



Kingdom of the Netherlands

GREENHOUSE SUB-SECTOR ANALYSIS IN ARMENIA

February 2022



***Greenhouse sub-sector analysis in Armenia** has been delegated by the **Netherlands Embassy in Yerevan, Armenia** and implemented by **ARGUMENT Consulting Bureau**. The analysis has been conducted in the period of December 2021 - February 2022.*

The purpose of conducting this sub-sector analysis is to assess the current status of greenhouse sub-sector in Armenia and identify the potential opportunities for suppliers of greenhouse building materials, technologies and seeds from the Netherlands.

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Abbreviations and explanations

ADA	▶ Austrian Development Agency
AMD	▶ Armenian Dram
CIS	▶ Commonwealth of Independent States
CJSC	▶ Closed Joint Stock Company
EAEU	▶ Eurasian Economic Union
FAO	▶ The Food and Agriculture Organization of the United Nations
G.A.P.	▶ Good Agricultural Practices
GDP	▶ Gross Domestic Product
GSP	▶ Generalised Scheme of Preferences
ICARE	▶ International Center for Agribusiness Research and Education
IFOAM	▶ The International Federation of Organic Agriculture Movements
LLC	▶ Limited Liability Company
N/A	▶ Not Applicable

RA	▶	Republic of Armenia
UNDP	▶	United Nations Development Programme
U.S.	▶	United States of America
USAID	▶	United States Agency for International Development
VAT	▶	Value Added Tax

1 BACKGROUND AND PURPOSE OF THE ASSIGNMENT

1.1 BACKGROUND

1.1.1 Geography and Climate



Armenia is an upper-middle income, landlocked country, located in western part of Asia. It occupies the northeastern part of the Armenian plateau – between Caucasus and Nearest Asia. The country is located in the latitude of 38° 50' - 41° 18' N and longitude of 43° 27' - 46° 37' E.

The total area of the country is 29 743 km², 68.7% of which is agricultural land. About 36.4% of terrain are mountains and 76.5% of territory is on the altitude of 1,000-2,500m above sea level. The country's lowest point is the underflow region of Debed river (375m), the highest elevation – the peak of Aragats mountain (4090m). Armenia is abundant with water resources: Lake Sevan is the largest lake in Armenia with 1 279.46m² mirror surface, the longest river is Araks river (192km). Renewable freshwater resources comprise 4,771.0 million m³ (see Table 1.)

Table 1. Renewable freshwater resources, 2016-2020 (mln. m³)

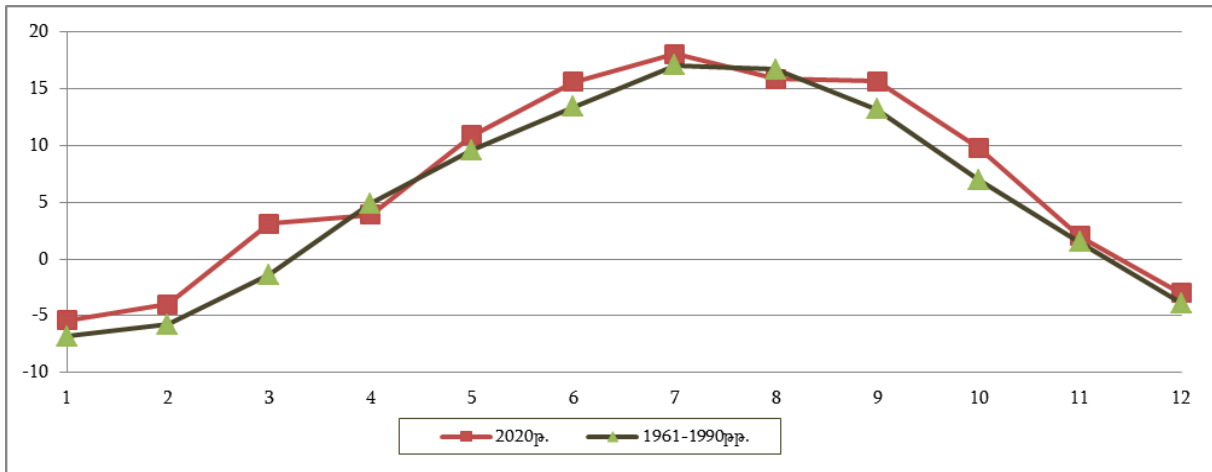
	2016	2017	2018	2019	2020
Precipitations	19,012.0	14,335.0	18,059.0	13,371.0	16,032.0
Total evaporation	12,928.0	10,382.0	12,120.0	10,285.0	11,261.0
Internal flow	6,084.0	3,953.0	5,939.0	3,086.0	4,771.0
Surface waters and groundwater inflow	798.0	710.0	632.4	1,303.0	942.2

Important indicators for construction of greenhouses are weather and climate data, particularly the temperature, wind speed, monthly precipitations, sun intensity, sun radiation and a number of sunny days during the year etc.

Armenia's climate (see Annex 6.4 for the climate map) can be described as highland continental, with large variation between summer highs (June to August) and winter lows (December to February). The country also experiences large climatic contrasts because of its intricate terrain, and the climates range from arid to sub-tropical and to cold, high mountains (World Bank data, 2022¹). The average annual temperature in Armenia was 6.9°C in 2020, which is 1.4°C higher from the norm of 1961-1990 (5.5°C). The average temperature in January was 5.4°C, in June - +15.6°C (see Figure 1 for monthly average air temperature in 2020). The air temperature was higher than the seasonal norms (1961-1990), especially in the winter and autumn it was higher by 2°C, in the spring by 1.6°C, in the summer by 0.8°C.

¹ <https://climateknowledgeportal.worldbank.org/country/armenia/climate-data-historical>

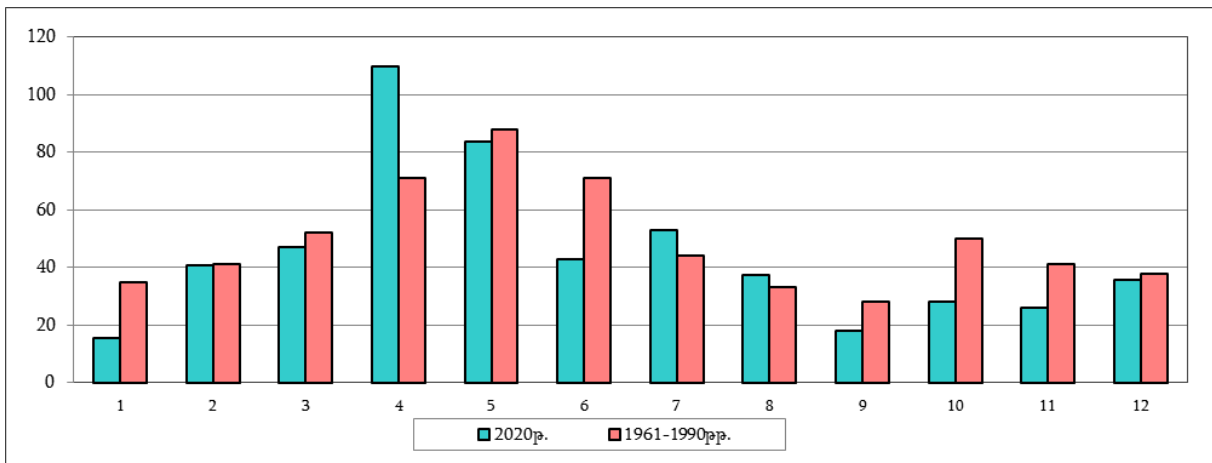
Figure 1. Monthly average air temperature and norms, 2020 (°C).



Source: Statistical Committee of Armenia, 2021

The average yearly number of precipitations was 538mm in 2020, which is 91% of the norm (see Figure 2 for monthly average precipitations in 2020). April and May were especially rainy: the monthly amount was 154% and 120% of the norm respectively.

