

*A CONTEMPORARY SITUATION OF THE VEGETABLE GROWING AND ITS LOCATION ON ALTITUDE ZONES IN THE GANJA-GAZAKH ECONOMIC-GEOGRAPHICAL REGION*

*Purpose.* One of the main issues disturbing all the countries in recent years is to ensure food security. In this regard the development of the country's agriculture is very important. Depending on natural and economic factors agriculture has different development properties in the regions. Different programs have been realised to support the development of this sector nationwide. The main purpose of the research is territorial organisation, to determine the level of the development in vegetable growing and development properties according to height zones, to investigate the root of the problems, to find solutions to them.

*Research method.* The analysis is based on the data of the Institute of Geography of the National Academy of Sciences of Azerbaijan and the State Statistics Committee and the works of the scientists having held research on economic and social fields. The situation of the vegetable growing in the last 10 years and its location according to the height zones, the effect of the economic reforms to the development of this sector in the region, existing problems and their solutions have been analysed in this research.

*Results.* The development of the vegetable growing plays an important role in meeting daily demands for food and in providing the population with fresh vegetables all the year round. It is also of highly importance in population employment and in the increase of their income in the height zones. Though natural conditions in the height zones are available for cultivation of different vegetables, the development of plant cultivation also depends on the application of the innovative methods. Alongside with the increase in vegetable production, it will also lead to the absolute elimination of the imported goods and will ensure the increase in exporting potential. The application of intensive methods, the appropriate usage of highly productive vegetable sorts and local conditions will lead to the development of the vegetable growing and to the meeting of demands of the population in the country at the expense of local production.

*Scientific innovations.* The organisation of the vegetable growing according to the height zones in the Ganja-Gazakh economic region have been investigated in the article for the first time. The situation of vegetable cultivation in this region in recent years has been investigated according to the statistical analysis and the survey in the region. The level of development in the vegetable growing and its location according to the height zones in the region has been analysed according to the statistical data. The analysis shows that there is a great potential for the development of the vegetable growing in this economic region and it affects positively the meeting of the demands in vegetable growing and the increase in exporting potential. However, there are factors negatively affecting the development of the vegetable cultivation and the high quality production. The inappropriate choice of vegetable types, seed choice, not paying attention to the sorts and sowing quality, agrochemical service, not struggling with illnesses and pests in time and other reasons have led to serious problems. In this regard purposeful measures must be taken to eliminate the problems mentioned and to achieve the highest development of vegetable cultivation in the Ganja-Gazakh economic region.

*Practical importance.* The results of the research can be used in territorial organisation and the support of the development of the vegetable cultivation in the Ganja-Gazakh economic region.

*Keywords:* economic-geographical region, agriculture, vegetable growing, export, import, agro park, altitude zones.

*Introduction.* In today's world, achieving the sustainable development of agriculture is one of the important issues in Azerbaijan, as it is in the world, which is of great importance in ensuring the food security of the population. A large part (43,4%) of the consumption expenses of the population in the country is spent on food, and among these products, various vegetables and products made from them prevail. In this regard, it is necessary to ensure the development of vegetable growing in the regions, to eliminate dependence on imports. The efficient territorial organization of vegetable farming, its quality to meet market demands, and the investigation of the problems in this field are of great economic and geographical importance.

At the same time, a large part of the income of the population in rural areas is obtained from self-employment. In the year 2020, 21,2% of the population's income in the Ganja-Gazakh economic-geographical region was obtained from self-employment, of which 17,2% was the income received from the production of agricultural products. Studies in this field indicate that among the regions of Azerbaijan, the highest share indicator (58,0%) of rural families engaged in the production of products both for themselves and for the market belongs to Ganja-Gazakh economic geographical region [13].

On average, 49,8 manats are obtained from agriculture per person per month. Interestingly, the incomes deriving from the production of vegetables dominate here [9].

At the same time, among the food products in the consumption basket of the population, vegetable products dominate the most. Thus, 134,1 kg of vegetables is consumed per person per year [10].

In recent times, several measures have been implemented to achieve the development of agriculture at the country level and to support entrepreneurs working in this field. On June 27, 2019, according to the "Rule of subsidizing the production of agricultural products", starting from 2020, a subsidy of 240 manats per hectare of the cultivated area was commenced to be given to vegetable producers [8].

