall efficiency, etc. The destruction of agricultural lands, the destruction of the fertile layer, the failure to use them for their intended purpose in large areas lead to the withdrawal of these lands from crop rotation and a decline in agricultural production. In this regard, determining the degree of salinity and salinity of soils and their utilization, implementation of special measures on saline or saline soils (eg gypsuming, production using special varieties of seeds), as well as "soilless production" in areas of poor quality or lost fertility It would be necessary to build greenhouses based on technology. The problems of the intensity of production in agriculture were considered, as well as the intensity in both agriculture and crop production was assessed, and capital investments related to the application of qualitatively new techniques and technologies were calculated accordingly. Of course, in the specialization of the farm, in the correct selection of the area, in determining the planting of any crop, in forecasting productivity, in assessing the production activity of the farm, as well as in determining

the potential productivity of the land, Given that agro-industrial grouping is a key condition for quality, it has been analyzed in more detail, and different types of soils have been combined in the agro-industrial group according to their quality characteristics.

In addition, the general scale of quality scores of Azerbaijani lands and the average weight score of the main cadastral regions of Azerbaijan and the coefficient of comparative value of lands are reflected. As good quality lands, it was revived with 71 points. In order to increase the economic efficiency of irrigated lands, it is necessary to determine the land cadastre based on the inventory of land resources of the country, the specification of their quantitative and qualitative indicators. Based on the materials on the agro-industrial groups of the land, it is possible to calculate the “Comparative Value Coefficient of the Lands” (COPR) for a specific territorial unit to simplify its use in practice. The following formula can be used for this: $T_{mda} = \frac{T_b}{T_{ob}}$ Here: T_{mda} - coefficient of comparative value of lands; T_b - quality score of the soil; T_{ob} is the average quality score of the soil in the area. If the coefficient of relative value of lands is equal to the unit ($T_{MDA} = 1$) or higher than the unit ($T_{MDA} > 1$), then there is no need to spend additional funds to increase and improve the fertility of those lands or lands belonging to the agro-industrial group. Conversely, if the coefficient of relative value of land is lower than the unit ($T_{MDA} < 1$), then it is necessary to incur additional costs to improve the quality of these lands [Valiyev, A.H. Problems of increasing the economic efficiency of land use in Azerbaijan: / Dissertation for the degree of Doctor of Economics. abstract. / Ganja, Azerbaijan State Agrarian University printing house, 2015. - 59 p.].

System of indicators characterizing the economic efficiency of Cultivation activities for preserve soil fertility should be implemented by organizing in complex order. In the new economic conditions, the use of large and heavy equipment, which can cause deterioration of the soil structure, should be restricted, saving techniques and technologies should be preferred, irrigation rules must be strictly followed, advanced irrigation methods should be prioritized and the land should be immediately plowed after harvesting for repeated planting.

Destruction of agricultural lands and their fertile layer, inadequate use of them causes in this land being withdrawn from farming turnover in a wide area and reduced agricultural production. Therefore, amelioration measures should be continued for taking comprehensive measures in order to attract poor quality or infertility and unused agricultural lands. In this regard, it is necessary to determine salinity level of lands and their fertilization, implementation of special measures (for example hardening measures, production of products using special seeds) in saline lands, also establishment of greenhouses based on "nonland production" technologies in the areas of poor quality or fertility loss.