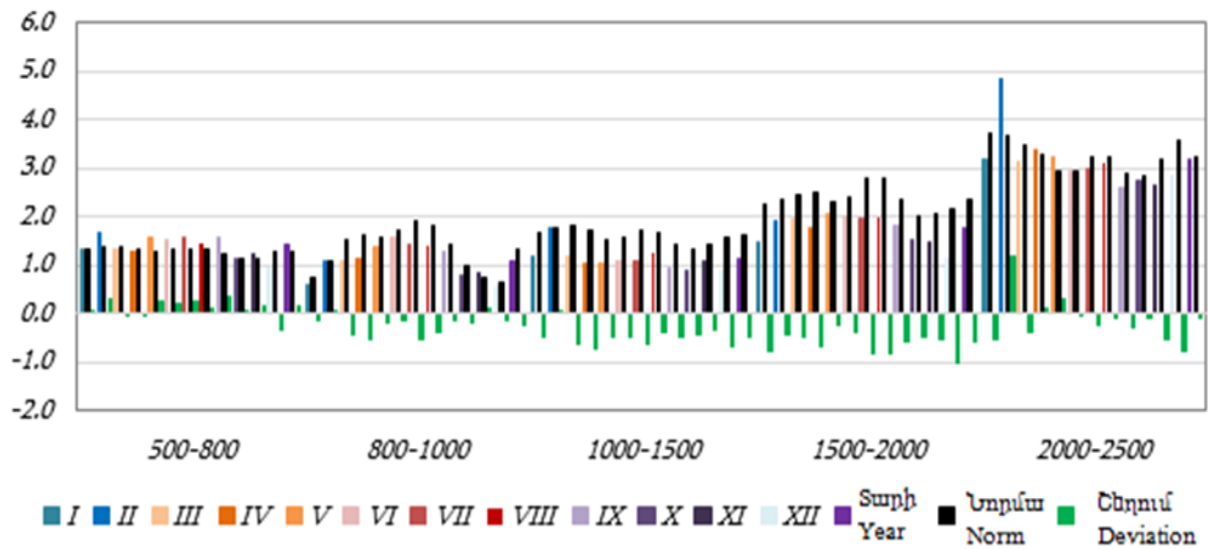
Figure 2. Monthly average precipitations and norms, 2020 (mm)



Source: Statistical Committee of Armenia, 2021

For the greenhouse construction important is also wind speed. As it is presented in the Figure 3, usually high-speed winds are registered at attitudes higher than 2,000 m. In 2020 the average annual wind speed in the republic was within the norm, with slight positive and negative deviations. In the valley (500-800 m) regions, a wind speed of 1.4 m/s was observed, which is 0.1 m/s higher than the norm. At altitudes of 1,000-2,000m, 1.1-1.6m/s was observed, which is 0.5-0.6m/s below the norm. In summer and autumn, the wind speed was close to the norm.

Figure 3. Average wind speed by altitudes and months, 2020 (m/sec)



Source: Statistical Committee of Armenia, 2021

In 2020, the relative humidity was mostly above the norm, with the exception of areas with an altitude of 800-1000 m (in particular, in Armavir in December, the relative humidity was 49%, the norm was 71%).

Table 2. Deviation of relative humidity by altitudes, 2020 (%)

Altitude, m	Deviation of relative humidity	Norm	Average maximum	Average minimum
500-800	72.1	70.0	91	45
800-1,000	57.9	61.2	86	34
1,000-1,500	70.8	67.1	94	48
1,500-2,000	73.7	70.0	95	47
2,000-2,500	76.8	71.7	97	56

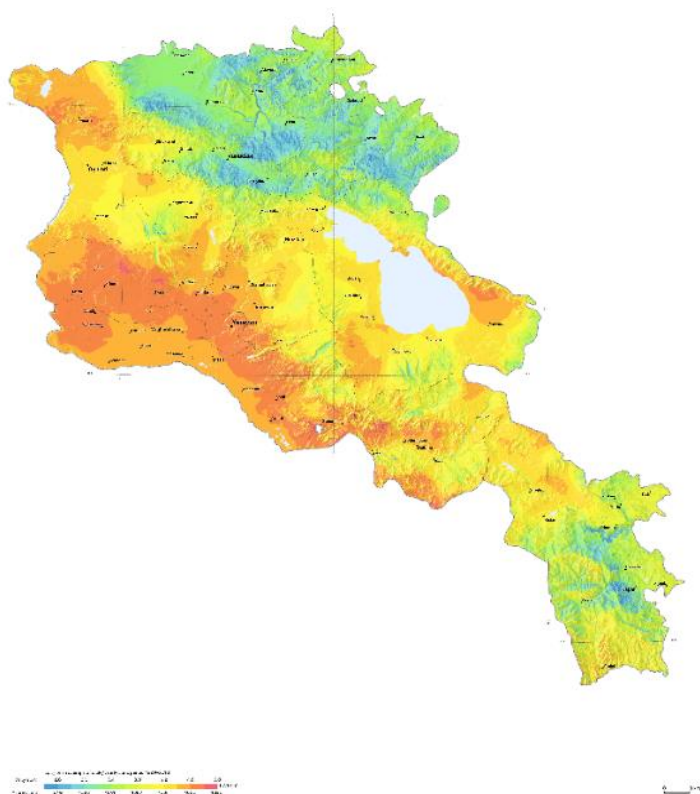
Source: Statistical Committee of Armenia, 2021

In total, 50 hazardous meteorological phenomena were registered in 2020. This number is comparably less than it was registered in 2018 or 2019. The Table 3 presents all registered hazardous phenomena in the country in 2016-2020.

Table 3. The number of cases of hazardous meteorological phenomena, 2016-2020 (unit)

	2016	2017	2018	2019	2020
Strong wind (speed of 25 m/sec and more)	23	14	11	35	8
Heavy fog (visibility less than 50 m)	16	43	29	21	24
Heavy rain (30 mm and more within 12 hours)	8	7	9	4	16
Heavy snow (20 cm and more within 12 hours)	10	3	2	1	1
Hailstorm (diameter of 20 mm and more)	7	5	1	5	-
Extreme hot (in the valleys: $\geq + 400C$, in the foothills: $\geq + 350C$, in mountainous areas of $\geq + 320C$)	1	14	17	10	1
Strong blizzard (>10 m/sec, with a duration of 12 hours, visibility < 50 m)	...	2	-	-	-
Total	65	88	69	76	50

Figure 4. Direct Normal Irradiation in Armenia, 1999-2018²



Average monthly hours of sunshine vary from approximately 2048 (Ijevan) to 2968 (Ararat) hours. In Yerevan, the monthly hours of sunshine were approximately 2696 hours in 2020 (average duration of sunshine exceeding 2200 hours with average of 4,773 MJ/m² solar radiation). The average annual solar radiation per square meter in Armenia amounts to 1720 kWh (the average European is 1,000 kWh). The digital map, prepared in the framework of “Development of Geographic Information System of Armenia for Renewable Energy Projects” of Global Environment Facility and Armenian Renewable Resources and Energy Efficiency Fund³ shows average annual solar radiation level in the whole territory of Armenia.

The Figure 4 presents information on the average daily/yearly sum of direct normal irradiation covering period of 20 recent years (1999-2018).

1.1.2 Agricultural statistics

Before starting the presentation on the greenhouse sub-sector of Armenia, it is important to present also several statistical information about the agricultural sector as a whole and its development potential.

As of July 2021, 68.7% of the total territory of the country or 2,043.5 thousand hectares (ha) are agricultural lands, of which 444.0 thousand ha are arable lands, 37.3 thousand ha - perenial plants, 121.1 thousand ha - hayfield, 1,050.6 thousand ha – pastures and 390.8 thousand ha - other types of land (see Table 4).

Table 4. Land balance of RA, 2020 (thsd. ha)

Lands by significance	Total	of which: irrigation
1. Agricultural	2,043.5	155.4
1.1. arable land	444.0	117.5
1.2. perenial plants	37.3	36.4
1.3. hayfield	121.1	1.5
1.4. pastures	1,050.6	-
1.5. other types of land	390.8	-

Source: Statistical Committee of Armenia, 2021

The main agricultural area of the country is Ararat valley, where two provinces (marzes) of the country are located - Ararat and Armavir marzes. Though they cover a relatively small area of arable land, they contribution to the country’s gross agricultural produce is higher, compared to other marzes (see Table 5.)