Currently, vegetable production has increased significantly compared to previous years, and the share of vegetables among exported agricultural products has increased. In 2020, 1738,9 thousand tonnes of vegetables were produced, 56,0 thousand tonnes were imported, and 220,2 thousand tonnes were exported.

In the last decade (2010-2020), vegetable production in the country increased approximately 1,5 times, and in the Ganja-Gazakh economic-geographical region, this figure increased up to 2 times. Export of vegetables in the country increased 4 times, while imports (34%) decreased. As can be seen from the analysis, there has been noticeable progress in the production of vegetables, which dominate the daily food ration of the population and are mostly used in canning.

Considering that there are potential opportunities for the development of vegetable growing in the economic-geographic region, it can be concluded that both local demand and imported vegetables can be met through local production. From this point of view, in the research work, we have studied the state of vegetable planting and production in the Ganja-Gazakh economic-geographical region in recent years, and the organization of it according to altitude zones depending on the relief.

*Sources and research methods.* From the sources related to the region, from the survey materials conducted in the area, the agriculture of Ganja-Gazakh economic-geographic region, including the state-of-the-art state of vegetable growing, the natural-geographical and economic factors affecting the development of this area have been investigated. Additionally, the location and current situation of agriculture in altitude zones was studied using the statistical data of the region.

In the article, the works of scientists and researchers of the Republic of Azerbaijan on agriculture, the data of the State Statistical Committee of the Republic of Azerbaijan and the research conducted by the author were used as sources of information. Azerbaijani scientists constantly research the agriculture of the country's territory and regions, the factors affecting its development, territorial organization, and development potential.

In this field, I.D. Abasov [1], J.T. Aghayev [2], A.J. Ayyubov, G.A. Hajiyev [11], A.A. Gurbanzade [13], N.A. Pashayev [14], A.T. Zeynalli [16] and others' scientific works can be taken into account as essential sources in order to study the agriculture of Azerbaijan.

The statistical, survey, comparative analysis, system structure and other methods were used in the research work.

*The object of the study.* The studied region – the Ganja-Gazakh economic-geographical region, covering 14.2% of the country's territory (12,3 thousand km<sup>2</sup>), is located in the west of the republic, on the northern slope of the Lesser Caucasus mountains. Its territory includes the Ganja-Gazakh sloping plain located in the Kura depression and the Jeyranchol plain located on the left side of the Kura river. The region, which has favourable natural conditions and resources, and an economic-geographic position, is located on the essential transport routes of the country, the "East-West" transport corridor. It is possible to ensure sustainable high development of the region by effectively using the natural and economic potential of the economic-geographical region.

According to the statistical data for the year 2021, the economic-geographic region, where 12,8% of the country's population (1298,9 thousand people) settle, includes Gazakh, Aghstafa, Gadabay, Tovuz, Shamkir, Dashkasan, Goygol, Samukh, Goranboy districts, Ganja and Naftalan cities.

The Ganja-Gazakh economic-geographic region is the second largest region in terms of the economic importance of the country. In 2020, the economic-geographic region accounted for 5,3% of the

output of the primary sectors of the country's economy, 2,8% of the industrial output, 16,2% of the agricultural output, 7,9% of the retail trade turnover, and 5,7% of the funds directed to capital [10].

*Analysis and discussion.* Ganja-Gazakh economic-geographic region is the second largest vegetable-growing region in the republic right after the Aran economic region in terms of vegetable production, and it accounts for 23,6% of the total vegetable production (Figure 1) [3].