In the dissertation, a procedure for calculating the intensity of agricultural production has been included, also intensity has been evaluated both in agriculture and in plant growing, capital investments related to the introduction of new techniques and technology have been calculated. Agro-production classification has been thoroughly analyzed according to land quality in farm specialization, correct selection of the area, determination of which species to be planted, forecasting of productivity, assessing the production activities of the farm, determination of potential soil fertility potential, and different land types have been merged in the agro-production group due to their quality characteristics. The total score of bonitet points of Azerbaijani lands and the average weight of the main cadastral regions of Azerbaijan and the comparative value of the lands have been shown. Among the researched economic regions, Absheron lands have rated as average quality with 44 bonitet points, Guba-Khachmaz lands with 71 bonitet points with the highest quality. In order to increase the economic efficiency of the irrigated land, it is also necessary to determine the land cadastre on the basis of inventorying the country's land resources and clarifying the quantitative and qualitative indicators of the country's land resources. As the academician G.S.Mammadov stated: *“Land cadastre in Azerbaijan is a comprehensive assessment, which is completed by combining soil types in groups - with the same agroecological quality levels, through considering crop requirements, regional specialization of agriculture”*.

“Analysis of factors affecting the current state and economic efficiency of irrigated lands in the Republic of Azerbaijan” has been stated **in the second chapter of the dissertation**. In this chapter, the current state, ecological- economic problems of irrigated lands in the Republic of Azerbaijan and complex measures against them, creation of database expert system for formation of farming systems on irrigated lands and establishment of sown areas, factors affecting the economic efficiency of the use of irrigated land in modern conditions and the directions for increasing productivity have been analyzed.

Soil, as the main mean in the production of agricultural products, is of great importance for improving the access of agricultural producers to this production means, the efficient use of land resources in general and stimulating production in the agrarian sector² [3]. Azerbaijan is among the countries with limited land resources, which can be seen clearly in Figure 1.

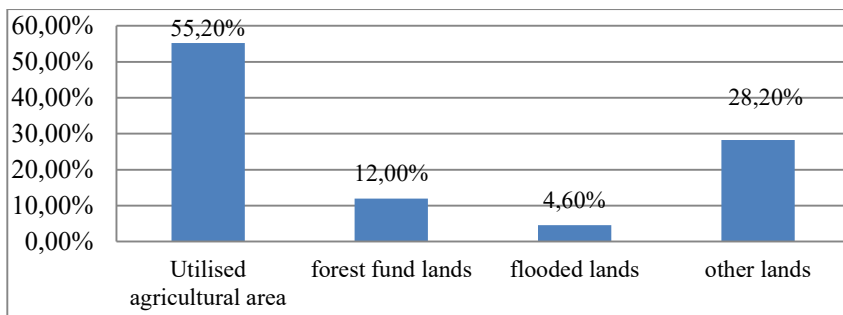


Figure 1. Land resources of Azerbaijan, as of 01.01.2020.

Source: Designed by author according to the data of the State Statistical Committee of the Republic of Azerbaijan [1, p.26], [2, p.24]

As shown in Figure 1, it has been determined by the balance of the land of our country that the total land fund of the Republic is 8660 thousand hectares, of which 4780.4 thousand hectares or 55.2% are favorable for agriculture, 1039.2 thousand hectares (12%) are forests, 398.3 thousand hectares (4.6%) are submerged lands, 2442.1 thousand hectares (28.2%) are other lands. When analyzing favorable agricultural land, it is revealed that as of January 1, 2020, favorable

agricultural land has increased by 7.7 thousand hectares compared to the relevant period of 2014. 4777.5 thousand hectares of favorable agricultural land are in agricultural turnover, of which 1969.1 thousand hectares are in state property, 1139.7 thousand hectares are in municipal property and 1668,7 thousand hectares are in private property⁴.

In Figure 2, the structure of agricultural lands of the Republic of Azerbaijan as of 01.01.2020 has been shown.

