DEVELOPMENT OF PLANT GROWING IN ARAN ECONOMIC-GEOGRAPHICAL REGION AND IMPACT OF CLIMATE FACTORS ON IT

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A b s t r a c t

The article analyzes the issues of development and territorial organization of plant growing in thee Aran economic-geographical region, as well as the role of climate factors in plant growing. Main parameters of the climate, important in terms of plant growing are shown, and the issues of area extension and increasing of the output of plantations are studied. The article examines the share of the plant-growing, as well as relevant trends typical for the studied region. There have been considered such issues as the regional structure of plant-growing, irrigated areas, increase of productivity in these areas and improvement of welfare of rural population by boosting production, as well as meeting population's demand for food through domestic manufacture and strengthening the export potential along with the above mentioned issues,. The results of comparative and statistical analysis have shown that plant-growing has been significantly developed in the Aran (lowland) economic-geographical region in recent years but the wheat-growing areas which are of strategic importance in ensuring food security of population have decreased while paddy and cotton growing fields expanded.

1. Introduction.

Natural resources and particularly climate resources are taken into account in process of developing measures on the efficient placement and improvement of economic complex of any region. This process makes necessary considering of the requirements and conditions of economic sectors, too. In Aran economic-geographical region, identifying ways of development of economic sectors, particularly plant growing would be impossible and wasteful without considering the climate resources available. In this context, the presented article explores climatic resources and development of plant growing interconnectedly on the example of Aran economic-geographical region, with showing recommendations of scientific and practical importance.

2. Materials and methodology

Development and territorial distribution of plant growing, as well as the role of natural and geographical conditions and climatic resources in the development of this subsector have been the subject of studies conducted in Azerbaijan in the past. Climate resources and climatic characteristics of Aran region as well as the positive and adverse role of climate and also climate induced disasters in the development of subsectors of agriculture were the subject of researches conducted by A.Ayyubov (1981), Kh.Rahimov (1991), M.Hasanov (2003), N.Babakhanov (2013), R.T.Aliyev, V.Rahimli, Sh.I.Hajiyeva, and other scientists in different years. Main climatic characteristics, as well as their agricultural significance were assessed by A.Ayyubov who has conducted agroclimatic zoning of the territory of Azerbaijan, and provided valuable data on climatic resources of different regions [3]. Kh.Rahimov (1991) has studied both climatic features of the arid zones of Azerbaijan and agroclimatic aspects of subsectors of agriculture such as viticulture and wheat growing [4]. Jointly with A.Ayyubov and others he has studied the impact of climate change and meteorological conditions on the quality of pomegranates and other cultivated plants as well. His researches included also ecological aspects of melioration conducted in mountain areas. M.Hasanov (2003) has studied climatic resources of Azerbaijan, including of Aran region, as well as opportunities for taking of advantage of using those resources in wheat growing and other subsectors of plant growing [9].

Concerning socioeconomic context of this study, it is remarkable that different aspects of the development and territorial organization of agriculture has been studied by different authors recently, including by Z.T.Imrani (2014), K.Zeynalova

(2008), V.Abbasov (2008), A.Gurbanzadeh, I.Abasov, V.Javadov, K.Aliyev, R.Aliyev and others, who emphasized the influential role of socioeconomic factors of agricultural activities in the regions [1, 3, 7].

In this research we studied the development of plant growing in Aran economic-geographical region and responsible climate factors based on the analysis of the works containing valuable data mentioned above. The emphasis is made upon the analysis of recent and current situation with plant growing in Aran region, as well as dynamics and development trends going by the production of various agricultural crops. The research is conducted through historical and comparative analysis, system approach, statistical analysis etc.

3. Analysis and discussion

Total area of Aran economic-geographical region is 21.15 thousand km2, which makes up 24.4% of the country's area, and its population is 2025.0 thousand people (2019), or 20.3% of the country's total population. The population density in region is 95 per sq. km. The territory of Aran region includes 15 administrative districts, including Agdash, Aghjabadi, Beylagan, Barda, Bilasuvar, Goychay, Hajigabul, Kurdamir, Imishli, Neftchala, Saatly, Sabirabad, Salyan, Ujar and Zardab, as well as 3 territorial units of Yevlakh, Mingachevir and Shirvan cities.