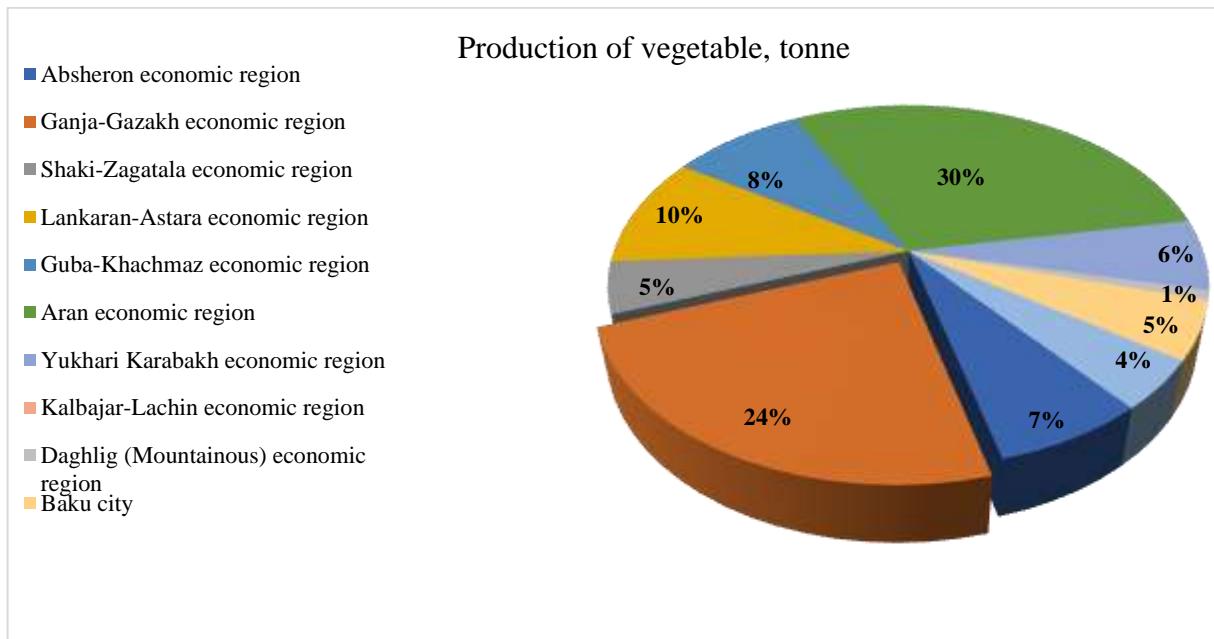
The natural conditions of the Ganja-Gazakh economic-geographical region, fertile land, agro-climatic resources and the traditional work habits of the population in the field of agriculture have created wide opportunities for territorial organization and development of vegetable growing. The population is engaged in vegetable growing both on large farms and in private farms and backyards.

In recent years, the interest of entrepreneurs in this field has increased in the economic region, and production has increased. Productivity of vegetable farming is almost 2 times higher than the indicator for the republic and reached 248 centner/hectare [5].

As in all parts of our republic, in the Ganja-Gazakh economic region, carrying out serious reforms in the field of agriculture, the successful implementation of the State Program for socio-economic development of regions has led to significant progress in the agrarian sector of the region. In accordance with the order "On state support to producers of agricultural products", assistance was provided to producers of agricultural products in the economic region [1].

According to the analysis of economic efficiency carried out by regions, vegetable production in the Ganja-Gazakh economic region is developing intensively and is one of the most profitable regions [17].

In 2020, 11,8 thousand hectares of vegetables were planted in the economic-geographic region, which accounted for 6,0% of the agricultural crops in the economic region.



Source: Agriculture of Azerbaijan, 2021 [3]

Figure 1. Distribution of vegetable production in the Republic of Azerbaijan in 2020 by economic regions, in percentage

Although fertile natural conditions in the Ganja-Gazakh economic-geographical region create sufficient opportunities for the development of vegetable growing in the open air, entrepreneurs show great interest in growing vegetables in covered lands as well. Currently, 39,6% of the vegetable crops and 40,3% of the production in covered lands across the country belong to the economic-geographical region.

Greenhouses built in the territory of the economic region widely used intensive methods, play an important role in providing fresh vegetables in the country in all seasons of the year, and also expand their reach in the foreign market by growing ecologically clean, competitive products. Thus, vegetables are exported from the economic region to the CIS and other countries [15].

The development, expansion and improved facilities of greenhouses in the region have turned vegetable growing into one of the most profitable fields for entrepreneurs.

In recent years, two of agro parks equipped with modern equipment, applied in the production system of agricultural products in the country, were created in Ganja-Gazakh economic-geographical region [7].

The total area of the Shamkir agricultural park, which is the first in the South Caucasus, covers 604 hectares. Agropark operates based on modern production, logistics and sales technologies.

In the Logistics Centre of Shamkir Agropark, 71 units of ULO-type refrigerating chambers with a capacity of 24 thousand tonnes have been installed for the minimum loss and quality storage of fruit and vegetable products. Products can stay in these cold warehouses from 25 to 270 days [4].