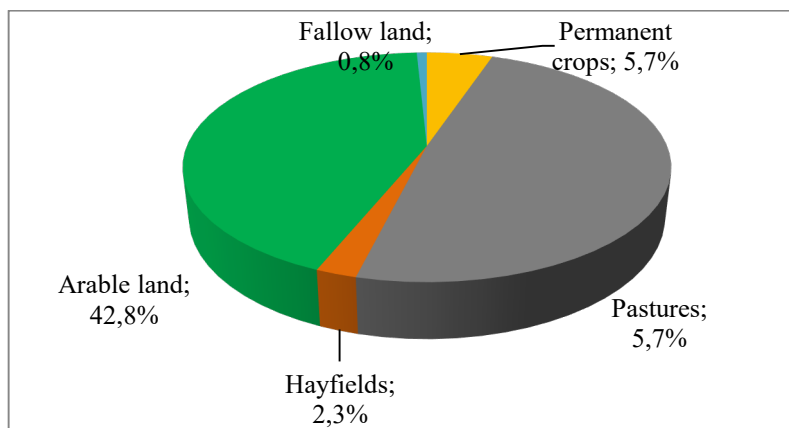


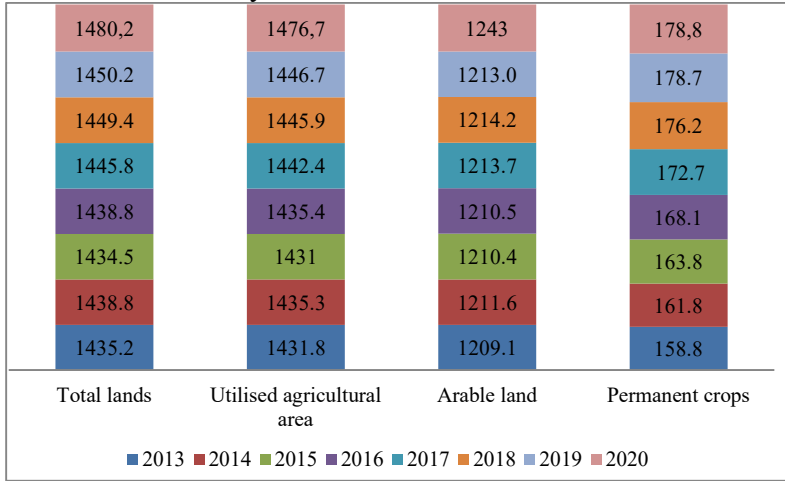
Figure 2. Agricultural land of Azerbaijan, as of 01.01.2020.

Source: Designed by author according to the data of the State Statistical Committee of the Republic of Azerbaijan - <https://www.stat.gov.az/>

As seen in Figure 2, 246.8 thousand hectares of agricultural land are perennial plantings, 108.8 thousand hectares are hayfields, 2327.4 thousand hectares of pastures, and 39.8 thousand hectares of arable lands. On land balance, 2054.7 thousand hectares of agricultural land are sown areas, of which 181.6 thousand hectares of them are under occupation. It should be noted that pastures dominate in the structure of agricultural lands. Thus, these lands are 48.7% of the total agricultural land by covering 13.3% more than sown areas, and 21.4 times more than perennial plantings. In addition, home gardens are 258.1 thousand hectares (227,600 hectares are favorable for agriculture), agricultural land per capita is 0.48 hectares, including

0.21 hectares of sown areas. Area of pastures and meadows per capita is less.

In Figure 3, the dynamics of irrigated lands in Azerbaijan for 2012-2020 has been analyzed.



Şəkil 3. Dynamics of irrigated lands in Azerbaijan for 2012-2020, as of the end of the year, thousand hectares

Source: Designed by author according to the data of the State Statistical Committee of the Republic of Azerbaijan - <https://www.stat.gov.az/>

The dynamics of the irrigated lands in 2012-2020 shows that total irrigated lands in the Republic of Azerbaijan has increased by 3.1% in 2020 compared to 2012, and at the beginning of 2020, this indicator has been 1480.2 thousand hectares.

In Figure 4, the structure of sown areas in the Republic of Azerbaijan has been analyzed.

As seen in Figure 4, in the sown areas of agricultural plants, mainly cereals and grain-legumes have been planted. Thus, in all farm categories, areas of cereals and grain-legumes are 62.4%, forage crops are 21.4%, potatoes, melons and vegetables are 8.6%, and technical crops are 7.6%.

