

**SOME ECONOMIC INDICATORS OF INDUSTRIAL GARDENING IN  
ARMENIAN-POPULATED AREAS IN THE EAST OF ARMENIAN  
HIGHLANDS IN 1806-2018**

**Beketovski D. A., Hayrapetyan A. M., Mamajanyan S. A., Tumanyan K. G.**

The article presents some data on the economic development of industrial gardening, or horticulture (fruit crops and viticulture) in region over the past two hundred years in general, data on the total area, the gross yield from the entire area, as well as the yield. The results of statistical processing of the data given reasonably show their sufficient scientific reliability.

**Keywords:** horticulture, fruit crops, viticulture, economy, statistics.

**Introduction.** For the first time an attempt was made to cover the development of horticulture as a whole and its two branches i.e., fruit growing and viticulture separately, as well the comparative analysis of these branches over a long period of two hundred years was conducted.

The territory of the modern Republic of Armenia is only part of the historical territory of Eastern Armenia, which was formed as a result of the last partition of Armenia between Persia and the Ottoman Empire in 1639. Later, in 1828, the small northern part of Eastern Armenia was conquered by the Russian Empire, which served as the basis for the creation of the modern Republic of Armenia.

For the period 1806-2018 this region, generally referred by as the Armenian-populated territory of Eastern Armenia, has edured the certain territorial, toponymic, ethnic and demographic changes, being called in turn the Erivan Khanate, as a part of Persia (1806-1828), the Armenian region, and later the Yerevan province, as part of the Russian Empire (1828-1918), the first Armenian Republic (1918-1920), the Armenian SSR (1918-1991), the third Armenian Republic (1991-2018), although its total area remained within 30 thousand square meters.

During the period of the existence of the Erivan Khanate of Persia (1806-1827), the gardening developed quite stably. Later, during the first few decades of Russian rule in the Armenian region (or Erivan province) in 1828-1870, some stagnant trends were observed. In 1861, serfdom was abolished in Russia, the application of which reached the Caucasus in 1870. This, in turn, stimulated the development of industrial production in Armenia, including agriculture, one of the branches is gardening. The development of trade and gardening was also stimulated by the development of railway transport, in particular, the opening of the Tiflis-Alexandropol-Kars line in 1897-1899, then Alexandropol-Erivan in 1901 and Erivan-Julfa in 1905. In Soviet period, Yerevan-Tbilisi roads were laid, and then road to Baku, and the airline began to function as regular air transport in the late of 1950s.

In general, over the past 200 years, Armenian horticulture, despite periods of recession caused by the Russian-Persian wars of 1804, 1808, 1826-1827, the Cholera Epidemic of 1830, the Russian-Turkish Wars of 1828-1829, 1854-1856, 1877-1878, Turkish massacre of Armenians in the 19-20 centuries, the Armenian-Turkish wars of 1918-1921, the Armenian-Georgian war of 1919, the civil war of 1921-1922, two world wars, sovietization, the Karabakh war of 1992-1994 (which actually continues to this day) has evolved steadily.

**Objectives and methods.** Statistical analysis was carried out according to the method of Dospekhov [4]. The data was collected and processed in uniform, generally accepted and comparable units of measurement, and the table data from 1960 are presented for five years.

**Results and analysis.** Table 1 shows [1, 2, 3, 5] that the smallest area of garden crops occupied in 1806 (0.4 thousand hectar, or th. ha), and the largest area is noted in 1980 (89.5 th. ha); the smallest gross yield recorded in 1890 (0.02 thousand tons, or th./t), and the highest - in 2015 (695.7 th./t). The lowest yield was observed in 1900 (0.003 tons/hectare, or t/ha), and the largest - in 2017 (23.5 t/ha), although according to Chopin [3], the yield in 1806 reached 28.5 t/ha (which is unlikely).

During the period of Persian rule in 1806-1827 in this region, relative stability in horticulture was observed. After joining the Russian Empire (01.10.1827-28.05.1918), relative developmental stability in gardening was noted until 1870, and later there was an increasing rapid growth. Under the first Armenian republic hostilities took place almost continuously, and gardening was in a stress situation.

Table 1.