Such conditions created in the economic district have increased the interest in the development of vegetable growing, even during our survey it was found out that entrepreneurs in Shamkir district use the land plots of neighbouring regions for vegetable growing. Shamkir administrative district is the region where vegetable growing is most developed in Ganja-Gazakh economic-geographical region.

In 2020, 15,8% of the total plant crops in the Shamkir administrative district were used for vegetable cultivation. 311,3 thousand tonnes of crops were harvested from this field. It made up 9,6% of total vegetable crops and 17,9% of production in this country.

5,3 thousand hectares of vegetables were planted in open lands, and the remaining 1,1 hectares were planted in covered lands. 43,3% of the produced vegetables were collected from open lands (144,3 thousand tonnes), and 53,7% (167,1 thousand tonnes) from covered lands. Vegetable farming has developed in family peasants and households [16].

30,8% of vegetable crops and 35,1% of production in covered lands across the country, and 77,8% and 87,1% of production in the economic region fell to the Shamkir district [3].

Several types of vegetables are grown in the economic region. According to the production of some vegetables, the region differs from the country. In recent years, among the exported agricultural products, the export of tomatoes has prevailed. The demand for tomato products in the republic is almost fully met [8].

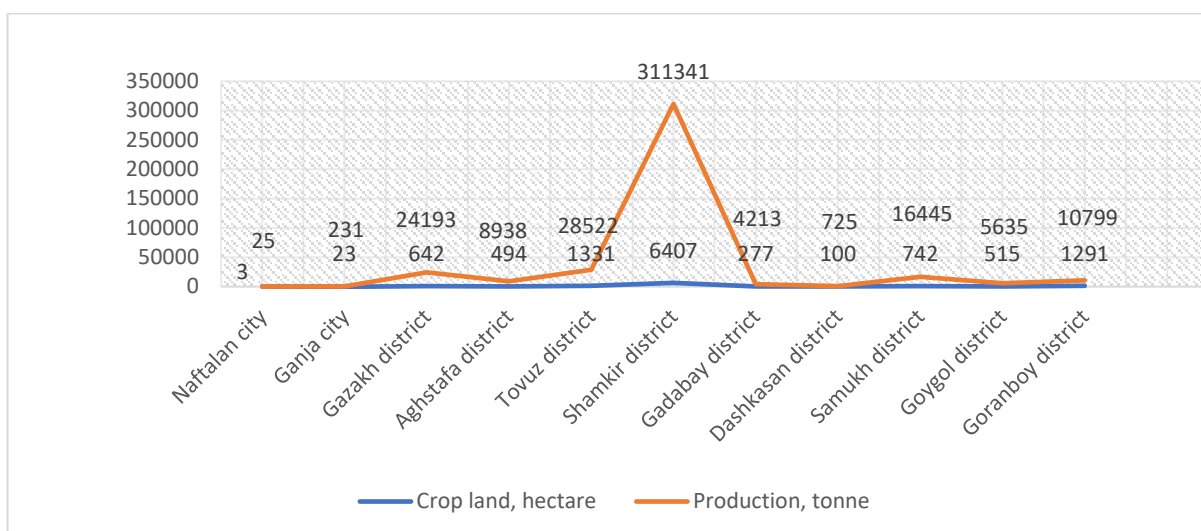
In 2020, the Ganja-Gazakh economic region was the first among vegetable products in terms of tomato production, and the second highest production in the country right after the Aran economic region in cucumber production. Thus, 203,1 thousand tonnes (26,2%) of tomato production and 40,8 thousand tonnes (18,0%) of cucumber production fell on the share of the economic region. According to the production of these vegetables, Shamkir district is in the first place in the republic and economic region. 21,5% of tomatoes produced in the republic, 82,2% in the economic region, and 11,9% and 66,4% of cucumbers, respectively, belong to this administrative district.

Compared to the corresponding period of 2019, a 20,3% increase in vegetable production was observed. Including, there was a 14,7% increase in crop production on covered lands. This indicates that interest in this field has increased in the region in recent times.

At present, the selling price of one centner of vegetables (on open ground) in agricultural enterprises is 19,15 manats, and in individual entrepreneurs' farms, it is 31,65 manats [12].