The territory of Aran is composed mainly of the Kur-Aras lowland, which is distinguished by desert and semi-desert climate types. The altitude of the region's territory in relation to sea level varies between –28 m and 400 m. The climate of Aran is characterized by the low humidity of climatic conditions and mild climate which prevails in winter. The average annual amount of precipitation in this area is about 15-50% of potential evaporation. Summer months are very warm and the temperature in these months is sometimes up to 40°. Frequently, hot-winds (Gara yel) blow in Aran. The Gara yel winds, in fact, are formed on quiet sunny days, as a result of changes in the properties of local air masses due to heating [8]. In addition, this dry and hot weather prevail in summer as a result of entering of tropical air masses into the region's territory. In summer, movement of southern cyclones from west to east is observed, too. Dry and hot Central Asian air masses enter the territory of the Caspian Sea as well. Consequently, the territory of Azerbaijan often experiences heat and scorching weather driven by the effect of the air masses that may blow from the Central Asia. The Caspian Sea plays the role of a protective barrier against very warm and flaming air masses coming from this region.

The average air temperature of the Aran economic-geographical region is 14.0-14.8°C, and the temperature of the soil surface is 17.0-18.0°C. There are favorable conditions for the development of agricultural areas due to the small temperature difference between administrative districts, fluctuations in relative humidity between 66-77%, rainfall at 293-503 mm, and possible evaporation at 930-1156 mm [6]. However, strong winds (>15 m/s) observed in the territory of the economic-geographical region cause serious damage to agriculture. Severe winds are observed in the administrative districts of Neftchala (30 days) and Barda (21 days) (Table 1).

Specialization in various areas of crop production, expansion of acreage and increasing production depends on the correct and efficient use of climate and land resources. The total land fund of Azerbaijan is 8.6 million hectares, of which 52.3% are agricultural lands suitable for agriculture [11]. However, in plant-growing, specialization in one type of production is not expedient, in view of the fact that according to agrotechnical rules, many plants as a rule cannot be planted every year in the same place. Biological processes in the soil require the use of a replaceable seeding system [1].

Agriculture is considered one of the leading branches of the economy in the Aran economic-geographical region. Agrarian sector accounts for 57.9% of the regional economy. The share of territories under cultivation occupies 42.1% of the region's total area, or slightly lower than that by livestock, while it should be added also that the sown area in the region has expanded significantly.

The factor of climate plays an important role in the territorial organization, specialization and development of agriculture. Though Aran economic-geographical region has a flat relief, the warmth regime here is variable. Therefore, there are evident differences in the production data of various agricultural crops. The above shown geographical factors are responsible for the long duration of the vegetation period of plants, as well as for the differences in periods of maturation of agricultural crops [7]. The annual temperature of the soil surface in this region is suitable for the development of grain-growing.

In Aran, areas occupied by cultivation, has been increased over the past 5 years by 9.1%, making 742685 ha, or 44.6% of country's total territory. In the region, out of the total plantations' area, 45.5% (337668 ha) are cereals and beans, 18.3% (135567 hectares) are technical plants, 4.3% are orchards

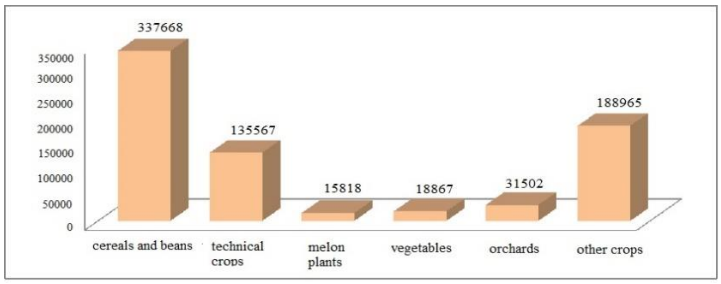
(31502 hectares), 2,6% are vegetables (18867 ha), 2.2% are melon-growing (15818 ha) and 27.1% are other crops (188965 ha) (Figure 1). The most planted crops are wheat (168774 ha), barley (153722 ha), corn (10358 ha), rice (3888 ha), industrial crops (120181 ha), sugar beet (5596 ha), and sunflower (1818 ha) [2].

