THE REPUBLIC OF AZERBAIJAN

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ABSTRACT

of the dissertations for the degree of the of Doctor of Philosophy

INCREASING THE EFFICIENCY OF SUBTROPICAL CROP HUSBANDRY BASED ON THE USE OF INNOVATIVE TECHNOLOGIES

Speciality:	5312.01 – "Sectoral economics"
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GENERAL CHARACTERISTICS OF SCIENTIFIC WORK

Relevance and development of the topic. Agriculture plays an important role in ensuring the socio-economic development of Azerbaijan. Economists often focus on the fact that agricultural development is of socio-economic importance in ensuring the country's food security, reducing unemployment and increasing employment. It should be noted that as a result of targeted reforms carried out in recent years, the agricultural sector makes a major contribution to economic development, increasing national income and export earnings. The agricultural sector is associated with an increase in the production of crops, livestock, fisheries, etc. Ensuring a comprehensive, coordinated and long-term agricultural policy is one of the most important tasks for the effective development of the agricultural sector of Azerbaijan. Increasing the added value of agricultural products before export through expanded development of agro-industrial complex mainly requires processing, storage and transportation of agricultural products, proper establishment of relations between agriculture and industry, ensuring development along the value chain. The development of production along the value chain in agriculture has a range of economic values.

Agriculture, along with maintaining its relevance for the economy of Azerbaijan, also plays an important role in diversifying the economy and protecting against external shocks. Increase in exports of main products, especially vegetables and fruits, allows the sector to retain its workforce and withstand economic downturns. For improving economic activity in Azerbaijan, it is very important to expand and especially diversify production areas using innovative technologies**.**

After agrarian reforms were carried out in Azerbaijan, the status of product producers was changed. As a result of this, the problems deepened and affected each manufacturer individually. After the agrarian reform continuous improvement in the field of agricultural technology, seed production, fertilizers, irrigation and pest control increased the productivity of farmers, however, there were no major changes in their income. Farmers do not agree with the prices offered

to them and actually refuse to increase the volume of agricultural products, which are considered a priority. The result of this is a sharp reduction in the areas of viticulture, cotton growing, tea growing and tobacco growing.

The development of subtropical crop production is of particular importance in ensuring food security and increasing the export potential of agricultural products. For this purpose, in our country has developed and adopted state programs for the development of tea and citrus fruits, which are a component of subtropical plants. Many years of experience in the field of agriculture shows that with proper adherence to agrotechnical rules, proper management of the economy, as well as rational placement of plants by species, it is possible to obtain a high, stable yield from agricultural plants and increase productivity in the livestock sector.

Natural and climatic conditions play an important role in the development of agriculture, the correct placement and specialization of production areas. The production of tea and citrus fruits in the country is possible mainly in the Astara, Lankaran and Masalli regions, which are part of the Lankaran-Astara economic region. Olives and other subtropical plants are grown mainly in the city of Baku, Absheron economic region, Siyazan and Salyan regions. Pomegranate is grown mainly in the Aran, Mil-Mugan, Shirvan-Salyan economic regions and the Akhsu region. Persimmon is mainly grown in Shamkir, Khachmaz, Agdash, Goychay and Balakan regions, but also in other regions.

Due to the fact that the production of these products is of particular importance, state programs for the development of certain industries have been adopted. The introductory part of the “State Program on the development of citrus fruit growing in the Republic of Azerbaijan for 2018-2025 years” notes that the implementation of state programs adopted in recent years in order to constantly meet the population’s needs for food and the measures being taken to stimulate the production of export-oriented agricultural products have led to achieve results in the development of the country's traditional agricultural sectors. In the regions was created a reliable basis for increasing employment and reducing poverty**.** The presence of favorable natural

and climatic conditions and traditions in the southern region of our country for growing citrus fruits, which occupy a unique place in agriculture, as well as the fact that this area has high economic efficiency and export potential, necessitate the development of citrus growing. All of the above mentioned determines the need for research in this area and characterizes the relevance of the dissertation topic.

Ensuring innovative development and efficiency of subtropical crop husbandry, deepening production along the value chain, increasing its competitiveness, improvement of the industry structure, efficient use of land resources, increasing the level of specialization in production areas, creation of an improved organizational and economic mechanism of activity, theoretical, methodological and applied aspects of subtropical grop husbandry market research in the context of food security, as well as problems of food security were considered in the scientific works of scientists Z.A. Samadzade, E.A. Gulieva, I.Kh. Ibragimova, V.K. Abbasov, I.H. Alieva, B.K. Atashov, M.M. Guseinova, A.K. Valiev, R.Z. Guseina, S.V. Salakhov, G.A. Akhmedov and others.