## Economic indicators of gardening in Armenia in 1806-2018

Years and five-years	General indices for gardening cultures		
	Area (Thousand ha)	Gathering gross (Thousands tons)	Average yield (t/ha)
1806	0,4	11,4*	28,5*(?)
1827	0,4	11,4*	28,5*(?)
1832	1,04	8,6	8,3*(?)
1870	1,42	6,0	4,2*(?)
1890	3,2*	3,2*	1,0*
1891	7,2*	0,02*	0,03*
1894	7,9*	5,3*	1,5*
1900	8,1*	-*	-*
1905	12,4*	0,04*	0,003*
1910	10,6*	0,04*	0,004*
1913	14,8	10,0*	2,8*
1919	13,6*	73,2*	5,9*
1922	6,7*	40,8*	2,9*
1925	7,8	50,6	3,9*
1928	11,0	67,2	4,7*
1930	13,3	51,2	5,1*
1935	7,7*	15,3*	5,4*
1940	31,6	28,2*	6,0*
1945	31,1*	108,6*	3,5*
1950	32,6*	8,0*	0,03*
1953	34,0*	13,6*	0,4*
1955	39,3*	21,4*	0,5*
1958	37,7	-	-
1960	47,4*	10,4*	0,2*
1965	55,2	140,3	5,4
1970	66,2	170,3	4,9
1975	78,2	238,2	4,8
1980	87,8	278,8	4,7
1985	89,5	373,5	5,9
1990	88,5	435,4	7,2
1995	83,2	361,7	6,0
2000	61,3	291,6	5,3
2005	42,3	242,7	6,1
2010	43,1	307,9	8,9
2015	54,3	487,8	11,8
2016	57,9	695,7	14,7
2017	57,6	421,4	8,8
2018	58,1	571,6	23,5
<b>Average</b>	<b>59,1</b>	<b>523,1</b>	<b>20,8</b>
<b>Relative Error</b>	<b>35.87</b>	<b>184.03</b>	<b>5.84</b>

Notes: \* – data that are questionable; (?) – data that are questionable doubly.

During the period of socialist construction in ArmSSR (11.29.1920 - 09.21.1991), much attention was paid to the development of extensive areas of

the economy: increasing the total and fruitful production areas as well the the collection of gross harvest. Until 1953 rather slow growth was observed, after which rapid development was already noted.

Recently, in third Armenian republic, the vector of economic development of gardening has changed dramatically. Currently, special attention is paid to the development of intensive methods of the gardening. For example, high-yielding varieties are introduced on dwarf rootstocks, varieties and stocks of fruit crops are reproduced by virus-free micro cloning methods in special high-tech nursery farms, in agricultural technology new methods of crown formation and drip irrigation are used, anti-hail networks are established, the new methods of mechanization of production processes are applied and the modern methods of economic incentives are introduced: leasing, subventions, subsidizing, insurance; the creative programs for introducing new technologies as well the various types of information and training programs for raising the qualifications of gardeners appeared. However, all these innovations mainly effect of the quite large gardens and owners with sufficient financial capabilities. But for the bulk of the peasant owners of small gardens, unfortunately, is not yet possible due to many constraining circumstances: lack of sufficient financial resources, debts, general and financial illiteracy, difficulties in adoption of new technologies, etc. We believe that the only possible way of progress in this area is in the state stimulation of small farms to the transition to mass cooperation.

Statistical data processing was performed to prove their reliability (Table 2), in this case it is possible to calculate the average of the arithmetic data given, to eliminate the errors. The calculated relative errors exceed the threshold accepted in agronomical studies by 5%, when the probability of the data is 95%, but given the 200-year period of the collected data, a 9-20% marks of this relative errors can be considered enough reliable.

Table 2.