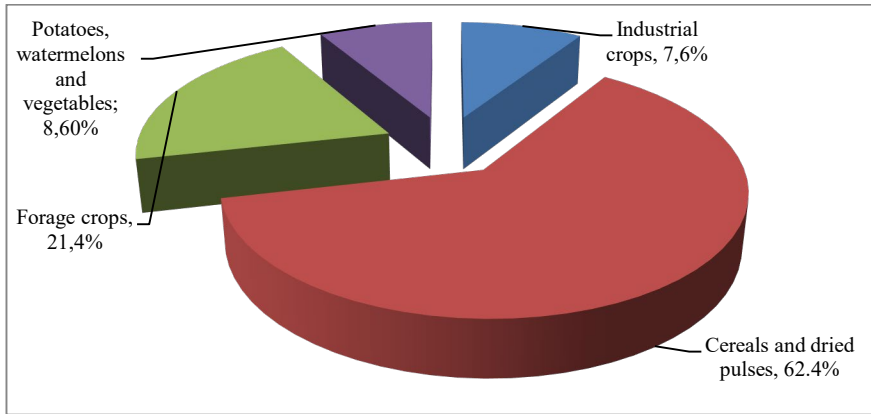


Figure 4. The structure of sown areas in the Republic of Azerbaijan for 2018 year, in percent (%).

Source: Designed by author according to the data of the State Statistical Committee of the Republic of Azerbaijan - <https://www.stat.gov.az/>

In 2019, there is a need for an analysis of the productivity of all farm species, including technical crops, cereals and grain-legumes on soils irrigated through the Samur-Absheron canal. For this purpose, we have classified the productivity indicators of each of technical crops, cereals and grain-legumes in the regions included in our research object.

Table 1. Productivity of technical crops, cereals and grain-legumes irrigated through the Samur-Absheron canal in 2018 centner/ha (100 kg/ha).

	Total, by country	Abshe-ron district	Khizi district	Shabran district	Khach-maz district	Guba district	Gusar district	Siyazan district
Grain	32,1	11,5	18,3	28,8	34,5	26,5	21,7	28,4
Wheat	32,4	15,3	19,0	24,6	34,8	26,7	27,8	29,2
Barley	29,7	10,3	17,0	22,8	30,0	23,9	26,0	27,4
Corn	59,5	2,0	36,0	89,4	95,3	53,1	27,9	18,6
Millet	19,6	-	-	9,0	-	-	-	-
Oats	24,7	-	-	-	37,2	18,8	15,0	-
Bean	20,9	17,5	15,8	15,8	37,7	18,6	12,8	13,1
Sugar beet	328	-	-	-	-	-	-	-
Sunflower	21,6	-	-	2,0	15,7	21,4	-	10,0

Source: Agriculture of Azerbaijan. Baku, 2020. P. 482-508.

According to the data in Table 2, it should be noted that the productivity of wheat and barley has been normal in all lands irrigated through the Samur-Absheron canal, and the highest indicator has been recorded in Khachmaz district. In the Absheron district, wheat and barley productivity has been the lowest, compared with other districts, and it has decreased by 7.5% and 10.1%, to 16.0 and 13.0 centner/ha, respectively. Since 2013, there has been an increase in wheat production in the Absheron district. So, wheat productivity in Absheron has been 12.8 centner/ha in 2014, 14.6 centner/ha in 2015, 10.2 centner/ha in 2016 and 9.5 centner/ha in 2017. Barley productivity has also decreased relative to the relevant years.