A theoretical view of innovative development can be found in the scientific works and studies of such economists as. E. Sut, A.K. Cetin, S.A. Danyshman, M.S. Bunin, V.S. Mironova, G.E. Ershova, N.V. Kiseleva, T.V. Borovikova, G.V. Zakharova, M.I. Riemer, N.A. Krasnova.

It should also be noted the innovative development and increasing the efficiency of subtropical crop production, assessment of the characteristics and development potential taking into account the challenges of global food problems, the development of the market for subtropical crop production, including tea products and citrus fruits, as well as the regulation of existing mechanisms, means of government support in this area, there remains a need conducting fundamental scientific research to improve and increase efficiency. It should also be noted the innovative development and increasing the efficiency of subtropical crop production, assessment of the characteristics and development potential taking into account the challenges of global food problems, the development of the market for subtropical crop production, including tea products and citrus fruits,

as well as the regulation of existing mechanisms, means of government support in this area, there remains a need conducting fundamental scientific research to improve and increase efficiency.

The object and subject of the research. Regardless of the form of ownership in the Republic of Azerbaijan, **the object of research** was determined to be subtropical crop production, including fruit farms. **The subject of the research** is various forms of ownership producing subtropical crop products, farm development, opportunities to use innovative technologies, formation of a modern management system in accordance with the requirements of new industrial relations, as well as theoretical, methodological and experimental issues of industry development.

Goals and objectives of the study. The main goal of the study is to analyze the current situation of innovative development and increase the efficiency of subtropical crop production taking into account new requirements and determine their directions for development. In this regard, the research work set a goal to achieve the following tasks:

The purpose and objectives of the study. The main purpose of the study is to analyze the current situation of innovative development and increase the efficiency of subtropical crop production, considering new requirements and determining directions for development.

- ✓ in accordance with the principles of market relations, generalization of theoretical and methodological aspects on the problems of innovative development and increasing the efficiency of subtropical crop production;
- ✓ organizing the production of subtropical crop production based on innovative technologies, identifying patterns of effective functioning and substantiating conceptual approaches to it;
- ✓ researching of international experience on the efficiency of the market for subtropical crop products and studying the possibilities of its application in our country in accordance with the conditions of competitiveness.
- ✓ determining the role of the development of subtropical crop production based on innovative technologies in ensuring the

socio-economic development of the country and analyzing the current state of economic efficiency.

- ✓ researching of the current state of production and sales of products of subtropical grop husband origin based on innovative technologies and identifying factors influencing its development.
- ✓ analysis of the features of regional development of subtropical crop farming;
- ✓ definition priority areas for the development of subtropical crop husbandry based on innovative technologies;
- ✓ preparation of recommendations and proposals for improving the mechanisms of state regulation and stimulating the development of subtropical crop production based on innovative technologies and increasing its efficiency.

Research methods: During the research process, economic-statistical, grouping, methods, comparative analysis, balance, logical generalization, target system approach, forecast and other methods were used.

The main provisions of the dissertation defense are characterized as follows:

- ✓ determination of economic aspects of the development of subtropical crop production based on innovative technologies, general provisions on scientific and theoretical foundations and increasing production efficiency;
- ✓ identification of factors determining the effectiveness of the development of subtropical crop production in the context of socio-economic development and food security of the country;
- ✓ determination of the methodological basis for assessing the economic efficiency of subtropical crop production based on innovative technologies;
- ✓ need for research the main economic indicators characterizing the production efficiency of subtropical crop production;
- ✓ assessment of regional features and development potential of subtropical crop production;
- ✓ identifying opportunities for organizing and developing a marketing service in the market for subtropical plant products and competitive sales;

- ✓ formation of effective development of enterprises for the production and processing of subtropical crop products, determination of directions for improving integration relations between them;
- ✓ identifying directions for improving the mechanisms of state regulation of innovative production of subtropical plants and increasing its efficiency.

Scientific novelty of the research.

- factors influencing the innovation process in the production of subtropical crop products have been identified, taking into account the characteristics of the agricultural industry;
- based on the strategy for ensuring the efficiency of development of production of subtropical crop production based on innovative technologies, priorities for the development of subtropical crop production in the region were determined on the basis of a new economic division in market conditions;
- from the point of view of methodological approaches in the context of ensuring the country's food security, the formation and development of the market for subtropical crop products is scientifically substantiated;
- the conditions for updating the mechanisms of state regulation of the supply, storage, creation and processing of subtropical crop products in the country and their adaptation to progressive world experience are substantiated;
- strategic directions for intensifying processes related to ensuring an innovative approach to the development of production of subtropical crop products, transfer and application of high technologies were assessed;
- The role and significance of the relevant economic regions in the country's economy specializing in the production of subtropical crop products are analyzed. The potential for specialization and directions for expanding integration ties have been identified in order to increase the share of these regions in the market and export of agricultural products
- The directions for improving the mechanisms of state regulation of the development of production of subtropical crop products

in Azerbaijan on the basis of innovative technologies and increasing efficiency have been identified, and appropriate proposals have been prepared.