² The data is published by the World Bank Group using data from the Global Solar Atlas.

³ See https://sustainable-caucasus.unepgrid.ch/layers/geonode_data:geonode:solar_radiation

Table 5. Land balance of Armenia per province and their share in gross agricultural produce, 2020

Regions	Agricultural land, ha	Arable Land, ha	The share of gross agricultural produce in the country's economy, %
Yerevan	3,330.0	913.2	-
Aragatsotn	217,892.6	53,917.2	9.9
Ararat	156,470.0	24,604.4	15.0
Armavir	97,007.0	40,271.7	21.7
Gegharkunik	345,260.0	81,453.6	11.9
Lori	250,904.4	42,013.6	8.1
Kotayk	155,236.5	37,419.2	8.8
Shirak	210,874.0	78,135.5	10.0
Syunik	306,284.8	43,966.7	6.6
Vayots Dzor	189,556.8	15,787.7	2.6
Tavush	110,695.3	25,516.5	4.3

Source: Statistical Committee of Armenia, 2021

Contributing to roughly 15% of GDP and 40% of employment, the agricultural sector is key for Armenia's economic development. The farm structure in Armenia, like in many other countries in the region, is dominated by a large number of small-scale farms with fragmented land holdings. The average farm size is about 1.48 hectares (ICARE and IFOAM, 2017). According to 2014 census data, the 317,346 family farms contribute to more than 97% of total agricultural output (FAO, 2020).

Table 6. Gross Agricultural Output, at current prices, bln. drams

	2018	2019	2020 ⁴
Agriculture, total including:	892.9	853.3	833.3
<i>plant growing</i>	415.8	410.9	399.5
<i>animal husbandry</i>	477.1	442.4	433.8

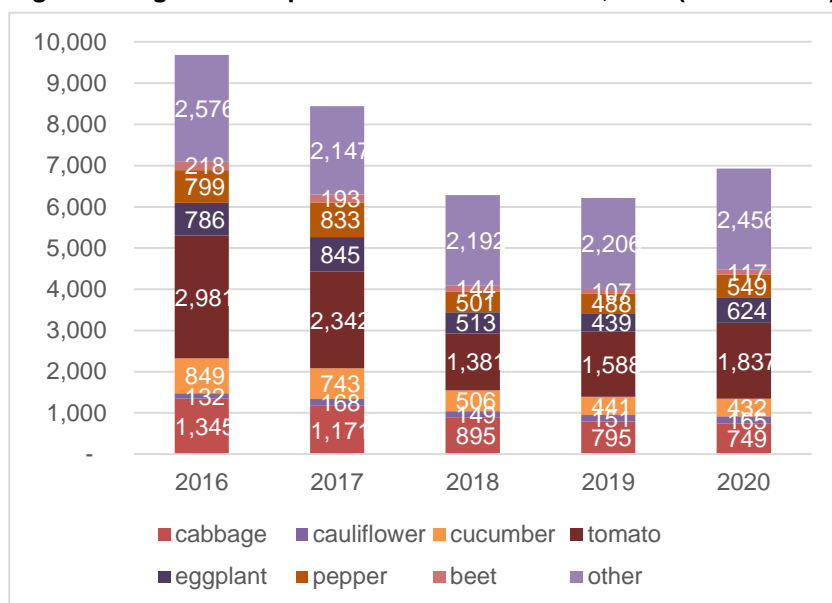
Source: Statistical Committee of Armenia, 2021

The analysis of statistical data shows that the gross agricultural output continues to decline in recent years. The reasons for this decline are different: limited irrigated land, inadequate infrastructure, limited access to finance, a lack of efficient technology, vulnerability to natural hazards, as well as external challenges (epidemic, war, etc.). Lack of innovation, research and development, and efficiency has impacted the sector's growth as well.

In 2017, the Government of Armenia set a goal to increase agricultural productivity by introducing modern technologies, promoting high value-added agriculture, expanding export volumes, and providing favorable conditions to farmers. Later on, in December 2019, the Government adopted National Strategy for Agriculture development (2020-2030), which aims to modernize the agricultural sector to achieve environmental sustainability, food security, and better livelihoods. The final objectives of the Strategy include enhancing farmers' productivity and income and increasing the diversification of agricultural food exports (10% more foreign markets), etc.

⁴ Data for 2021 are not available yet

Figure 5. Vegetable crops harvested in 2016-2020, total (ths. centner)



Source: Statistical Committee of Armenia, 2021

According to the Statistical Committee of Armenia 6,928 thousand centner of vegetable (cabbage, cauliflower, cucumber, tomato, pepper, etc.) was harvested in 2020, of which 932,567 centner was harvested from 957 ha greenhouses.

Tomato production comprises the large portion (about 26.5%) of total vegetable production in Armenia. Tomato production plays a significant role in the agricultural exports of the country as well. This particularly relates to greenhouse production, where almost all harvested products are exported. Cabbage is the second

most harvested vegetable product in the country.

Table 7. Sown area of main vegetable crops and berries fields, gross harvest, average crop capacity and export volume⁵

Crop	2018				2019				2020			
	Harvest areas / plantations, ha	Harvested crop, centner ⁶	Average crop capacity of hectare, centner	Export, thousand tons	Harvest areas / plantations, ha	Harvested crop, centner ⁷	Average crop capacity of hectare, centner	Export, thousand tons	Harvest areas / plantations, ha	Harvested crop, centner ⁸	Average crop capacity of hectare, centner	Export, thousand tons
Cabbage ⁹	2 960	988,092	333.8	2.1	2,850	919,390	322.6	3.1	2,672	886,381	331.9	1.3
Cauliflower	415	140,491	338.5	1.3	427	145,699	341.2	1.8	416	155,929	374.8	2.3
Cucumber	1 751	420,985	240.4	2.7	1,542	374,069	242.6	9.8	1,567	388,497	247.6	7.1
Tomato	4 315	1,336,449	309.7	40.9	4,290	1,566,446	365.1	30.0	4,736	1,791,328	378.6	46.4
Eggplant	1 555	491,474	316.1	0.2	1,464	427,599	292.1	0.8	1,678	597,481	356.5	1.4
Pepper	1 905	495,334	260.0	2.0	1,826	481,587	263.7	0.7	1,972	526,628	267.1	1.1
Berries	1,770	120,718	69.5	6.7	1,861	125,655	69.3	8.2	1,797	145,707	83.1	8.0

Source: Statistical Committee of Armenia, 2021

As it can be seen from these statistics, the average crop capacity of cucumber, tomato, pepper and berries continuously grows, though in some cases harvest areas of these crops declined. It is explained by increase of greenhouse areas as well as capacities of greenhouses (introduction of new technologies, improvement of capacities etc.). It is clear, that the capacity is low in open areas, because of changes in

⁵ Does not include the harvest of crops from both re-and inter-row sowing

⁶ includes harvest of 681,611 centner vegetable crops collected from 926 ha greenhouses and hothouses

⁷ Includes harvest of 744,716 centner vegetable crops collected from 829 ha greenhouses and hothouses

⁸ Includes harvest of 932,567 centner vegetable crops collected from 957 ha greenhouses and hothouses

⁹ Includes harvest of cauliflower

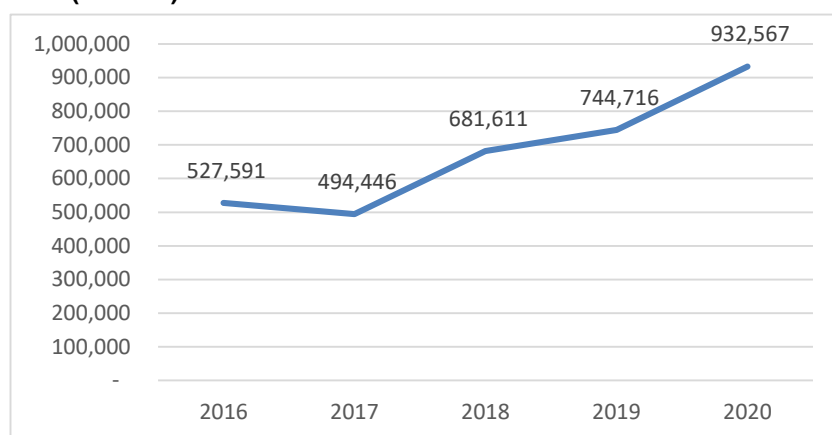
climatic conditions, irrigation issues, problems relating to pest control, etc. In the greenhouses, where everything is controlled, the yield capacity is higher.