## Calculation of the reliability of data in Table 1

Years and five years	General indicators for horticultural crops			Deviations $X_i=(X-\bar{X})$ from the average and their squares					
	Area (th.he) $\bar{X}$	Gathering gross (th.t) $\bar{X}$	Medium yield (t/he) $\bar{X}$	Area (th.he) $x_1$	$X_1^2$	Gathering gross (th.t) $x_1$	$X_1^2$	Medium yield (t/he) $x_1$	$X_1^2$
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>
1806	0.4	11.4	28.5	-34.21	1170.32	-149.19	22257.66	23.648	560.93
1827	1.04	8.6	8.3	-33.57	1126.94	-151.99	23100.96	3.484	12.14
1832	1.42	6	4.2	-33.19	1101.58	-154.59	23898.07	-0.616	0.38
1870	3.2	3.2	1	-31.41	986.59	-157.39	24771.61	-3.816	14.56
1890	7.2	-	-	-27.41	751.31	-	-	-	-
1891	7.9	5.3	0.7	-26.71	713.42	-155.29	24114.98	-4.116	16.94
1894	8.1	-	-	-26.51	702.78	-	-	-	-
1900	12.4	-	4.3	-22.21	493.28	-	-	-0.516	0.27
1905	10.6	-	-	-24.01	576.48	-	-	-	-
1910	14.8	10	0.7	-19.81	392.44	-150.59	22677.35	-4.116	16.94
1913	13.6	73.2	5.4	-21.01	441.42	-87.39	7637.01	0.584	0.34
1919	6.7	40.8	6.1	-27.91	778.97	-119.79	14349.64	1.284	1.65
1922	7.8	50.6	6.5	-26.81	718.78	-109.99	12097.80	1.684	2.84
1925	11	67.2	6.1	-23.61	557.43	-93.39	8721.69	1.284	1.65
1928	13.3	51.2	3.8	-21.31	454.12	-109.39	11966.17	-1.016	1.03
1930	7.7	15.3	2	-26.91	724.15	-145.29	21109.18	-2.816	7.93
1935	31.6	28.2	0.9	-3.01	9.06	-132.39	17527.11	-3.916	15.34
1940	31.1	108.6	3.5	-3.51	12.32	-51.99	2702.96	-1.316	1.73
1945	32.6	8	0.3	-2.01	4.04	-152.59	23283.71	-4.516	20.39
1950	34	13.6	0.4	-0.61	0.37	-146.99	21606.06	-4.416	19.50
1953	39.3	21.4	0.5	4.69	22.00	-139.19	19373.86	-4.316	18.63
1955	37.7	-	-	3.09	9.55	-	-	-	-
1958	47.4	10.4	0.2	12.79	163.58	-150.19	22557.04	-4.616	21.31
1960	55.2	140.3	2.5	20.59	423.95	-20.29	411.68	-2.316	5.36
1965	66.2	170.3	2.6	31.59	997.93	9.71	94.28	-2.216	4.91
1970	78.2	238.2	3.1	43.59	1900.09	77.61	6023.31	-1.716	2.94
1975	87.8	278.8	3.2	53.19	2829.18	118.21	13973.60	-1.616	2.61
1980	89.5	373.5	4.2	54.89	3012.91	212.91	45330.67	-0.616	0.38

1	2	3	4	5	6	7	8	9	10
1985	88.5	435.4	4.9	53.89	2904.13	274.81	75520.54	0.084	0.01
1990	83.2	361.7	4.3	48.59	2360.99	201.11	40445.23	-0.516	0.27
1995	61.3	291.6	4.8	26.69	712.36	131.01	17163.62	-0.016	0.00
2000	42.3	242.7	5.7	7.69	59.14	82.11	6742.05	0.884	0.78
2005	43.1	307.9	7.1	8.49	72.08	147.31	21700.24	2.284	5.22
2010	54.3	487.8	9	19.69	387.70	327.21	107066.38	4.184	17.51
2015	57.9	695.7	12	23.29	542.42	535.11	286342.71	7.184	51.61
2016	57.6	421.4	7.3	22.99	528.54	260.81	68021.86	2.484	6.17
2017	58.1	571.6	23.5	22.23	494.17	387.57	150210.6	17	311.9
2018	59.1	523.1	20.8	23.23	539.63	339.07	114968.5	14	223.8
<b>Sum</b>	<b>1363.2</b>	<b>6073</b>	<b>198.4</b>	<b>0.1</b>	<b>29733.3</b>	<b>0.0</b>	<b>1294799.9</b>	<b>-0.2</b>	<b>1401.5</b>
<b>Average</b>	<b>35.87</b>	<b>184.03</b>	<b>5.84</b>	n=38		n=33		n=34	

**Average**

**Error**

**Relative Error**

**Area**

$$X = 35.87 \text{ th.he} \quad s_x = \sqrt{\frac{\sum (x - \bar{x})^2}{n(n-1)}} = 4.5 \text{ th.he} \quad S_x \% = \frac{s_x}{X} \cdot 100 = 12.5 \%$$

**Gathering gross**

$$X = 184.03 \text{ th.t} \quad s_x = \sqrt{\frac{\sum (x - \bar{x})^2}{n(n-1)}} = 35.02 \text{ th.t} \quad S_x \% = \frac{s_x}{X} \cdot 100 = 19.03 \%$$

**Medium yield**

$$X = 5.84 \text{ t/he} \quad s_x = \sqrt{\frac{\sum (x - \bar{x})^2}{n(n-1)}} = 1.12 \text{ t/he} \quad S_x \% = \frac{s_x}{X} \cdot 100 = 19.13 \%$$

**Conclusion.** The first reliable statistics on Armenia have been appearing since 1852, but have been quite regular since 1910, although they have become detailed since the 1960s.