Theoretical and practical significance of the research. Theoretical and practical significance of the research is to develop and improve the efficiency of production of subtropical crop products based on innovative technologies, as well as identifying measures aimed at solving important organizational and economic problems on farms in accordance with regional natural and climatic conditions.

The main provisions, results and proposals obtained as a result of the study can be useful in solving the problems of innovative production of subtropical crop products and developing the sales market, increasing efficiency in the future. It can also be effective for "specialization of agriculture by region", "determination of agricultural policy", "increasing employment in the agricultural sector", "increasing competitiveness in the agricultural sector", as well as in the preparation of projects and programs and their implementation.

In addition, the scientific and theoretical principles set out in the dissertation can also be used in the preparation of textbooks and teaching aids, lectures, when carrying out research work, as well as in the educational process.

Aprobation and application: The main provisions and main results of the dissertation are reflected in 6 articles and 4 theses (1 of them abroad) in prestigious domestic and foreign publications recommended by the Higher Attestation Commission, as well as in the materials of republican and international scientific and practical conferences. "Economic efficiency production of crop products in the Lenkoran economic region" (Makhachkala -2021); "Economic significance of the development of subtropical crop husbandry" (Ganja-2022),), "Economic importance of innovative development of fruit growing" (Sumgait -2022), "The period of development of tea production in Azerbaijan" (Baku-2023), "Directions for improving stimulation of citrus growing development in Azerbaijan" (Moscow -2021); "Problems of innovative development of agriculture" (Baku-2020); "Conceptual rationale for a regional model for managing the competitiveness of the tea industry" (Baku-2021); "Directions for

expanding the production of subtropical crop products based on innovative technologies " (Baku-2022), "Modernization is the basis for innovative development of agriculture" (Baku-2020); "Problems of export of fruit and vegetable products in Azerbaijan" (Baku-2022). 6 articles and theses were published in a volume of 3.8 printed pages, reflecting the main provisions of the dissertation work. Of these, 1 were published in foreign country.

Name of the organization where the dissertation work was completed: The dissertation work was completed at the Azerbaijan Cooperation University.

The total volume of the dissertation with a sign indicating the volume of the structural sections of the dissertation separately. The dissertation consists of an introduction, three chapters, conclusions and proposals, as well as 107 references. The content of the dissertation was compiled on 135 pages of computer paper. The introduction includes - 14703 characters, the first chapter - 78744 characters, the second chapter II -50825 characters, the third chapter - 68812 characters, the result - 8596 characters. The dissertation contains 14 tables, 1 scheme and 4 diagrams. The total volume of the dissertation is 249,717 characters (221,680 characters excluding the list of references, tables, and appendices).

MAIN CONTENT OF THE STUDY

In the introduction of the dissertation work, a broad explanation is given about the relevance and degree of development of the research topic, the object and subject of the research, the goals and objectives of the research, methods, the main provisions being defended, the scientific novelty of the research, its theoretical and practical significance, approval and application, as well as the overall scope of the work.

The first chapter, **"Scientific, theoretical and methodological foundations for increasing the economic efficiency of subtropical crop production based on the use of innovative technologies,"** shows the role of the development of subtropical crop production, analyzes the scientific and theoretical foundations of the innovative

development of subtropical crop production and the use of innovative technologies, and gives methodological features for assessing the economic development efficiency.

In this chapter, the author analyzed the efficient use of production resources and the wide possibilities for increasing productivity using innovative technologies in agriculture. Satisfying the reliable supply of food to the population and the needs of industries for raw materials produced in agriculture determines the innovative development of the agricultural industry and research in this direction. Satisfying the reliable supply of food to the population and the needs of industries for raw materials produced in agriculture determines the innovative development of the agricultural industry and research in this direction. Satisfying the reliable supply of food to the population and the needs of industries for raw materials produced in agriculture determines the innovative development of the agricultural industry and research in this direction.

According to the author, since 2010, in order to ensure the effective development of the agro-industrial complex in our country, as a result of the use of innovative technologies and modern production methods, new approaches, along with an increase in production, their quality has also improved.

At the same time, the author notes that according to the results obtained in the course of our research, applied technological research is developing in the following main areas (sectors) to ensure sustainable development of the agricultural industry:

- water and forestry, reclamation;
- production of crop products and plant protection;
- animal feeding and disease protection;
- mechanization, electrification and automation of production;
- storage, transportation and processing of agricultural products.

During the research process, the researcher determined that the development of agriculture, as well as subtropical crop production using innovative technologies, generally corresponds to the goals of sustainable rural development.

The first steps taken towards the development of agricultural industries should be aimed at improving the living conditions of

producers, so that their interest in production increases.