Table 1

The main climatic indicators of the Aran economic-geographical region

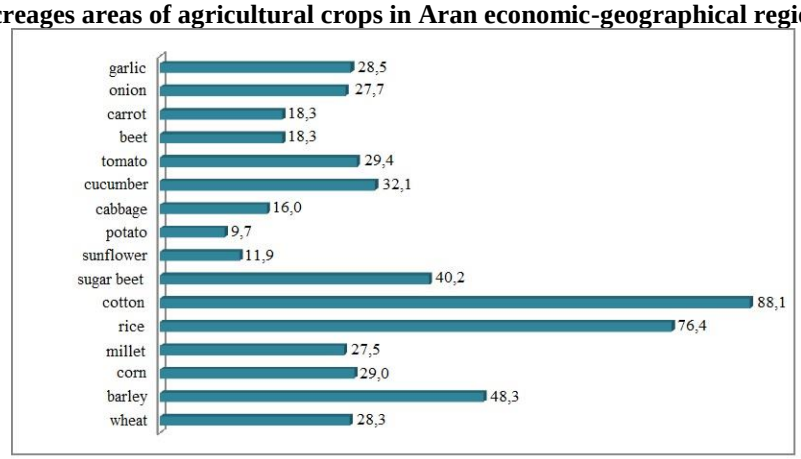
Cities and administrative centers	during the year						
	The average air temperature, ^oC	Temperature of soil surface, ^oC	Average relative humidity of air, %	The amount of precipitation, mm	Possible evaporation, mm	Average wind speed, m/s	Days with strong wind (> 15 m/s), day
Yevlakh	14,6	17,0	68	323	1139	2,6	21
Mingachevir	14,8	18,0	66	359	1156	3,8	-
Shirvan	-	-	-	-	-	-	-
Agdash	14,2	17,0	71	503	930	2,1	5
Aghjabadi	14,0	18,0	73	332	980	2,2	9
Beylagan	14,0	18,0	72	312	990	2,2	10
Barda	14,1	17,0	68	329	1050	2,6	21
Bilasuvar	14,2	17,0	74	321	987	3,0	12
Goychay	14,2	17,0	71	503	930	2,1	5
Hajigabul	-	-	-	-	-	-	-
Kurdəmir	14,5	17,0	72	360	1034	2,3	15
İmishli	14,0	18,0	73	302	970	2,2	7
Neftchala	14,4	-	77	294	940	4,2	30
Saatly	14,0	18,0	74	293	950	2,2	4
Sabirabad	14,2	18,0	72	309	944	2,1	5
Salyan	14,5	18,0	74	283	962	3,1	12
Ujar	14,5	17,0	72	360	1034	2,3	15
Zardab	14,3	17,0	72	335	922	1,8	14

The table is compiled on the basis of calculations of H.A.Hajiyev and V.A.Rahimov



Source: Agriculture of Azerbaijan, State Statistical Committee of the Republic of Azerbaijan, Baku, 2018

Figure 1. Acreages areas of agricultural crops in Aran economic-geographical region by hectare



Source: Agriculture of Azerbaijan, State Statistical Committee of the Republic of Azerbaijan, Baku, 2018

Figure 2. The share of Aran economic region in the country for territory area of some cultivations, in percentage