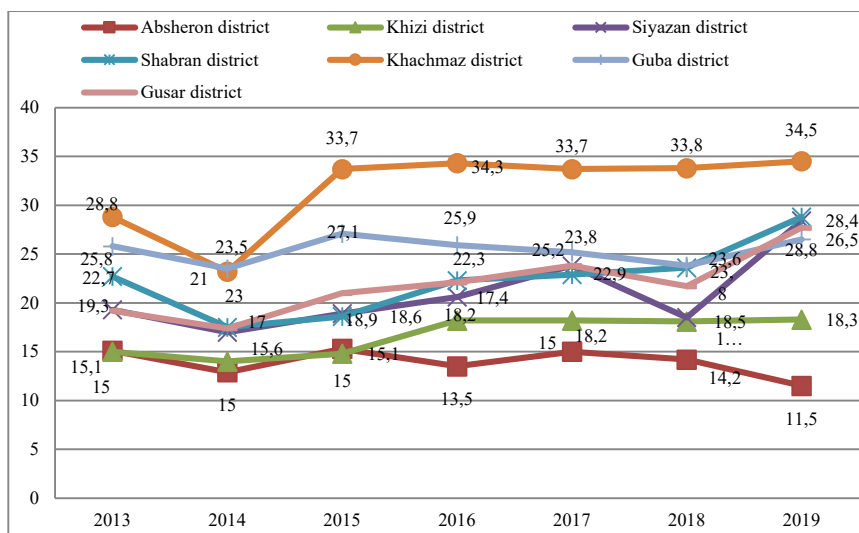


Chart 1. dynamics of grain productivity in the Absheron and Guba-Khachmaz economic regions in 2013-2019, centner/ha

Source: Agriculture of Azerbaijan. Baku, 2020. P.475.

In Graph 1, the dynamics of grain productivity in the Absheron and Guba-Khachmaz economic regions in 2013-2020 has been reviewed.

According to Chart 1, it could be noted that the grain productivity has continuously increased in all areas irrigated through the Samur-Absheron canal in 2013-2019.

It would be more advisable to create an integrated intellectual information system that could replace an agro-technical specialist by

applying information technology and new computer equipments with formation of automated workplaces in order to increase the economic efficiency of agricultural products grown on irrigated lands. The operation of an automated agro-technical system must be provided through the software by selecting agro-technical procedures such as current meteorological indicators and pruning, spraying, fertilizing, tea bush and seedling forms according to the Lunar calendar of each region. Under these conditions, relevant databases subsystems, data search and selection subsystems, subsystems of automated regulation of irrigation systems in accordance with the biological properties of plants, decision-making subsystems of irrigation system of irrigated lands should also be established in Azerbaijan. In addition, agricultural production should be prioritized by considering adaptation to climate change and exceptional water conditions in agriculture. It is necessary to optimize agricultural production, develop farming practices and replace the cultivated plant species with less water-demanding species. So, an intelligent regulation system should be established in the irrigation system by considering the specified requirements, and it could ensure to control some functions as soil water balance, relative humidity and temperature of air and others.

In the third chapter of the dissertation, **“The economic efficiency of the use of irrigation water in modern conditions and improvement of land amelioration trends”**, the economic efficiency of water supply of lands, applied irrigation types, and amelioration status of the irrigated lands under modern conditions in Azerbaijan have been evaluated, and also innovative development trends of the implementation of irrigation systems in soil irrigation and the role of the Samur-Absheron irrigation system in the improvement of soil water supply and its reconstruction project have been analyzed.

Considering that Absheron, Siyazan, Shabran, Khachmaz districts are located in the arid region and Khizi, Guba and Gusar districts are located in the humid region, it is natural to use water resources unequally for irrigation of agricultural plants in each region. In order to research the proper use of water resources, in the dissertation, the pros and cons of different irrigation methods (gravity-flow irrigation, ground irrigation, sprinkler or rain irrigation, drip

irrigation, sprinkler irrigation) have been analyzed. At present, as a result of research of Scientific-Research Institute of Irrigation and Erosion, micro rain, impulse-local, low-intensity rainfall and impulse rain systems have been developed in order for irrigation of plants in the open air and in the greenhouses in farms and private farms in the republic. All research show that one of the most important methods for farms in our country is impulse drip irrigation system. Thus, water is saved at least twice and agricultural productivity increases, when replacing the traditional irrigation method with drip method. Because of full automation of drip irrigation, system management is very easy. Currently, sprinkler irrigation has preferred in irrigation of plants in many regions of the country.