In ensuring rural development, special attention must be paid to the following factors:

- ensuring social well-being and health;
- providing the population with clean drinking water;
- to ensure sustainable economic growth in rural development, affordable and sustainable energy and ensuring full employment of the working population;
- accelerated application of innovative technologies in agriculture and the creation of sustainable infrastructure, supply of raw materials for the sustainable development of the processing industry;
- improving the ensuring of safe and sustainable housing for the population;
- sustainable modelsproduction and consumption;
- ensuring the development of agriculture in accordance with global climate change;
- formation and development of a favorable and sustainable consumer and product market in the regions.

In the process of research, the author determined that all these factors given above determine a more efficient use of natural and economic resources formed in accordance with the natural and climatic conditions of each economic region.

The author noted that the transition to an innovative economic model leads not only to stabilization, but also to a constant increase in local production at the technical and technological level. The main areas of innovation in subtropical crop production are:

- for the production, storage and processing of subtropical crop products (tea, lemon, orange, kiwi, tangerine, pomegranate, persimmon, olive, etc.) the availability of energy and resource-saving technologies;
- innovations that help fill the domestic market with cheap and high-quality food products;
- innovations aimed at extending productivity, efficiency, service life of machinery and equipment, and increasing labor productivity;
- preparation educated specialists for the agro-industrial complex, taking into account the creation of an innovative economic model;

- measures to improve the environmental situation.

The researcher came to the conclusion that without an objective economic assessment of various events occurring in agriculture, it is impossible to determine the level of economic efficiency of subtropical crop production based on the use of innovative technologies.The author argues that the criterion of economic efficiency serves to evaluate certain types of activities carried out in the agricultural sector. According to most scientists, the criterion for the economic efficiency of the entire national economy is the volume of national income per capita. National income is not only a source of satisfying people's needs, but also a source of further expansion and improvement of production.

In the second chapter of the dissertation, a scientific research was conducted in the direction of "**Analysis of the current state of economic efficiency of production of subtropical crop production in the agriculture of Azerbaijan**."

In this chapter, the author gave an analysis of the current state of production and consumption of subtropical crop products in agriculture, as well as the economic efficiency of production. Research in the direction of analyzing the current situation in the processing and sale of subtropical crop products have been continued.

The author, analyzing the possibilities for the development of citrus fruit growing, which is part of subtropical crop husbandry production, points out that almost all natural economic zones of the country specialize in the production of multi-branch agricultural products.

The conducted studies show that the planned specialization that was carried out during the Soviet Union underwent changes during the period of private property. These changes generally had a greater impact on the viticulture, tea and cotton sectors. The main reason was due to problems that arose in the sale of these products. Conducted reforms updated the development of these areas.

In order to develop these areas, state programs were adopted. A state program has been adopted for the development of citrus growing, which is part of subtropical crop production and one of the main directions in the Lankaran-Astara economic region. According to the 2022 land balance, the area of land in the Astara region suitable for

agriculture is 17,563 hectares. 6,028 hectares of which are used for crop area, and 2,176 hectares for perennial crops.

The area of agricultural land in the Lerik region is 57,607 hectares, of which 38,406 hectares (66.7%) are pastures, and 3,463 hectares (6.0%) are hayfields. In the Yardimli district, the area of land suitable for agriculture is 41,889 hectares, of which 12,916 hectares are used for crops and 21 hectares for perennial crops.

The specialization and diversity of land resources in these regions determines the development of agricultural production using intensive technologies and increased productivity. It should be noted that in the Lankaran-Astara economic region, crop production is very widely specialized.

The Lankaran-Astara economic region grows various crops: grains (including rice), tobacco, tea, grapes, vegetables and citrus fruits. Each of these plants has its own region of development.

The production of crop products in the Lankaran-Astara economic region in 2022 is presented in Table 1.

Table 1

Production of crop products in the Lankaran-Astara economic region in 2022, tons

	wheat	barley	rice	potato	vegetables	grapes
In general for the republic	**1736087.2**	**1100754.2**	**11302.8**	**1074261**	**1823330**	**212645**
Astara	124.7	56.8	841.0	7844	29099	26
Lankaran	1212.5	96.3	2828.1	4050	82689	155
Lerik	6180.0	258.3	-	22287	4436	-
Yardımlı	7037.5	771.7	-	8595	2339	3
Masallı	17494.2	6592.4	781.9	15695	56612	1064
Jalilabad	165600.0	13250.0	-	190400	2593	22913
Specific gravity in % of the country's production						
Astara	0.01	0.01	7.44	0.75	2.39	0.02
Lankaran	0.07	0.01	25.2	0.39	6.79	0.10
Lerik	0.36	0.02	-	2.14	0.37	-
Yardımlı	0.41	0.07	-	0.82	0.19	-
Masallı	1.01	0.60	6.92	1.50	4.63	0.17
Jalilabad	9.54	1.20	-	16.1	0.21	12.26

Source: Compiled by the author based on data from the State Statistics Committee (8, p. 379).