This capacity however differs, depending on the type of the greenhouse. According to communication with producers and analysis of different reports, we can say that, for example, average yield of tomato and cucumber in greenhouses varies from 30kg per square meter in soil-based glasshouses to 59 kg in hydroponic type greenhouses with polyethylene cover but equipped with all necessary equipment and technology (except artificial lighting).

This figure is different in the Netherlands. According to the Dutch companies participated in the survey, the tomato yield in the modern glasshouse, with the relevant lighting system, can reach to 100kg per square meter, while yield of cucumber can reach to 200kg per square meter. The harvest of up to 140kg of tomato from one square meter was registered in glasshouses of Russia.

Unfortunately, there is a lack of comprehensive data on production of non-traditional high-value vegetables (kale, broccoli etc.) and species (rucola, basil etc.) in Armenia. However, our analyses have shown that the cultivation of non-traditional vegetables and species have gained a wider popularity and have an increasing tendency.

Figure 6. Vegetable crops harvested in 2016-2020 from greenhouses, total (centner)



Source: Statistical Committee of Armenia, 2021

According to the official statistics, the harvest of vegetables from greenhouses in 2020 increased more than 1.7 times compared to 2016. It is worth to mention, that this statistical information provides data only from 957 ha of greenhouses. While, according to non-official information there is more than 1,000 ha of greenhouses operating in Armenia.

Main export destination of Armenian agricultural products is Russian Federation, with the share of 54% in 2020. The table below

presents main export destinations of several crops and berries that are grown in greenhouses in Armenia. Second export destination for tomatoes and berries is United Arab Emirates. Other possible markets are Georgia, Iran, for cucumbers – European countries, such as Latvia, Lithuania and Poland.

Table 8. Export markets of some crops and berries in 2018-2020, thousand USD.

Crop	2018				2019				2020				
	Russia	UAE	Other	Total	Russia	UAE	Other	Total	Russia	UAE	Iran	Other	Total
Cucumber	1,168.4	-	77.9	1,246.3	7,271.0	-	346.9	7,617.9	4,185.9	-	-	550.4	4,736.2
Tomato	23,161.5	21.5	11.9	23,194.9	22,120.6	10.3	97.66	22,228.6	30,301.0	36.1	15.4	122.6	30,459.7
Pepper	42.8	-	-	42.8	286.1	-	-	286.1	1,060.1	-	-	-	1,060.1
Berries	465.6	8.7	-	474.4	5,353.6	8.1	0.3	5,361.9	9,220.8	12.0	-	-	9,232.8

Source: Statistical Committee of Armenia, State Revenue Committee of Armenia, UN COMTRADE

1.2 METHODOLOGY

The main objective of this sub-sector analysis was **to assess the current status of the greenhouse sub-sector in Armenia and identify the potential opportunities for suppliers of greenhouse building materials, technologies and seeds from The Netherlands.**

1.2.1 Data collection

To meet this objective, the following methods have been applied:

- ▶ Desk research/analysis,
- ▶ Consultations with the greenhouse sub-sector operators and actors involved in construction of greenhouse facilities,
- ▶ Discussions with the representatives of the state bodies and international organisation,
- ▶ Consultations with Dutch suppliers.

One of the important steps of the work was the **desk research**, which included

- ▶ Identification and analysis of relevant statistical data,
- ▶ Reports, literature relating to greenhouse construction,
- ▶ Identification of data relating to operators and constructors of greenhouses, etc.

The next important step of the analysis was consultations with the main players of the sub-sector. This included meetings and face-to-face interviews with:

- ▶ **greenhouse sub-sector operators** - we have conducted meetings with different operators from different regions of Armenia. These were not only organizations operating high-tech greenhouses, but also farmers with small capacities having small greenhouses (less than 1,000 m²) as well as medium operators having greenhouses with a surface area of more than 1,000 m². It is important to mention, that small operators were not considered as a target for this analysis, as they don't use modern technologies in their greenhouses and crops harvested there are used mainly for their families or for bartering with another commodity.
- ▶ representatives of **the Dutch suppliers**, interested in or already having cooperation in Armenia
- ▶ actors involved in **construction of greenhouses and importing of relevant materials and equipment** to understand the main tendencies existing in the sub-sector, main technologies and construction materials used etc.
- ▶ representatives of **public bodies, international partners and other institutions** which provided relevant information on existing support programmes as well as data on greenhouse sub-sector operators.

1.2.2 Data processing and summarization

The following methods were used to process, analyse and summarize the collected information and data:

- ▶ Systematization and classification of the collected information and data,
- ▶ Authentication, verification and triangulation of collected and systematized information and data,
- ▶ Data analysis and preparation of the report.

2 GREENHOUSE PRODUCTION IN ARMENIA: CURRENT SITUATION

2.1 INTRODUCTION OF ADVANTAGES OF GREENHOUSES (TYPES AND SUITABLE PRODUCTS FOR ARMENIA)

A greenhouse is a structure with walls and roof made of transparent material “that protect plants from abrupt changes in climatic conditions, diseases and pests, ensuring high yields” (Ministry of Economy of the Republic of Armenia (RA)). The climate control within these structures allows to ensure plant cultivation the whole year round. Some advantages of greenhouses can be:

- ▶ Increase in crop yield and ensure stable yield,
- ▶ Ensure optimal conditions for plants,
- ▶ Effective pest control,
- ▶ Production of crops all year long, etc.

Greenhouses come in different shapes and sizes. A commonly used typology is distinction between low-tech, mid-tech and high-tech greenhouses. **Low-tech** greenhouses are plastic greenhouses with passive climate control. **Mid-tech** greenhouses usually have plastic structures with limited environmental control. **Hightech** greenhouses mainly have glass structures with a high degree of active environmental control and automation.

In Armenia, there is a wide range of operating greenhouses, starting with the small-scale tunnel plastic models to modern glass greenhouses, where yields are usually higher with a better quality and climate control systems. The analysis has shown that the operating greenhouses in Armenia can be grouped by their structure as follows:

- ▶ *Film plastic (Polyethylene) greenhouses* designed for production of herbs, seedlings, and small volume of vegetables. These are mainly tunnel type greenhouses with protected soil which gives a possibility to prolong the plant growing period (from end of February to mid of November). Construction of such greenhouses does not require large investment costs.
- ▶ *Metal or polymer framed heated greenhouses* covered with glass (these are mainly constructed in Soviet period), rough polymer material (e.g. polycarbonate) or membranous plastic film designed for larger scale. Such greenhouses usually are not equipped with modern technologies (these are usually low-tech to mid-tech greenhouses).
- ▶ *Large plastic or glass greenhouses* mainly installed on galvanized steel frame, equipped with advanced technologies (climate control system, technologies of plant irrigation and nutrition systems, shade control, CO₂ etc.). Majority of large greenhouses constructed in Armenia are high-tech, polyethylene film greenhouses. These are mainly Venlo type greenhouses. These types of greenhouses are used mainly for vegetable and flower production.

Reasons of not using glasshouses in Armenia are different, which mainly relate to costs of construction and operation of such greenhouses. Particularly:

- ▶ glasses are expensive compared to polyethylene film,
- ▶ in winter glasshouses require additional costs for heating,
- ▶ in summer or hot season glasshouses require additional costs for cooling and/or shading,
- ▶ the glasses can be damaged by hail and will require additional costs for renovation.

There is also another reason of avoiding using the glass greenhouses: the average daylight which is comparably higher in Armenia than in other countries.