According to the Ministry of Ecology and Natural Resources, 1.8-2.0 billion cubic meters of ground-water resources are used for irrigation of planting areas and this covers 45-50% of usage resources⁵. Unlike river water, waters formed at a depth close to the soil surface are more favorable for use due to the different chemical composition of ground-water⁶. According to research of E.A.Mammadova, it should be noted that ground-water is additionally irrigated at the expense of irrigation water and ground-water are flowed into the aerial zone and thus, in cases of non-working artificial drainage, salt is collected both in soil and ground-water. The impact of irrigation and economic factors changes the natural regime of ground-water and determines the different irrigation regime of ground-water in irrigated soils. The ground-water regime in irrigated soils could be divided into genetic groups, subgroups, classes, species and different types. Irrigation is done according to the timing, norm and number regime for each planting type and it is called irrigation regime. *“The methods of achieving the optimum ground-water regime are distinguished not only by different regimes types but also by the general hydro-economic conditions, their establishment is an element of a general set of amelioration measures aimed at achieving the rational structure of the water-salt balance, and there should be constant control over the regime and balance of ground-water, the salt regime of the soils, irrigation and drainage during the use of amelioration systems”*⁷.

Within the project “Reconstruction of the Samur-Absheron irrigation system”, the construction of the Takhtakorpu water reservoir, Valvalachay-Takhtakorpu and Takhtakorpu-Jeyranbatan water canals has been finished and on September 2018, at the opening ceremony has been attended by President of the Republic of Azerbaijan Ilham Aliyev. With the Order # 019U dated May 8, 2014 by the Azerbaijan Amelioration and Water Farm OJSC, the State Admission Commission has been established and with the Act of the Commission dated November 12, 2014, Takhtakorpu water reservoir including hydro power plant, roads leading to Takhtakorpu water reservoir, Velvelechay-Takhtakorpu, Takhtakorpu-Jeyranbatan canals had been set to exploitation. As the implementation of the Presidential Instructions on acceleration of involvement of about 30,000 hectares of new irrigated land into agricultural turnover regarding the construction of the Takhtakorpu reservoir, ameliorative measures have been completed on a total of 7111 hectares areas (5400 ha new irrigated) in the Khizi district and 3204 hectares areas (2539 ha new irrigated) in the Siyazan district in 2015. This has also allowed for the creation of large agricultural enterprises on 7939 hectares to be commissioned. Moreover, construction works have been continued to provide an additional 320 million cubic meters of water from the 6 rivers of the northern region to the Samur-Absheron Canal and have been completed in the Jagajugchay, Kudyalchay and Gusarchay rivers.

So, the Samur-Absheron canal can be considered as one of the most important and significant project for the development of agriculture, as well as one of the largest infrastructure projects in our country due to financial resources.

MAIN RESULTS

In the “**Conclusion**” part of the dissertation, the scientific provisions and results obtained, and materials for substantiation of results have been presented.

“The economic efficiency of the use of irrigated lands has been assessed by a system of natural and value indicators in accordance with the conditions of modern times and these indicators has been

classified and severally analyzed”– the main provisions of scientific innovation are included in these works [8; 17; 10]. As a substantiation of scientific result, it could be noted that the purpose of the dissertation has been formulated as a result of the comparative analysis of the current state of the problem and the following topics have been identified to achieve this goal: 1) The evaluation of the indicator system, which indicates the economic efficiency of the irrigated areas, should be realized in accordance with modern conditions; 2) The creation of a system of similar indicators allows for more objective determination of the economic efficiency of the use of irrigated areas; 3) The existence of a system of indicators, and criteria and principles for the issues researched is the basis for the formation of a more complete imagination of these problems and etc.