According to the statistics given in this table, wheat and barley are mainly grown in Yardimli, Masalli and Jalilabad regions, potatoes in Lerik, Masalli and Jalilabad regions, grapes in Masalli and Jalilabad regions, rice in Astara, Lankaran and Masalli regions, vegetables in Astara, Lankaran, Lerik and Masalli regions. Low agricultural productivity is determines innovative development.

Table 2 shows the yield of crop products in the Lankaran-Astara economic region in 2022.

Analysis of the statistical data given in Table 2 shows that the yield indicator for these types of products in the region is 15% higher than the national average in the Astara region for rice production, higher than 11% in the Lankaran region for vegetables, Masalli region by 42 % higher.

Potato yields were 62% higher in the Jalilabad region, and grape yields were 23-54% higher in the Jalilabad and Masalli regions, respectively. Wheat and barley yields in the region was below average across the republic.

Table 2

Productivity of crop production in the Lankaran-Astara economic region in 2022, c/ha

	wheat	barley	rice	potato	vegetables	grapes
In general for the republic	**31.9**	**28.8**	**36.1**	**190.4**	**196.2**	**102.7**
Astara	25.2	20.0	41.6	82.0	149.7	63.4
Lankaran	24.1	24.9	35.2	92.5	217	12.0
Lerik	24.0	20.5	-	145.0	129	-
Yardımlı	22.3	19.3	-	92.7	119	-
Masallı	24.2	22.1	35.4	174.4	279	159.0
Jalilabad	29.2	25.0	-	307.5	181	126.8

Source: Compiled by the author based on data from the State Statistics Committee (8, p. 636).

If the product was not competitive, continuing to produce it could be considered an inefficient use of resources. But first of all, increasing wheat yields can solve the problem. An is this case, on a smaller area it will be possible to grow wheat, which the country needs from the

point of view of food security, and on part of the grain lands conditions will be created for other competitive crops. According to the statistics given in Table 3, there are more areas of walnut, pomegranate and persimmon orchards in the country. The large export potential of these products has led to their advantage, and another reason is that these fruit products can be grown over large areas of the republic.

Table 3

Dynamics of development of perennial plantings in subtropical crop production in Azerbaijan (thousand hectares)

	2018	2019	2020	2021	2022	in 2022 compared to 2018 in %
Persimmon	12.0	12.3	12.7	13.1	13.1	109
Pomegranate	22.6	22.9	22.7	22.6	22.6	100
Olive	3.9	5.8	6.4	6.7	6.7	172
Fig	2.0	2.0	2.0	2.0	2.0	100
Lemon	0.6	0.6	0.6	0.7	0.7	117
Orange	0.5	0.5	0.6	0.6	0.6	120
Tangerine	2.7	2.8	2.8	3.0	3.1	115
Kiwi	0.1	0.2	0.2	0.2	0.2	200
Feijoa	1.5	1.5	1.5	1.5	1.5	100
Walnut	5.1	5.6	5.9	6.2	6.4	126
Hazel	75.0	79.5	79.6	80.4	81.5	109
Chestnut	0.3	0.3	0.29	0.27	0.28	93
Tea	1.1	1.08	1.07	1.0	1.0	91

Source: stat.gov.az (Agriculture, forestry and fisheries)

At the same time, high domestic demand for vegetable oils led to the expansion of olive plantings. On the other hand, drought-resistant olive groves are developed mainly in the Absheron economic region, which in turn makes it possible to effectively use land areas that are not so suitable for the production of other agricultural products.

Table 4

Dynamics of production of subtropical crop husbandry in Azerbaijan, thousand tons

	2018	2019	2020	2021	2022	in 2022 compared to 2018 in %
Persimmon	160.1	177.1	185.2	192.5	184.3	115
Pomegranate	155.1	181.0	182.1	185.3	187.4	121
Olive	1.1	1.1	1.0	1.5	3.2	291
Fig	11.2	12.1	12.3	12.6	12.3	110
Lemon	4.6	4.8	4.9	5.3	5.6	122
Orange	3.1	3.5	3.9	4.5	5.1	165
Tangerine	37.0	38.5	39.9	45.8	50.7	137
Kiwi	0.2	0.2	0.3	0.4	0.6	300
Feijoa	9.8	11.1	11.7	12.7	13.4	137
Walnut	11.7	11.6	12.6	13.1	13.6	116
Hazel	52.1	53.8	49.5	67.6	72.1	138
Chestnut	0.6	0.6	0.6	0.6	0.6	100
Green tea production	0.9	0.9	0.9	1.2	1.0	111

Source: stat.gov.az (Agriculture, forestry and fisheries)

In the production of subtropical crop products in 2018-2022 across the country, the largest increases were observed in the production of olives 191%, kiwi 200%, and oranges 65%. There is also observed dynamics of increasing production of nuts, pomegranates, figs, lemons, green tea and other subtropical products. Only chestnut production remained stable in recent years, the total area of olive and kiwi orchards in the country has increased, including as a result of more than doubling the area of gardens, there is an increase in production by more than 2-3 times. These factors indicate that innovative development is accelerating while traditional production is maintained.