It is important to mention that the Dutch greenhouses are mainly built from glass. The typical glass that is used for such greenhouses is the horticultural float glass, which is transparent glass with a high light admittance that allows higher penetration of light. The average life of this type of greenhouse is 15 years, compared to the shorter life span of polyethylene covers (in average 4-5 years). In general, according to professionals, 1% of additional light equals to 1% additional production. In this perspective glass has advantage over plastic because of higher sun transition.

Usually, glasses suggested for greenhouse construction are tempered. This makes the glass 4-7 times stronger and resistant to damage from hails compared to the default form of float glass. Also, in case of glass breakage, it shatters into a large amount of small pieces which can prevent human injury and crop damage. However, these types of glasses are expensive.

There are other reasons to select glasshouses:

- ▶ The light transmission of a glass greenhouse is around 15% higher compared to the light transmission of a film greenhouse,
- ▶ The light transmission of a film greenhouse decreases over the years. After 4-5 years it is possible that the light transmission has decreased to 55-65%, which results in decrease of harvesting,
- ▶ A film greenhouse is more vulnerable to snow, wind and earthquakes. Modern technologies allow to engineer the earthquake proof glasshouses, while it is not possible for the film greenhouses,
- ▶ Though the investments for the equipment inside the greenhouse is more or less equal for both types of greenhouses, it is not rational to cover a greenhouse with a polyethylene and replace it every 4-5 years.

As mentioned above, 932,567 centner of vegetable was produced in the greenhouses of Armenia in 2020. According to the Government of the RA, the total area of greenhouses operating in Armenia has increased from about 30 hectares to 1,300 hectares from 2011 to 2019. According to estimations of specialists, currently there are around 1,000 ha greenhouses operating in Armenia, of which around 250 ha are high-tech greenhouses. This number has a tendency to grow, as there is a state support programme as well as high interest within the country. Moreover, it is expected that around 35 ha high-tech greenhouses will start operating in 2022. In addition, 24 contracts to start construction of greenhouses in the framework of state support programme were concluded in 2021.

There are tendencies of certain changes in the greenhouse sector in Armenia. Particularly, according to specialists, there is a consolidation tendency in the sector. Due to the high operation costs and fluctuations of crop prices in the local market, some small, low-tech greenhouses stop operating or convert into, at least, mid-tech greenhouses, as it allows to increase yield level, sell products into foreign markets thus increasing their income.

Main crops produced in the greenhouses in Armenia are:

- ▶ **Vegetable products:** tomato, cucumber, bell pepper, beans. Production of beans is mainly done in small low-tech greenhouses. Tomato is grown in all kind of greenhouses, including high-tech greenhouses. Cucumber is mainly produced in mid-tech greenhouses or glasshouses constructed in the Soviet period. Production of bell pepper on an industrial scale is a new tendency in Armenia. There is an interest from large greenhouses in this product and it is one of upcoming opportunities for Dutch organisations and promising direction for future.
- ▶ **Flowers:** rose, gerbera, dianthus and alstroemeria. Some of the large high-tech greenhouses are specialized in production and export of roses.

- ▶ **Berries:** strawberry has a high demand in foreign market and there is a tendency to increase greenhouses that produce this crop.
- ▶ **Seedlings and greens:** production of these crops is mainly concentrated in the small (low- and mid-tech) greenhouses.

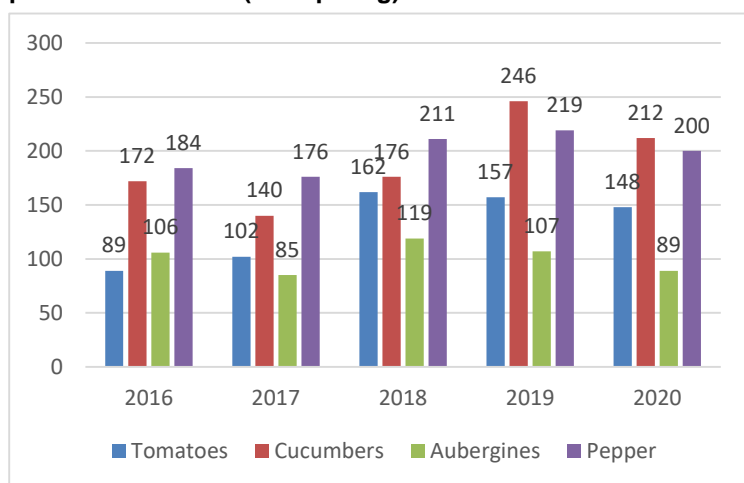
Depending on the capacity of the greenhouse, markets of grown products are different. High-tech large greenhouses completely export their products. Export markets are different, depending on the type of the product. However, majority of operators export their products to the Russian market. For example, according to producers, there is a high demand of tomato in the Russian market whole year long. Though there is some competition with products from Turkey or other countries, because of a big demand these competition does not have a big influence on them.

The same can be said about berries and flowers. The main market of these products is the Russian market. However, flowers, particularly roses are exported to other countries as well, including the Netherlands. As to berries, as it was presented by the “Klubnichnaya Polyana”, there was some experience of exporting to the countries of Middle East, but there were some difficulties because of requirements of the market and consumer preferences. For this reason, the Russian market continues to be in the leading position.

One of the important reasons to select the Russian market is logistics. There are direct flights to Moscow almost every day and boarding costs are comparably cheaper. Moreover, it is beneficial to export flowers and berries to this market.

For tomatoes or cucumbers, the logistics plays important role as well. Although there is not a common border with Russia, the track transportation is done through Georgia, it takes at most one week to transport these crops to logistical centers in Russia and it is cheaper compared to transportation by plane. Life cycle of tomatoes and cucumbers is comparably longer and it is possible to store these products for a long time (up to one month), if required conditions are met.

Figure 7. Average annual sale prices of some agricultural products in the RA (AMD per kg)



Source: Statistical Committee of Armenia, 2021

The prices of vegetables produced in greenhouses and sold in the local market are greatly influenced by the products of small farms sold on the domestic market, the cost of which is relatively high. The annual average prices of some vegetables are provided in the Figure 7.

Prices of these agricultural products start growing in October and reach their peak in January. The lowest prices are usually in the summer and the beginning of September, when harvest of open field vegetables starts.

In recent years, the cultivation of tomatoes in the open field has become unprofitable due to pests, as the means of control have become ineffective. Tomatoes grown in the open field are also non-transportable and cannot be exported.

Table 9. National food balances by selected products

Product	Indicator	2018	2019	2020
Cucumber	Production, ths. tons	50.6	44.1	43.2
	Export, ths tons	2.7	9.8	7.1
	Consumption per capita, kg / year	18.8	14.5	13.5
Tomato	Production, ths. tons	138.1	158.8	183.7
	Export, ths tons	40.9	30	46.4
	Consumption per capita, kg / year	52.8	50.3	51.6
Pepper	Production, ths. tons	50.1	48.8	54.9
	Export, ths tons	2	0.7	1.1
	Consumption per capita, kg / year	16.1	15.5	16.4

Though this data shows total production of selected crops (in open air and greenhouses), it is clear from the data that export of tomatoes continuously grows. Moreover, there is a growth tendency in the production of export-oriented tomatoes grown in greenhouses. Despite the fact that the statistical data per product for 2021 is not published yet, the available data shows that export of vegetable products increased around 37% compared to 2020, which gives a basis to assume, that export of the mentioned products also increased.

According to the Government of Armenia, “local experience shows that in greenhouses using traditional technologies, the yield per 1 m² varies between 8-20 kg, depending on the crop, and in the greenhouses using modern technologies the yield of crops reaches 40-60 kg”.

Summary

- ▶ Greenhouses in Armenia can be grouped by their structure as film plastic (Polyethylene) greenhouses, metal or polymer framed heated greenhouses and large plastic or glass greenhouses;
- ▶ In general, plastic greenhouses prevail in Armenia. There are several reasons of not choosing glasshouses, the main of them being price: glasshouses are expensive to construct and their operational costs are higher (according to operators);
- ▶ Main crops produced in greenhouses of Armenia are tomato, cucumber, bell pepper, flowers, berries and beans. High-tech greenhouses are mainly specialized in production of tomatoes, berries, cucumbers and flowers (roses).
- ▶ The main export market of greenhouse production is Russian Federation. There is a high demand for tomatoes and strawberries in this market, logistical costs are not higher and consumers don't have special preferences. Export of tomatoes has a tendency to grow.