As we have mentioned, the economic region differs in the republic due to the cultivation and production of other areas of vegetable growing. Thus, in 2020, most cabbage, as well as cauliflower, table beet and carrot, and hot pepper were planted in Ganja-Gazakh economic-geographical region in the republic. 34,9% of cabbage planting and 36,6% of its production, 92,3% of cauliflower planting and 96,7% of production, 52,9% of table beet planting and 62,6% of production, 58,3% of table carrot cultivation and 51,1% of its production fall on the share of the economic region.

Currently, 0,2% of the total vegetable crops and 0,1% of production in the Ganja-Gazakh economic-geographical region is in the Ganja city, 0,8% and 0,2% in the Dashkasan, 2,3% and 1,0% in the Gadabay, 4,2% and 2,2% in the Aghstafa, 4,4% and 1,4% in the Goygol, 5,4% and 5,9% of the Gazakh, 6,3% and 4,0% in the Samukh, 10,9% and 2,6% in the Goranboy, 11,3% and 6,9% in the Tovuz, 54,2% and 75,7% in the Shamkir district, respectively (Figure 2).



Source: Agriculture of Azerbaijan, 2021 [3]

Figure 2. Vegetable crops and production by administrative districts in Ganja-Gazakh economic-geographic region in 2020

In the Ganja-Gazakh economic-geographic region, the altitude zones where vegetable growing is located can be divided into five zones: 1-200 m, 201-500 m, 501-1000 m, 1001-1500 m, 1501-2000 m. - 26.0-0 and above 2000, since there are very few cultivated areas, it was not considered important to conduct research (Figure 3).

The agro-climatic conditions of the economic region vary from hot and dry regions to cold and humid regions according to the vertical zonation. In plain areas, the irrigation network enables the efficient use of thermal resources. In the foothills and mid-mountains, the heat reserve covers the demand. As it moves towards the highlands, the heat reserve decreases, and unfavourable relief conditions limit the possibilities of farming [11].

In the economic-geographical region, the lowland areas with an absolute height of 200 m above sea level open wide opportunities for growing vegetables under the conditions of abundant temperature and irrigation. The lack of irrigation water in some areas makes it difficult to make the most of the zone's potential.

In this altitude zone, 0,7 thousand hectares of vegetable crops are located in the economic-geographic region. Plantings were in the territory of Goranboy, Samukh and partly Shamkir administrative districts of the regions. The total vegetable crops in the Goranboy district formed 37,8% as opposed to the Samukh at 36,0%. However, this figure was 0,2%. 2,3% of the vegetable production of the economic region was obtained from this altitude zone (Table 1).

The zone between 201-500 m above sea level is the main altitude zone where vegetable growing is located in the economic region. Thus, convenient natural conditions and economic factors have created fertile conditions for vegetable growing, as well as many vegetable growing areas. In addition to vegetables grown in open conditions, crops also cover a large area in this zone. 9,3 thousand hectares of vegetables were planted in the high-altitude zone. The largest number of vegetable crops were planted in the Shamkir, Tovuz, Goranboy, Gazakh, Aghstafa, Samukh, and Goygol, and the least due to natural conditions in the Dashkasan region. 95,0% of the total vegetable crops in the Shamkir district fall to this altitude. These figures are 85,4% for the Tovuz district, 42,4% for the Goranboy district, 97,0% for the Gazakh district, 81,4% for the Aghstafa district, and 64,0% for the Samukh district, 23,8% for the Goygol district and 5,0% for the Dashkasan district, respectively.

Vegetable crops in the territory of the cities of Ganja (23 hectares) and Naftalan (3 hectares) are located in this zone.

88,9% of vegetable production in the economic region falls in this altitude zone (Table 1).

1,0 thousand hectares of vegetables are planted in the economic-geographic region on altitude zones between 501-1000 m. Plantations are mainly in Goygol, Goranboy, Shamkir, Tovuz, and Aghstafa districts. The lowest number of vegetable crops in this altitude zone is in the Gazakh and Dashkasan districts due to difficulties in irrigation. 64,0% of the total vegetable crops in the Goygol district fall to this altitude. These figures are 18,9% for the Goranboy district, 3,0% for the Shamkir district, 7,8% for the Tovuz district,

18,6% for the Aghstafa district, and 3,0% for the Gazakh district and 5,0% for the Dashkasan district, respectively. 4,7% of vegetable production is concentrated in the high-altitude zone.