The autor notes that cost is the main indicator for determining product prices. Systematic reduction of the cost of industrial products is one of the main conditions for increasing the efficiency of industrial production. Because it directly affects profit margins and profitability levels. This occurs mainly during tea processing.

To increase the competitiveness of products, continuous technical progress, the use of intensive production technologies and the development of intensive horticulture are necessary. Since these processes affect changes in the cost of products, they are a decisive condition for reducing financing. The use of new technologies, comprehensive mechanization and automation of production processes, improvement of technologies, and the use of modern types of materials can significantly reduce production costs by increasing productivity. Expanding specialization and cooperation is a serious resource for reducing production costs.

Table 5

Dynamics by region primary processing of crop husbandary products in the Lankaran-Astara economic region for 2017-2022

	2017	2018	2019	2020	2021	2022	In 2022	
							Compared to 2020, %	Compared to 2021, %
Astara district								
- natural tea, tons	32.9	93.9	37.7	34.5	83.0	45.2	131	83
Lankaran district								
- fruit juices, thousand dkl	-	-	-	1.8	4.3	4.9	272	114
-natural tea, tons	3486.3	2524.3	3011.9	933.4	3703.8	4753.2	509	128
- beer, thousand dkl	3.5	4.5	34.2	6.0	3.5	7.2	120	206
Masallı district								
- beer, thousand dkl	1.5	1.5	1.9	0.9	1.6	1.3	144	81

Source: Statistical indicators compiled by the author based on data from the State Committee on Statistics (Industrial Statistics) (https://www.stat.gov.az/).

The dynamics of primary processing of crop products in the Lankaran-Astara economic region for 2017-2022 by region are presented in Table 5.

Due to preferential loans provided by the state for the production and processing of agricultural products, certain work has been carried out towards the development of tea cultivation. It should be noted that in our republic there are 10 tea processing factories with an annual processing capacity of 24.3 thousand tons. The tea factory, built in the Astara region, is capable of processing 10 tons of green tea leaves per day. Despite the production of 662.5 tons of green tea leaves in the Astara region in 2022, according to statistics, only 6.8% (45.2 tons) of it was processed. The remaining part was given to the Lankaran region for processing as raw materials.

In the third chapter of the dissertation, the research work ended with an analysis of "**Directions for increasing the economic efficiency of subtropical crop production based on the use of innovative technologies.".**

In this chapter, the author, on a scientific basis, identified priority areas for the use of innovative technologies in the production of subtropical crop products, improving mechanisms for stimulating innovative development and areas for increasing the efficiency of using innovative technologies.

The author notes that the development of agriculture based on innovative technologies can be considered as the proper management of man-made and natural resources. The most stable natural conditions are climate, topography, land and water resources. Below are the basic principles that are recommended to guide the development of a management system:

-compatibility of the system with the natural and economic conditions of the zone;

- development of specialization, cooperation and integration of production, taking into account the demand for agricultural products;

- ensuring communication and rational composition of industry and sector industries;

- more efficient use of land, material and labor resources;

-obtaining sufficiently high financial results to maintain expanded reproduction and development of the social sphere.

In order to ensure sustainable and competitive development of the agricultural sector, the use of scientific and technological progress and innovative processes that allow updating production technologies accelerates the development of agriculture and each of its areas. Ensuring sustainable development depends on the fact that manufacturers define the main goal, building their activities on an innovative basis.

From this point of view, manufacturers constant attention to new ideas, proposals and developments allows them to maintain their position in the market and increase their income. At the same time, the author points out the need to determine the strategic function of activity as one of the important issues of business management for the production of subtropical crop production and related industries in the Lankaran-Astara economic region. Thus, the business environment faced by farms and processors, while very complex, has similar and different characteristics. At the same time, changes are occurring rapidly due to many factors influencing this environment.

By conducting an analysis of GIZ (german development cooperation) on the use of innovative technologies in the agricultural sector of Azerbaijan for the production of subtropical crop production, it is possible to identify issues important for the producer (farmer) and determine a strategy. The use of innovative technologies in the production of subtropical crop products, the GIZ analysis is shown in Table 6 in the dissertation work.

Despite the processes occurring in the environment, important decisions and strategic operations are required to adapt to the built environment in order to achieve sustainable development.

The established strategic function allows you to correctly understand the environment in accordance with the actual field environment, evaluate information related to environmental production (opportunities and risks), draw up effective action plans, making the right decision on mutual measures.