2.2 MAIN PLAYERS (CONSTRUCTORS AND OPERATORS)

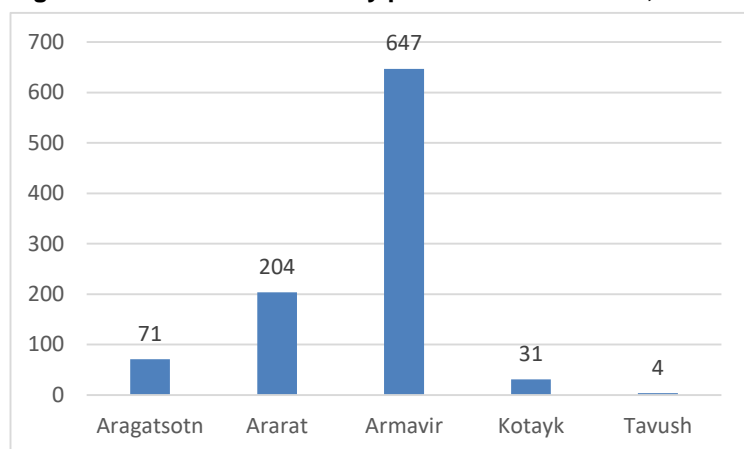
2.2.1 Greenhouse operators

As it was mentioned above, there is more than 1000ha of greenhouses operating in Armenia. Distribution of these greenhouses per province is different. According to the Statistical Committee of Armenia, most of the greenhouses producing vegetables are located in Armavir (647 ha), Ararat (204ha) and Aragatsotn (71 ha) provinces. Unfortunately, we cannot say that this is a comprehensive data, because of the sampling method used by the Statistical Committee as well as because of high grow tendency of the sector.

Our analysis has showed that the majority of greenhouses operating in Ararat and Armavir provinces are low- and mid-tech soil-based greenhouses. The only high-tech greenhouse with film cover is the greenhouse of Spayka LLC, operating in Ararat province. Main high-tech greenhouses are located in Kotayk and Aragatsotn provinces. The main reason of this distribution is climatic conditions which will be

discussed later. Several high-tech greenhouses are also located in Shirak and Tavush provinces.

Figure 8. Greenhouse areas by provinces of Armenia, ha



Source: Statistical Committee of Armenia, 2021

Annex 1 of the report provides the list of more than 600 greenhouses operating in different provinces of Armenia. This data was received from relevant regional administrations and partner organisations. Again, this is not the comprehensive list of greenhouses, although it lists all high-tech greenhouses currently operating in Armenia. Our research also identified data of high-tech greenhouses which are currently under construction or are

planned for 2022 and 2023 (see Table 8.) These figures do not include the projects that are under negotiations.

Table 10. Data on operating and planned high-tech greenhouses as of January 2022

Crops grown in greenhouses	Total area of operating greenhouses (ha)	Will start operation during 2022 (ha)	Will be established and launch operation during 2023 (ha)
Vegetables (Tomato, Pepper, Cucumber, Eggplant)	170	20	20
Rose	60	10	10
Strawberry	25	5	5

Source: Consultant researches, 2021

Main high-tech greenhouses operating in Armenia are as follows:

Table 11. List of main high-tech greenhouses operating in Armenia

Province	Organisation
Aragatsotn	▶ Avalanzh LLC
Ararat	▶ Spayka LLC
Kotayk	▶ Ecotomato LLC
	▶ Armyanski Urzhay LLC
	▶ K&G Group LLC
	▶ Rockberry LLC
	▶ Klubnichnaya Polyana LLC
	▶ Green Farmer LLC
	▶ Ecoland LLC
	▶ Agrobusiness LLC
	▶ Greenfood LLC
Shirak	▶ Greenhouse LLC
Tavush	▶ Ecofruit LLC



Spayka LLC and Greenhouse LLC (<https://www.spayka.am/>)

“Spayka” is one of the leading agricultural holdings in Armenia. It started greenhouse operations in 2014 to secure its supply of vegetables. According to our research, Spayka operates 70ha greenhouses. These greenhouses are located in Ararat province. Spayka also operates greenhouses under the name Greenhouse LLC on 50ha area. These greenhouses are located in Ararat province as well, near to Artashat city. The main crops produced in both greenhouses are mainly cucumber, tomato, pepper, radish. The greenhouse is built by the French company Richel Group, one of the leaders in the production of high-tech film greenhouses in Armenia. Greenhouses of Spayka are certified with Global G.A.P.



Greenfood LLC (<https://greenfood.am/>)

Greenfood LLC is a 9 ha greenhouse complex located in Artik town of Shirak province. The main produced crop is strawberry. The greenhouse is constructed by the French Richel company, but the technology used in the greenhouse is Dutch origin. It is a semi-closed greenhouse with film cover. A new 4ha greenhouse is planned to be constructed in 2023, where bell pepper will be grown.



Green Farmer LLC (<https://greenfarmer.am/>)

With 18.8ha total area Green Farmer’s greenhouse is located in Kotayk marz and produces tomato. It is a high-tech greenhouse constructed by the Italian Lucchini company and is fully equipped with Dutch technologies. The greenhouse complex works with hydroponic system with film cover. According to the company representatives the yield per square meter is 58-59kg in summer and 53-55kg in winter. The greenhouse is certified with Global G.A.P.



Rock Berry LLC (<https://rockberry.am/>)

The greenhouse is located in Kotayk province and occupies 8ha area, additional 3ha is under construction. Main types of crops produced in the greenhouse are strawberry, blackberry and other types of berries. The company is certified with Global G.A.P. The constructor of the greenhouse was French Richel company, which also provided the greenhouse with Dutch equipment. The planting material and seedlings are from the Netherlands as well.

Ecofruit LLC and Greenhouse LLC

Both greenhouses are located in Tavush province and are specialized in production of flowers (roses). The greenhouses were constructed in 2017 and started operation in 2019. In total, both greenhouses cover 9ha territory, of which 5.5ha are Ecofruit’s greenhouses and 3.5ha – Greenhouse LLC. Moreover, 4ha of these greenhouses are glasshouses of Dutch origin (glasshouse of 1st generation). Main export market is Russia.

Avalanzh LLC

The greenhouse operates in Aragatsotn province of Armenia and occupies 4.2ha area. It is specialized in production of roses. According to the available information, 3ha of the greenhouse is operating according to the Ultra-clima concept.



Klubnichnaya Polyana LLC (<https://sweetberry.am/>)

The organization started its operation in 2015 and currently occupies 3ha area. The greenhouse is located in Kotayk region and produces strawberry with the annual yield of 300 tons. The construction was done by the French Richel Group company, which together with French technology, used other European equipment as well, including Dutch origin equipment. Seedling used in the greenhouse are of Dutch origin.



K&G Group LLC (<https://ecoberry.am/>)

The company was established in 2015 and operates a 3ha greenhouse in Kotayk province. The main crop produced in the greenhouse is strawberry. The supplier of greenhouse structures was the French company Richel.



Ecoland LLC (<https://www.ecoland.am/>)

The greenhouse complex of 20 ha is situated in Kotayk province. The company is specialized in production of tomato and cucumber. The greenhouse is equipped with modern technologies mainly imported from the Netherlands.

2.2.2 Greenhouse constructors and/or service providers

There are not many greenhouses construction companies in Armenia. Though Annex 2 of the report provides a non-comprehensive list of these constructors; however, these are the main players in the sub-sector. Moreover, there are companies that are specialized in construction of low-tech greenhouses (such as Jermater LLC), while others (for example Agrotrend, Eco Jermoc or Alpha progress) are specialised in construction of mid and high-tech greenhouses. There are also greenhouse construction supervising companies (such as Greenhouse engineering) as well as service providers and companies that sell equipment or other type of materials (Agrotech LLC).