“The ecological and economic problems that emerge by analyzing the current condition of the irrigated lands have been systemized according to their characteristics and their solutions have been enounced” – the main provisions of scientific innovation are included in this work [6]. The formulation of this scientific provision is based on a number of scientific arguments: 1) It is impossible to achieve the targets in any economic sector without balancing the ecological and economic system or solving problems in this field. 2) environmental and economic problems are secular and should not be neglected; 3) ecological balance expectation positively affects the living standards and the health status of the population and etc.

One of the scientific novelties is that “Formation of the farming system on irrigated lands has been assessed and establishment of database expert system for planting areas has been substantiated”– the main provisions of scientific innovation are included in these works [6; 19; 20]. The main provisions can be stated as follows: 1) In order to increase the efficiency of the irrigated lands, farming systems should be established in the farms; 2) agricultural production should be optimized according to modern requirements; 3) In agriculture, the system of alternately sowing should be used more actively; 4) Effective use of organic fertilizers and yielding seeds should be organized and etc.

“Factors affecting the economic efficiency of the use of irrigated lands have been identified, substantiated and systematized”– the main provisions of scientific innovation are included in these works [8; 17; 18; 10; 9]. A number of important factors, such as these, have been given more consideration: 1) Some factors cause to the destruction of agricultural lands and their fertile soil; 2) Inadequate use of lands results in this land being withdrawn from farming turnover in a wide area and reduction agricultural production and therefore, decrease in the economic efficiency of the use of irrigated lands and etc.

“The creation of a comprehensive IIS - Intellectual information systems has been substantiated by applying information technology and new computer equipments”– the main provisions of scientific innovation are included in this work [2]. This scientific provision is explained by the following: 1) The software functions of the IIS are interconnected with the ytechnical support of automated irrigation and agro-technical systems; 2) It would be more advisable to create an integrated intellectual information system that could replace an agro-technical specialist by applying information technology and new computer equipment in order to increase the economic efficiency of agricultural products grown on irrigated lands. 3) For the creation of "E-agriculture" system, agricultural land in the structure of electronic agriculture should be registered accurately, and based on electronic map materials, a unified database of lands should be created and constantly improved; 4) The structure and scope of electronic services in this area should be expanded.

“Factors affecting the productivity increase in irrigated lands have been identified and evaluated”– the main provisions of scientific innovation are included in these works [10; 16]. The main arguments for this scientific novelty are as the follows: 1) A number of factors such as organic matter loss, physical degradation, erosion, salinity, food shortage, man-made and chemical pollution that negatively affect productivity should be analyzed comprehensively and systematically, and measures should be taken in this direction; 2) Soil-climate conditions, factors contributing to the development of erosion, the degree of soil erosion, the direction of the agriculture should be taken into account during the development and implementation of these

directions; 3) All anti-erosion measures, and improving soil fertility by protecting the soil from being washed, sprayed, and absorbed should be ensured; 4) In order to increase the economic efficiency of the use of irrigated lands, the direction of efficient economic activity and production structure should be properly defined in each region.

“Ways to increase the economic efficiency of the use of irrigation water in farms by considering the current situation with the use of irrigation water in agriculture”; “The ameliorative state of irrigated lands in modern conditions has been assessed and innovative development directions of the use of irrigation systems in the irrigation of lands have been substantiated” and “Relevant recommendations and suggestions have been developed and substantiated to increase the economic efficiency of the use of irrigated land and irrigation water in agriculture by characterizing the indicators” – the main provisions of scientific innovation are included in these works [15; 8; 12; 2; 7; 11; 6; 10; 9; 4; 16; 14]. A number of factors are more focused due to scientific results: 1) Measures should be taken to apply more advanced and efficient mechanisms, considering the current status of use of irrigation water; 2) Depending on climatic conditions, the necessary measures should be systematized, for example, it is important to afforest around the fields against wind erosion; 3) Strict mechanisms should be established to comply with the water norms given to the fields to prevent irrigation erosion; 4) progressive norm - drip irrigation and rainfall or spraying methods should be more widely used; 5) an erosion hazard map for the whole country should be prepared with an objective approach; 6) In order to prevent erosion, it is advisable to use a number of rules such as ploughing slope horizontally and using cross-planting during sowing (that is, sowing once in the widthwise direction of the slope with 50% of the norm and once in the lengthwise direction of the slope).