Table 6

SWOT analysis of the application of innovation technologies in the production of subtropical crop products

Strengths: - provides increased productivity; - reduces production costs; - imported agricultural equipment is exempt from customs duties. - product quality improves; - makes it easier for the farmer to make the right decisions; - ensures economical use of resources; - economic efficiency of production increases; - increasing farm incomes	**Weaknesses:** - the use of innovative technologies is not available to small farms; - no funds are allocated for innovative technologies, support is weak; - knowledge and skills in the use of innovative technologies are at a low level; - funding for research projects is insufficient.
Opportunities - increase productivity through the use of innovative technologies; - exit to wider markets by producing quality products; - ensure constant production growth	**Threats:** - competitiveness is declining; - resources are used inefficiently; - interest in working in agriculture decreases; - dependence on subsidies increases.

The table was compiled by the author.

In this case, by making and implementing the right decisions in accordance with the changes, farms effectively use the strengths of the changes, avoid the weak ones and gain advantages that will ensure their competitiveness. It is noted that poor decisions can expose farms and businesses to long-term difficulties.

In the "Conclusion" section of the dissertation, proposals and recommendations are given that have scientific and practical significance, based on the results of the study.

In world history, agriculture is one of the problem areas that are constantly dependent on other areas and many factors. That is why the situation in agriculture during all periods of the new economic system was more complex and painful than in other areas. Despite the positive changes achieved in many areas in recent years as a result of economic

reforms, current agricultural production levels are generally well below potential levels. One of the main reasons for this is related to the problems of effective use of innovative technologies and increasing their economic efficiency in general agriculture, including the development of subtropical crop production as one of the profitable areas.

Research and generalizations carried out in this direction made it possible to determine the following provisions and conclusions:

- The socio-economic essence of the development of scientific innovation lies in the fact that the use by the consumer of the results of innovative activity directly in the production of agricultural products gives a certain economic and social effect. As a result, material conditions are created for effective management and development of production. The functional essence of the development of received scientific innovations can be considered as an important potential for bridging the gap in the state of the latest scientific and technical knowledge and production experience.
- According to the development of industries in the agricultural sector and the characteristics of product production, the innovation process has the following specifics: natural conditionality of the agricultural technological process, competitive disadvantage, requirement of large financial resources, small size of farms, etc. The classification of innovations adopted in various areas of subtropical crop production to a certain extent characterizes modern directions of innovative development and the level of investment in each area of production. Therefore, taking into account the peculiarities of production, it is considered necessary to take into account the factors influencing the use of innovative technologies and integration processes in subtropical crop production.
- A generalization of the experience of developed countries shows that the appropriate legal framework formed during the organization of innovation activities is directly involved in the organizational and economic regulation of innovation processes. Thus, developed countries have the opportunity to influence innovation processes directly and indirectly. The basis of the direct effect is financing in various ways, and the indirect effect is the creation of favorable

economic and socio-political conditions for scientific and technological development, as well as stimulation of innovation processes. Thus, the state shows special interest in the development of the industry based on innovative technologies.

- Modern technological systems in Azerbaijan must be adapted to adaptability, biologization of processes, environmental and economic efficiency, stable fruiting, optimal implementation of the production potential of fruit agrocenoses and high consumer qualities of products. To adapt subtropical fruit seedlings imported into the country to local climatic conditions, it is necessary to pay attention to horticultural indicators. This takes into account the biological characteristics of the plant, its resistance to diseases and pests, management of adaptive reactions of plants, etc. The most optimal option for the development of innovative gardening is the creation of local plant varieties, which increases demand in foreign markets by increasing the competitiveness of local products.
- Despite the difficult economic situation observed in the development of the agricultural sector in recent years, innovative processes are gradually intensifying. This situation is especially evident in some farms that intensively introduce innovative innovations in various areas of production (in intensive horticulture, vegetable growing, livestock farming), at the same time both in productivity and in compliance with product quality standards. Analysis of these indicators, in general, when comparing data on average indicators for different farms, shows that a significant difference appears, reaching a level of two- and three-fold increase. Therefore, it can be considered appropriate to develop a strategy that ensures dynamic development and production efficiency in subtropical horticulture based on innovative technologies.
- In recent years, in the implementation of innovation policy, a special place has been given to the organization of an information and consulting service for the agricultural sector, helping agricultural producers apply both domestic and foreign innovations and best practices. The task of meeting the growing demand for food due to population growth is a problem facing not only business entities. It is necessary to note the role of scientific research and its tasks.

Innovations in scientific research, which have a greater role in creating food abundance and increasing the production of environmentally friendly products, and their application in production, the creation of better agricultural methods to reduce the negative impact of agricultural activities on the environment, are of particular importance. Let us also note that the state faces an important task here. Because we believe that the state should perform a regulatory function that helps ensure the common interest between commercial entrepreneurs and the population, ensuring the protection of an environmentally friendly environment necessary for the healthy functioning of the country population.