Usually, these companies are involved in constructing and equipping greenhouses in Armenia, even if the design is done abroad. Several companies cooperate with Dutch producers. For example, as it was mentioned by Agrotech¹⁰ LLC, 80% of their products are from the Netherlands (substrates, crop protection or pollination insects etc.).

Several other companies cooperate not only with Dutch organisations, but with Iranian, Israeli or Chinese companies, presenting their products and equipment.



Agrotech LLC (<https://agrotech.am/>)

Agrotech LLC is founded in 2014 and provides high quality products for plant cultivation, as well as agronomic consultation to greenhouse producers, farmers and other people involved in horticulture. Agrotech LLC presents the products of the leading manufacturers from Europe and from the world to Armenia. The company is the leading supplier of the crop market and covers 95% of the market of the water-soluble fertilizers. Besides the fertilizers, Agrotech LLC offers Protection Means, Pollinating Bumblebees, Disinfectants, Seeds, Seedlings and Plants, Organic and Mineral Substrates, Shading Coatings, Membranes (Anti-hail,

¹⁰ <https://agrotech.am/>

Shading), Measuring Devices, Greenhouse Accessories and other products necessary for the production of the horticultural products.



Greenhouse Engineering (<https://www.ghe.am/>)

Greenhouse engineering LLC is operating since 2015. It provides engineering services for industrial greenhouse facilities. The company cooperates with world famous partners, such as Richel Group, Dalsem, Agrotech-Didam BV, Priva, Zantingh, etc. The main services provided by the company include:

- Supervision of the construction of structures
- Supervision of the assembly of all required internal equipment systems: heating and CO₂, irrigation, automatic systems, electrical installations, shading, supplementary lighting, hanging gutters
- Adaptation of drawings and construction documents of foreign companies, taking into account local characteristics of a particular project
- Maintenance after the establishment of the greenhouse complex.



Agrotrend CJSC

The company was founded in 2019 and company provides services in the agricultural sector, including the greenhouses sub-sector, as well as imports high-quality products from France, the Netherlands, Germany, Italy, Russia and advanced technologies from more than 17 world-famous manufacturers (Klasmann, Bayer (Germany), Plastic-Puglia (Italy), TECA (Spain), etc.) It is the official representative of a number of brands in Armenia (Puccinoni (Italy), Rijk Zwaan (The Netherlands), Plastika Kritis (Greece), etc.) The company is also involved in construction and design of greenhouses.

2.3 GREENHOUSE TYPES EXISTING IN ARMENIA AND APPLIED TECHNOLOGIES

Greenhouses can be classified according to their operation, design, seasonality, technology for growing crops, type of translucent or coating etc.

According to the seasonality feature, there are two types of greenhouses operating in Armenia: heated (winter) and unheated (early spring and late autumn). Majority of small low-tech greenhouses are unheated greenhouses. Depending on the heating method, there are greenhouses heated by water pipes or air heating. Different types of air heaters and thermogenerators are used in air systems (which use steam, boiled water, gas, electricity).

In general, two types of greenhouses are constructed in Armenia: tunnel (single-flight) and modular (multi-flight) greenhouses. These greenhouses are either soil based or hydroponic greenhouses. Hi-tech or mid-tech (some of them) greenhouses are hydroponic greenhouses, as it ensures high profitability. Small greenhouses are mainly soil based greenhouses, but gradually switch to hydroponics, especially if strawberries are to be grown. Aquaponics is a new approach for Armenia: they are still being built through small grant programs. Aeroponics is not used yet.

As to the cover of the greenhouses, three types are used: polyethylene, polycarbonate and glass. Polyethylene films existing in the Armenian market are produced in different countries, such as Russia, Israel, Greece, China and Iran. Prices of polyethylene films vary from \$0.4 to 1\$. As to polycarbonates, it is possible to find Chinese, Russian, Italian and Swiss polycarbonates in the Armenian market. The latter are superior to other polycarbonates in their physical and other properties. The price of 1 m² of quality polycarbonate is higher than the price of ordinary glass. However, the average price of 1 m² polycarbonate is 6,000 AMD.

Greenhouses with polyethylene film are mainly built in one-layer or two-layer. In the latter case, air is inflated between two layers, which provides additional insulation and improve structure's ability to retain temperatures through cold nights. The greenhouses of the Armavir region were mainly built with ordinary stretch polyethylene film.

Many Armenian specialists recommend to use double layer polyethylene inflation kits in the greenhouses, because of the following reasons:

- ▶ Thermal insulation - the space between the two layers is filled with air using a simple air pump. Filling the space with air creates a pocket of insulation. This pocket of air acts as a barrier between the warmer air within the greenhouse and the cooler air outdoors. During the heating season this approach reduces the heating costs of greenhouses,
- ▶ Price - price of polyethylene inflation kits is cheaper than for polycarbonate and glass. Though the lifespan of this cover is shorter, the greenhouse operators prefer to change it every 4-5 years than to spend huge investments during the construction of greenhouses. According to estimations, around 20-25% more investments are needed for construction of glasshouses compared to greenhouses with polyethylene cover,
- ▶ Transportability - polyethylene is comparably ease and cheap to transport,
- ▶ Repairing - it is easy and cheap to repair,
- ▶ Translucency - according to specialists there are 2-3 time more sunlight in Armenia than in other countries and polyethylene plastic greenhouse film translucency diffuses light well compared to glasses. In the case of glasshouses, operators will need to invest in shadow systems as well, which increases the construction costs of greenhouses,
- ▶ Some specialists think that because Armenia is in the seismic zone, it is safe to have greenhouses with polyethylene cover.

Many modern greenhouses maintain temperature, lighting, humidity and CO₂ in accordance with the specific needs for a specific crop using automatic systems (mainly Priva). Heating is the critical element of greenhouse. Usually, greenhouse heating in Armenia is performed through gas fired boiler. However, this type of heating becomes expensive because of changes in gas prices. Because of this, the Armenian greenhouse operators are looking for a cost-effective approaches and techniques.

Due to fluctuations in weather conditions as well as because of hot climate in summer, many greenhouses use cooling systems. Some of the techniques for cooling during high temperature is fogging or shade cloth, which is used to cover the top of the greenhouse. In summer, greenhouses in Armenia use also special shading agents that reflect high levels of solar energy.

Though number of sunny days, and as a result, solar capacity potential in Armenia is higher, solar panels are not widely used by greenhouse operators. The reason of this is the size of area which is needed for construction of relevant solar photovoltaic systems. Details about greenhouse irrigation, electrification, heating and cooling systems suggested to Armenian greenhouse operators and their costs can be found in Annex 6.3 (Examples of Costs Calculations for Greenhouse Construction).

Summary

- ▶ According to the seasonality feature, two types of greenhouses are operating in Armenia: heated (winter) and unheated (early spring and late autumn). Majority of small low-tech greenhouses are unheated greenhouses.
- ▶ In general, tunnel (single flight) and modular (multi-flight) greenhouses are constructed in Armenia. Tunnel greenhouses are small and low-tech greenhouses constructed by small farmers for their family use. Mid-tech and high-tech greenhouses are mainly multi-flight greenhouses.
- ▶ Soil cover (with enriched soil) and hydroponic greenhouses are main type of greenhouses constructed in Armenia. Aquaponics is a new approach for Armenia. Majority of greenhouses use polyethylene films, though there are glasshouses and greenhouses with polycarbonate covers.
- ▶ Greenhouse operators prefer polyethylene films as it is cheaper to install and update.

- ▶ Heating is critical element of a greenhouse. Greenhouse heating in Armenia is performed mainly through gas fired boiler, which however becomes expensive due to gas price fluctuations. There is a need to identify alternative heating techniques to reduce operating costs of greenhouses, particularly in winter.