*Table 1*  
The location and production of vegetables in the Ganja-Gazakh economic region by altitude zones in 2020, in percentage

Altitude zones, m	Total vegetable crops		Production	
	Hectare	%	tonne	%
1-200	721,3	6,1	9454,5	2,3
201-500	9318,1	78,8	365438,6	88,9
501-1000	1005,1	8,5	19320,1	4,7
1001-1500	685,9	5,8	15209,5	3,7
1501-2000	94,6	0,8	1644,3	0,4
<b>Total</b>	<b>11825</b>	<b>100</b>	<b>411067</b>	<b>100</b>

Source: It was calculated based on the data of the statistical offices of the administrative districts of the Ganja-Gazakh economic-geographic region.

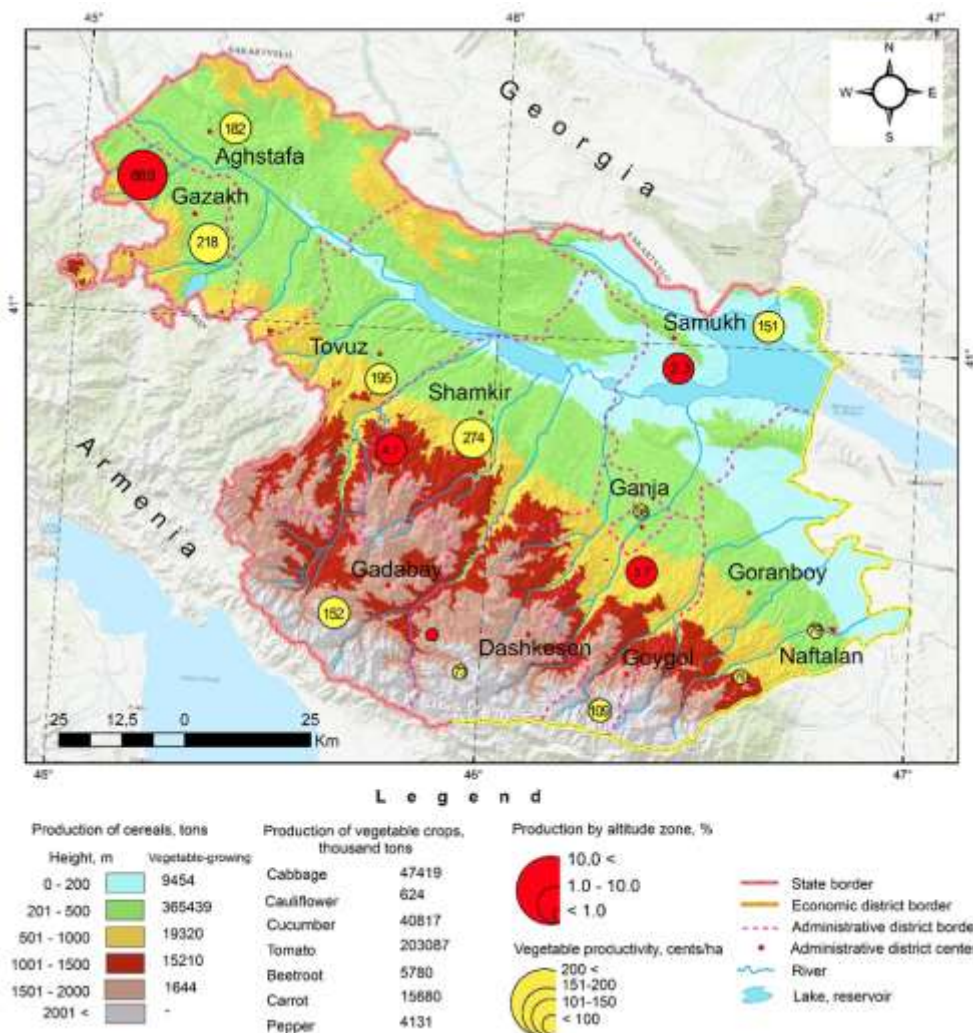


Figure 3. The location of vegetables in the Ganja-Gazakh economic region by altitude zones

Approximately 0,7 thousand hectares of vegetable crops are located in Ganja-Gazakh economic-geographical region in the altitude zones between 1001-1500 m. 90,8% of the total vegetable crops in the Gadabay district fall at this altitude. These figures are 49,0% for the Dashkasan district, 5,6% for the Tovuz district, 12,2% for the Goygol district, 1,8% for the Shamkir district and 0,9% for the Goranboy district, respectively. This altitudinal zone accounted for 3,7% of vegetable production.