“The role of the Samur-Absheron irrigation system in improving soil water supply and its reconstruction project have been substantiated” – the main provisions of scientific innovation are included in these works [13; 1]. As the main scientific and economic arguments, these are more important: 1) As a result, the Samur-Absheron canal can be considered as one of the most important and

significant project for the development of agriculture, as well as one of the largest infrastructure projects in our country due to financial resources; 2) Systematic and consistent measures to improve water supply in the country could contribute to improving the living standards of the population and the development of the agrarian sector, the most important sector of our economy, and could be most effective in the future; 3) Regardless of the method of irrigation used in the irrigated lands through the Samur-Absheron canal, the irrigation norms and times should be properly followed, the favorable conditions should be created to regulate the water regime of irrigated lands, the use of land should be increased, qualitative implementation of agro-technical measures should be ensured; 4) In order to ensure the effectiveness of water supply infrastructure created through the Samur-Absheron Canal, taking logistical support and modernization measures in the planned form, availability of mechanisms to protect and strengthen the infrastructure, consideration of technological and ameliorative innovations in the world in this area are very important; 5) Considering the strategic importance of the Samur-Absheron irrigation system, a strategy and activity program should be developed and implemented to maximize the potential of this canal and etc.

THE MAIN CONTENT OF THE RESEARCH IS INDICATED IN THE FOLLOWING SCIENTIFIC PAPERS OF THE AUTHOR:

1. Innovative measures in the field of amelioration / Materials of the Republican scientific conference on problems of innovation-oriented economic development in the Republic of Azerbaijan and ways of their solution. Sumgayit: – 2010. – s.91-92. (original in Azerbaijani).

2. History of amelioration and development of water farm in the Republic of Azerbaijan. Azerbaijan Scientific Research Institute of Agricultural Economics and Organization. Scientific publications. No. 3. Baku: 2011. p. 51-55. (original in Azerbaijani).

3. Land amelioration and ameliorative measures against salinity. Proceedings of the International scientific-practical conference on

“Agrarian economy: 20th years of independence”. Baku - 2011. p. 93-95. (original in Azerbaijani).

4. The role of Samur-Absheron canal in extension of irrigated land and improvement of water supply of lands. Scientific publications, No. 3. Baku-2012. p. 125-128. (original in Azerbaijani).

5. Agro-climatic resources and land cover of irrigated agricultural regions. Ministry of Education of the Republic of Azerbaijan. Proceedings of the XVI Republican scientific conference of doctoral students and young researchers. Baku - 2012. p. 234-237. (original in Azerbaijani).

6. Objective necessity of investment in land amelioration. Ministry of Education of the Republic of Azerbaijan, Sumgait State University, Institute of Economics of ANAS. Proceedings of the International scientific conference on "Socio-economic problems of innovative development". Sumgait -2012. p. 117-118. (original in Azerbaijani).

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15. Conceptual Approach Systems to Improve Economic Efficiency. Actual Scientific Research, Rome, Italy- 2018. p. 12-16. (original in Russian).
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19. The role and place of the agrarian sphere in the effective development of the non-oil sector in Azerbaijan. Materials of the Republican scientific conference on the role of Azerbaijan's transit potential in economic development. Sumgayit: -2020.- p.321-324.
20. Actual problems of economic efficiency of irrigated lands and their water supply. Journal of “Financial Economics”. Moscow-2020. No. 02. - p. 123-127. (original in Russian).

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