Table 2

Production of agricultural crops in Aran economic-geographical region, in tons

Crops	Years						Increase and decrease, in %
	2012	2013	2014	2015	2016	2017	
wheat	592568	617755	516157	514716	573340	568724	-4,0
barley	314917	369437	356964	494429	450667	389962	23,8
corn	32098	59647	68549	69597	69289	83852	260
millet	-	-	-	35	316,6	692,4	-
rice	3314,2	4248,7	2062,9	2331,1	4279,7	11958,2	360
cotton	50474	41075	37551	33790	79671	179983	360
sugar beet	110193	112301	106221	95481	153261	165650	50,3
sunflower	4437	3546	4279	2785	2640	3827	-13,7
potato	89883	90407	77484	84200	79599	79813	-11,2
cabbage	30043	28402	19036	21090	14546	21851	-27,3
cucumber	68213	69640	69805	78432	68072	65894	-3,4
tomato	136419	145738	141003	154995	135633	157313	15,3
beet	2034	958	1274	3212	6688	4390	250
carrot	2778	1968	1076	2743	3647	4831	73,9
onion	46198	44297	52539	61229	56876	60127	30,2
garlic	7464	8403	8137	7740	6876	6513	-12,7

Source: Agriculture of Azerbaijan, State Statistical Committee of the Republic of Azerbaijan, Baku, 2018

In recent years, the expansion of sown areas in Aran economic-geographical region has been conducted mainly at the expense of using waters of Kura and Aras rivers in irrigation. Nevertheless, the current state of the material and technical base of irrigation systems can be considered satisfactory in part. Notwithstanding, in some farms, modern irrigation systems are currently used.

Considering the above, we conducted a comparative analysis of the agricultural fields, and we identified the leading farming subsectors of the Aran economic-geographical region. In Azerbaijan, 88.1% of cotton production, 76.4% of rice, 48.3% of barley, 40.2% of sugar beet, 32.1% of cucumber and 29.4% of tomato production fall to the share of this region (Figure 2).

Harvest plays a key role in the overall increase in agricultural production, and also in displacement of one type of plant growing by another in certain territories [8]. For example, under irrigated conditions, autumn wheat fields were replaced mainly by perennial grasses, inter-row acreage crops (cotton, corn, sugar beet), vegetables, melon crops, beans and cereals. As a result, productivity remains high, and the soil available keeps fertility.

Analysis of the dynamics of production in the Aran region shows that cereals account for highest portion of the cultivated areas, despite the fact that wheat production in 2012-2017 decreased by 4.0% (23,844 tons). Meanwhile, fall was recorded by the production of other crops, including 27.3% by cabbage, 13.7% by sunflower, 12.7% by garlic, 11.2% by potatoes and 3.4% by cucumber. However, there is a tendency of growth in the production of other products. For instance, by the same period, growth in rice and cotton production at 3.6 times, growth in corn production at 2.6 times, and growth in beet production at 2.5 times were recorded (Table 2) [10].

4. Conclusion.

Analysis, carried by the recent years, shows that in the Aran economic-geographical region, production of agricultural crops has been increased considerably, and this allowed meet the population's demand for food products mainly at the expense of domestic output and increase the republic's export potential. There is a tendency of increase with respect to cultivated areas as well. Over the last 20 years crop areas have been increased as much as 50% at least. However, the problem of increasing productivity remains in Aran like other regions of the country. This factor considerably impedes satisfying the needs of the population for the very important two crops – wheat and corn completely at the expense of domestic production, making necessary importing them. Lack of steadily growing tendency in the production of wheat, and even decrease observed in this field is most notable disturbing issue. Cotton cultivation, in contrast, develops recently with much higher rates in the region. As observations show, onion is a main crop often planted

rotationally by farmers. In 2012-2017 years production of rice, cotton, corn and beets in Aran economic-geographical region has increased dramatically. Vegetables are also rapidly increasing crop compared to others. Along with grain growing, cotton growing, gardening and vegetable growing can be considered specialized subsectors, taking into account recent relevant statistic data.