0,09 thousand hectares of vegetable crops in the economic-geographic region are located in the zone covering absolute heights of 1501-2000 m. 41,0% of vegetable crops in the Dashkasan district are located in this altitude zone. These figures are 9,2% for the Gadabay district and 1,2% for the Tovuz district.

0,4% of the total vegetable production in the economic region was obtained from the altitudinal zone.

The development of vegetable growing in the high altitude zones not only meets the population's demand for these products, but also opens wide opportunities for the development of their processing, marketing of produced products, and employment of the population. At the same time, it stimulates the development of entrepreneurship.

It should be noted that fruits and vegetables occupy an important place among the products included in the non-oil sector exported by the country. Thus, among the primary goods exported by the country, 13,47% belong to the non-oil sector, of which 4,42% is the export of fruits and vegetables [6].

In 2020, the export of vegetables was 218,5 thousand tonnes, which brought a profit of 219968,5 thousand dollars to the country. The import of fresh vegetables was 35,3 tonnes, for which 18906,3 thousand dollars were spent [10].

As in other crop fields, there are difficulties in vegetable growing. Particularly, the productivity of some vegetables has decreased due to changes in the environment, diseases in plants, and the presence of low-quality seed types in recent years.

This is more evident in the vegetables cultivated in the backyard. Hence, in addition to diseases of infectious origin, the changeable amount of various ions in the agrochemical composition of the soil and in the irrigation water is accompanied by various signs, as in other agricultural crops, and the owners of private farms have difficulties in solving these problems. [2]

On the other hand, farms do not follow the rotation crop system, improperly select the predecessor plants and varieties, do not pay attention to the varieties and sowing qualities of the obtained seeds, agrochemical service, as well as disease and pest control works are performed poorly [1].

One of the current problems in this field is the excessive use of chemical drugs and fertilizers in cultivation in order to create an abundance of vegetables and obtain more income from the market. In addition to damaging the quality of vegetables, this has a negative effect on the human body.

One of the factors that hinder the development of vegetable farming is the difficulties that arise during export. Thus, in recent times, problems arising in the export of agricultural products to neighbouring countries make it urgent to find new markets. It should be noted that Azerbaijan's agricultural products, especially vegetable products, are mainly exported to Russia. It can be said that almost 90% of the tomato export fell to this country [10].

The opening of new markets will accelerate the development of vegetable growing both in the republic and in the economic-geographical region.

**5. Conclusion.** The following conclusions can be drawn from the analysis of the development of a vegetable growing and its location by altitude zones in the Ganja-Gazakh economic region:

Vegetable growing is one of the developed fields of agriculture in the Ganja-Gazakh economic-geographic region. In recent years, the economic region has made a place for itself both in the domestic and foreign markets in this field.

Vegetable crops are unevenly located in the region, depending on natural conditions and economic factors. The altitude zones where vegetable growing is developed are divided into five zones by us. Vegetables, which are grown in all altitude zones, are mostly planted in the economic region in the altitude zone between 201-500 m, which has the most fertile natural conditions and where the economic potential is concentrated. It should be noted that this altitude zone covers 32% of the territory of the economic region and contains about 70% of its population [14]. 78,5% of vegetable crops and 88,9% of production are located in this altitude zone.

The study of the organization of vegetable growing in the economic region by altitude zones indicates that there are ample opportunities for the development of this field in the area. Thus, it is possible to correctly assess the natural and economic factors in Ganja-Gazakh economic-geographical region, eliminate the problems in the field of vegetable growing and to further increase productivity by applying new approaches.

Therefore, in order to meet the needs of the population at the expense of local production and ensure food security, the development of vegetable farming should be the focus of attention. Attention should be paid to all areas of vegetable rising and its development should be achieved. In this regard, in addition to the achievements of scientific and technical progress and the wide use of new technologies, attention should

be paid to the planting system, the rotation should be expected, the problems of lack of irrigation water should be eliminated, timely and correct irrigation should be carried out, and care should be taken when using fertilizers and pesticides.

The application of the intensive method, the correct use of productive vegetable varieties and local conditions will lead to the high development of a vegetable growing and the satisfaction of the population's demand in the country through local production.

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