- Due to the small size of most business entities in Azerbaijan, it is impossible for them to raise the necessary funds to implement large-scale innovations. In order for these farms to be widely represented on the domestic and foreign markets of the day, they need to have extensive connections. The application and development of innovative technologies increasingly determines the development of inter-industry relations. However, it should be taken into account that cooperation with various fields of science and technology requires additional costs, and therefore the acceleration of integration processes and the development of large economic forms are considered, the creation of cooperatives in this area is one of the main priority issues.
- If the development of integration processes is not ensured may lead to isolated implementation of the resulting innovations. This can lead to significant losses for both individual parties and the economy as a whole. In other words, the inconsistency of various connections of technological chains, associated with large economic losses, will lead to inhibition of development based on innovative technologies. The expansion and development of integration relations under the influence of certain factors can lead to high independence of business entities, which will allow them to gain a competitive advantage in the market.
- Successful implementation of innovation policy is impossible without the formation of legislative and regulatory mechanisms regulating innovation in agriculture. It is necessary to improve the attitude and support of the state towards the innovative development

of agriculture, to ensure the direction of state support and the effective implementation of measures arising from the adopted programs. For this purpose, favorable conditions must be created, the preparation and adoption of laws and other regulatory documents for this purpose must be ensured. It is considered necessary to invest in innovation activities based on the emergence of national production technologies, especially in breeding production, and to adopt legislation related to the innovative development of the agricultural sector in accordance with local conditions.

- One of the factors limiting the correct and precise development of agriculture based on innovative technologies is, in fact, the lack of proper professionalism capable of integrating its multidisciplinary aspects. In order to increase the efficiency of the application of innovative technologies, it is necessary to conduct appropriate training for the preparation and advanced training of technical and professional experts and specialists for advanced agriculture, which can be integrated into modern and global development in this area, as well as to prepare and implement training programs in new technologies so that enhance farmers ability to use advanced technologies.
- Attributing the production of subtropical crop products of origin based on innovative technologies and the development of the processing industry to the class of complex natural and socio-economic systems leads to a different approach. To increase the efficiency of production and processing of subtropical fruits, joint activities of producers and processors of products are considered more effective. It is from this point of view that the strategy of joint action should be formed under the influence of factors such as the state support system, the territorial location of production and joint actions with farms, the training of professional personnel, and the preference for a scientific approach. At the same time, taking into account the influence of these factors on the development of the processing industry, being a necessary condition for the development of this industry, allows us to ensure its sustainable development. We think that the comprehensive development of the agricultural processing industry in general, as well as types of production, can provide employment to the population in the regions by accelerating the

industrialization of agriculture, efficient use of labor resources, increasing technical equipment, potential and level that helps modernize agriculture.

The main provisions of the dissertation work, the results obtained and conclusions are reflected in the following published scientific works:

1. Problems of innovative development of agriculture - // – Baku: scientific and practical journal "Cooperation", No. 1(56), 2020, – pp. 47-51
2. Modernization is the basis of innovative development of agriculture // – Baku: "Geostrategy", No. 2(56), 2020, pp. – 108-112;
3. Economic efficiency of production of crop products in the Lenkoran economic region // – Makhachkala: "Food security: problems and solutions" October 27-28, 2021 international conference, – pp. 118 -123;
4. Directions for improving stimulation of the development of citrus growing in Azerbaijan // – Moscow: journal "Economics and Management: Problems, Solutions", No. 4, 2021, – pp. 167-173;
5. Conceptual justification for a regional model for managing the competitiveness of the tea processing industry // – Baku: - scientific and practical journal "Cooperation", No. 3(62), 2021, – pp. 143-149;
6. Problems of export of fruits and vegetables in Azerbaijan // – Baku: scientific and practical journal "Audit", No. 2 (36). 2022, – pp. 99-108;
7. Directions for expanding the production of subtropical crop products based on innovative technologies // – Baku: Center for Agrarian Research, scientific and practical journal "Agricultural Economics", No. 2 (40) 2022, – pp. 51-57;
8. Economic importance of the development of subtropical crop production // – Ganja: "Technological development is the basis of economic development" Proceedings of the republican conference, Azerbaijan Technological University. March 10, 2022, – pp. 30-33;

9. Economic importance of innovative development of fruit growing // – Sumgayit: materials of the Republican conference "Current problems of socio-economic development of the Azerbaijan Republic". Sumgayit State University, October 20-21, 2022, – pp. 118-121.

10. The period of development of tea production in Azerbaijan // – Baku: International scientific and practical conference "Heydar Aliyev and the modern Turkic world", dedicated to the 100th anniversary of the birth of national leader Heydar Aliyev. May 2, 2023, – pp. 428-432.

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