The data presented for the first time for 212 years (1806-2018) of the economic development of horticulture in the region revealed some regularities.

It should be noted that only in the periods of the 1st (1914-18), the 2nd (1939-45) and Karabakh (1992-94) wars there was a marked reduction in the rates of constant growth of all indicators. Rapid development began in peacetime and especially after reforms and with the development of

communications. For example, peaks of development were observed in 1913 and 1985. In general, the yield of viticulture products as a rule is higher than that of fruit crops.

In the last years the production of horticulture in Republic of Armenia gradually increases.

From the data in Table 1 it can be seen that for a number of indicators, 2015 and subsequent years became record-breaking, which is very encouraging and inspires some optimism regarding the future as a whole.

Statistical analysis of the Student's index made it possible to show that the data collected and presented in Table 2 are quite reliable, despite numerous defects associated with the methodology for presenting statistical data in the different period.

The diversity and quality of horticultural products, combined with the expansion of export opportunities and methods of processing, can fully serve as a solid base for further development of the industry. The results of statistical processing of the data given in Table 2 reasonably show their sufficient scientific reliability.

**ՀԱՅԿԱԿԱՆ ԼԵՌՆԱՇԽԱՐՀԻ ԱՐԵՎԵԼՅԱՆ ՀԱՅԱԲՆԱԿ  
ՏԱՐԱԾԱՇՐՋԱՆՆԵՐԻ ԱՐԴՅՈՒՆԱԲԵՐԱԿԱՆ ԱՅԳԵԳՈՐԾՈՒԹՅԱՆ  
ՈՐՈՇ ՏՆՏԵՍԱԿԱՆ ԲՆՈՒԹԱԳՐԻՉՆԵՐԸ 1806-2018ԹԹ.**

**Բեկետովսկի Դ. Ա., Հայրապետյան Ա. Մ., Մամաջանյան Ս. Ա.,  
Թումանյան Կ. Գ.**

Հոդվածը ներկայացնում է ընդհանուր առմամբ վերջին երկու հարյուր տարվա ընթացքում տարածաշրջանում արդյունաբերական այգեգործության (պտղաբուծության և խաղողագործության) տնտեսական զարգացման վերաբերյալ տվյալներ՝ ընդհանուր և համախառն բերքի, ընդհանուր տարածքների և բերքատվության վերաբերյալ: Տրված տվյալների վիճակագրական մշակման արդյունքները ցույց են տալիս դրանց բավարար, գիտական հուսալիությունը:

**Բանալի բառեր.** այգեգործություն, պտուղներ, խաղողագործություն, տնտեսագիտություն, վիճակագրություն:

# НЕКОТОРЫЕ ЭКОНОМИЧЕСКИЕ ПОКАЗАТЕЛИ ПРОМЫШЛЕННОГО САДОВОДСТВА В АРМЯНОНАСЕЛЕННЫХ ТЕРРИТОРИЯХ ВОСТОЧНОЙ АРМЕНИИ В 1806-2018 ГГ.

Бекетовский Д. А., Айрапетян А. М., Мамаджанян С. А., Туманян К. Г.

В статье приводятся некоторые данные об экономическом развитии промышленного садоводства (плодовых культур и виноградарства) в регионе за последние двести лет в целом, данные об общем и валовом урожае со всей площади, а также урожайность этих культур. Результаты статистической обработки приведенных данных обоснованно показывают их достаточную научную достоверность.

**Ключевые слова:** садоводство, пловодство, виноградарство, экономика, статистика.

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### **Information about the authors**

*Beketovski D. A.* - PhD in Agricultural Sciences

Armenian National Agrarian University

"Voskehat Educational and Research Center of Enology" branch, scientific researcher

E-mail: [beket.da.53@gmail.com](mailto:beket.da.53@gmail.com)

*Hayrapetyan A. M.* - Doctor of Sciences (Biology)

National Academy of Sciences RA, Institute of Botany after A. Takhtajyan, leading researcher

E-mail: [alla63\\_03@mail.ru](mailto:alla63_03@mail.ru)

**Mamajanyan S. A.** - PhD in Agricultural Sciences, Associate Professor  
Armenian National Agrarian University, Vice Dean  
E-mail: [s.mamajanyan@gmail.com](mailto:s.mamajanyan@gmail.com)

**Tumanyan K. G.** - PhD in Economics  
Armenian National Agrarian University  
"Voskehat Educational and Research Center of Enology" branch, scientific researcher

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