Too high variations observed in data by various crops cultivated in Aran region are partially related to adverse climate factors. Low rainfall and high temperatures often entails drought, negatively affects the agricultural production. Farmers, as observations show, often lack proper and complete irrigation considerably due to natural factors, such as longer duration of drought during summer season. In this context a variety of crops in Aran can be considered as vulnerable due to climate factors. From this view, further improving of techniques in plant growing must reduce dependency on climatic condition, at least partially. More adaptable and resistant sorts of crops, including in wheat production must be used in order to mitigate the possible negative impact of climate chnage, and lessen the related risk level faced by farmers in the plant growing. Accordingly, as we think, that deep rooting must be carried out to minimize the effect of sunlight on the roots of cereals.

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ARAN İQTİSADİ-COĞRAFİ RAYONUNDA BİTKİÇİLİYİN İNKİŞAFI VƏ İQLIM AMİLLƏRİNİN ONA TƏSIRI

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Xülasə. Məqalədə Aran iqtisadi-coğrafi rayonunda bitkiçiliyin inkişafı və ərazi təşkili, habelə əkinçilik sahəsində iqlim amillərinin təsiredici rolu təhlil edilmişdir. Bitkiçilik baxımından vacib olan əsas iqlim parametrləri göstərilir, bitkiçilik sahələrinin genişləndirilməsi və məhsul həcminin artırılması məsələləri öyrənilir. Məqalədə bitkiçilik sahəsinin ümumi məhsulda payı, eləcə də tədqiqat ərazisi üçün xarakterik olan tendensiyalar təhlil olunur. Bunlarla yanaşı, bitkiçiliyin ərazi strukturu, suvarılan sahələr və onlarda məhsuldarlığın yüksəldilməsi, məhsul istehsalının artırılması yolu ilə kənd əhalisinin maddi rifah halının yaxşılaşdırılması, eləcə də əhalinin ərzaq məhsullarına olan tələbatının daxili istehsal hesabına ödənilməsi və ixrac potensialının gücləndirilməsi kimi məsələlərə baxılmışdır. Aparılan müqayisəli və statistik təhlil nəticəsində müəyyən edilmişdir ki, son illər Aran iqtisadi-coğrafi rayonunda bitkiçilik təsərrüfatları xeyli inkişaf etdirilmidir, lakin ölkə əhalisinin ərzaq təhlükəsizliyinin təminatında strateji əhəmiyyəti olan buğdanın əkin sahəsi azalmış, çəltik və pambıq kimi bitkiçilik sahələri genişləndirilmişdir.

Açar sözlər: iqlim, bitkiçilik, əkin sahəsi, təsir, becərmə, məhsul, dənli bitkilər

РАЗВИТИЕ РАСТЕНИЕВОДСТВА В АРАНСКОМ ЭКОНОМИКО-ГЕОГРАФИЧЕСКОМ РАЙОНЕ И ВЛИЯНИЕ КЛИМАТИЧЕСКИХ ФАКТОРОВ НА НЕГО

Л.Ф.Алиева

Аннотация. В статье анализируются вопросы развития и территориальной организации растениеводства в Аранском экономико-географическом районе, а также роль климатических факторов в растениеводстве. Показаны основные климатические параметры, значимые с точки зрения развития указанной подотрасли, изучены вопросы расширения территорий выращивания урожая и увеличения объема продукции. В статье рассматривается удельный вес и другие показатели растениеводства, а также тенденции, характерные для исследуемого региона. Наряду с этими вопросами так же были рассмотрены такие вопросы, как территориальная структура растениеводства, орошаемые территории и повышение

плодородия этих территорий, улучшение благосостояния сельского населения с помощью увеличения производства сельскохозяйственных продуктов, обеспечение спроса населения на продукты питания за счёт внутреннего производства, а так же усиление экспортного потенциала. В результате проведённого сравнительного и статистического анализа было выявлено, что в последние годы в Аранском экономико-географическом районе растениеводство развивалось, но территория посевов зерна, которое имеет стратегическое значение в обеспечении продовольственной безопасности населения страны уменьшилась, а территории, где развито растениеводство таких его видов, как рис и хлопок, расширились.

Ключевые слова: климат, сельское хозяйство, растениеводство, воздействие, выращивание, урожай, зерновые