2.4 SWOT ANALYSIS OF GREENHOUSE SECTOR IN ARMENIA

S	<ul style="list-style-type: none"> • More than 300 sunny days in a year • Solar radiation intensity • Average daylight is 2-3 times more than in The Netherlands • Available agricultural land • Fast-growing sub-sector
W	<ul style="list-style-type: none"> • High operational costs (high heating cost) • Difficulties of accessing cheap financial resources • Absence of relevant infrastructure (testing laboratories, research capacities) • Lack of relevant specialists • Not diversified export markets (concentrated mainly to Russian market)
O	<ul style="list-style-type: none"> • Government support • Favourable business conditions (tax exemption, VAT exemption in case of import of equipment etc.) • High export potential to the Eurasian Economic Union and Middle East markets
T	<ul style="list-style-type: none"> • Long transportation time for export • High transportation costs in case of export (especially air cargo) • Possible border barriers (war, closed borders etc.) • Fluctuation of prices of agricultural products in foregin markets • High level of labour migration

2.5 PROBLEMS OF THE APPLIED TECHNOLOGIES



The heating system used in the Green Farmer LLC

No serious problems relating to the applied technologies were encountered during the operations of greenhouses in Armenia. As mainly high-quality technologies are used in high-tech greenhouses, no major problems were identified with the main operation systems (heating, cooling, fogging etc.) and they don't need to be changed. The polyethylene films are mainly changed every 4-5 years. Sometimes there is a need for changes in the irrigation network and the substrates used in the greenhouses.

3 LEGISLATION AND SUPPORT PROGRAMMES

3.1 LEGISLATION

3.1.1 Tax legislation

According to Armenian legislation legal entities or sole proprietors involved in primary agricultural production are exempted from the value added tax (VAT) if their annual turnover is less than 115mln Armenian dram. These business operators are also exempted from the profit tax until the end of 2024. The table below shows the tax payment rates for greenhouses per type of business operator.

Table 12. Tax payment rates for greenhouses per type of business operator

Action	Legal entity	Sole proprietor
Sale of primary agricultural product in the territory of Armenia (VAT)	N/A	N/A
Export of primary agricultural product (VAT)	N/A	N/A
Profit tax	Is exempted until 31 December 2024	Is exempted until 31 December 2024
Income tax to employees	21% for the year 2022	21% for the year 2022
Social security payments for employees ¹¹	4,5% for the year 2022, if the monthly salary is less than 500,000 AMD or At the difference of 10% and 27,500 AMD if the monthly salary is more than 500,000 AMD	4,5% for the year 2022, if the monthly salary is less than 500,000 AMD or At the difference of 10% and 27,500 AMD if the monthly salary is more than 500,000 AMD
Social security payment for entrepreneurial activities		4,5% for the year 2022, if the monthly salary is less than 500,000 AMD or At the difference of 10% and 27,500 AMD if the monthly salary is more than 500,000 AMD

According to the “Tax Code” of Armenia, sale of equipment and their parts classified under HS codes 8432, 8433, 8434, 8436, 8701, of fertilizers of HS codes 31, of pesticides of HS codes 3808 91, 3808 92, 3808 93, 3808 94, 3808 99, products of HS codes 0106 41 000, 106 49 000, 5305 00 000 0, 9406 00 310 0, as well as seeds and seedlings of agricultural crops and perennial plantations are exempted from VAT.

3.1.2 Licenses

To carry out the construction of a greenhouse, it is necessary to obtain an appropriate license. The license is not required if the total area of the greenhouse does not exceed 1000 square meters. Thus, if the total area of the greenhouse exceeds 1000 square meters, it is necessary to obtain a relevant license for a business operator which is considered to be a constructor or sign a contract with a construction company that already has such kind of license.

3.1.3 Import

There are no serious issues identified during the import of greenhouse related equipment or material from the European countries. Some technical difficulties are present in import from Iran, as in this case control prices are applied by the customs authorities of Armenia. Moreover, according to the decree of the Government of the RA No. 1118-N of 2015, exemption from customs duties applies to technological equipment, its components, raw materials (including those purchased under leasing) imported under the

¹¹ Social security payments are paid for employees born after 1 January 1974

investment program in the priority sectors (agriculture is also considered as a priority sector), if 80% of the final product will be exported.

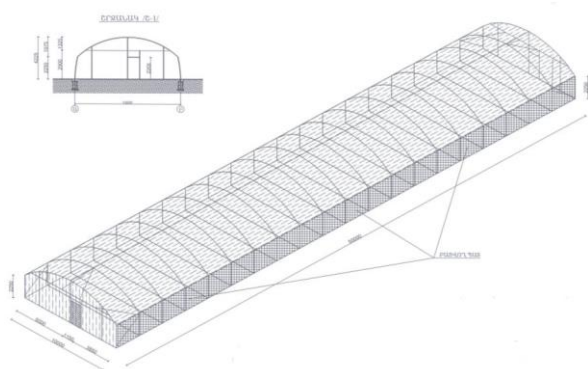
3.2 SUPPORT PROGRAMMES

3.2.1 Program on state assistance for introduction of small and medium-sized greenhouses

One of the key directions of the state policy in the agricultural sector is the creation of conditions for the most effective use of the existing resources. Having in mind the natural and economic conditions of the country and potential of the agricultural sector, the Government of Armenia adopted a “Program on state assistance for introduction of small and medium-sized greenhouses” in 2019. The goal of the program is to promote construction of small and medium-sized greenhouses with modern technologies and criteria, raise the level of competitiveness of the produced products, and contribute to increase of income of business entities operating in agriculture.

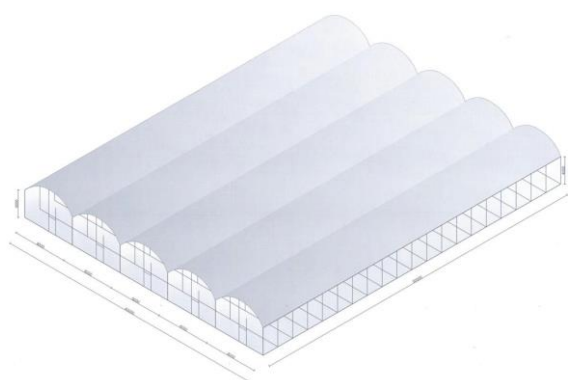
Particularly, the program promotes construction of **tunnel greenhouses of 300-600 sq.m area** and **greenhouses of 800-3,000 sq.m with a single- or multi-flight polyethylene film** with enriched soil mass or hydroponic cultivation methods. The programme also provides criteria for these greenhouses.

The programme offers the following three compensation options:



✓ *Option 1 - a tunnel greenhouse of 300-600 sq.m with enriched soil mass:* the cost of construction and technology provision is calculated around 11,850 AMD per square meter and the government is ready to provide the costs compensation at 4,000 AMD per square meter, and at 6,000 AMD per square meter to citizens who became disabled as a result of realizing military duty or military operations during military service, business entities operating in the settlements of border communities receiving social assistance, agricultural cooperatives, young people

(18-35 years old), higher and secondary vocational educational institutions and agricultural scientific-production organizations.



✓ *Option 2 - a greenhouse of 800-3,000 sq.m with a single- or multi-flight polyethylene film and enriched soil mass:* costs for construction and technology provision are estimated at 24,550 AMD per square meter. The government is ready to provide costs compensation at 8,000 AMD per square meter, whereas for those who have privileges as defined by Option 1 the compensation is provided at 12,000 AMD per square meter.

✓ *Option 3 - a greenhouse of 800-3,000 sq.m with a single- or multi-flight polyethylene film by hydroponic cultivation method:* costs for its construction and technology provision are estimated at 30,000 AMD per square meter, costs compensation is 10,000 AMD per square meter, whereas for those who have privileges as defined by Option 1 the compensation is 15,000 AMD per square meter.

The program is developed for years 2020-2022 and according to the Ministry of Economy, it will be suspended soon.

3.2.2 Program on state assistance of leasing for financial lending of agri-food equipment in the Republic of Armenia

The main goal of the program is to provide business entities operating in the agri-food industry with the necessary machinery by using mechanisms of financial lending (leasing) of equipment. In the framework of the programme, the business entities operating in agri-food industry are allowed to get equipment for their production, including greenhouses. The total cost of equipment purchased within the framework of this program should not exceed 1,000.0 million AMD.

The terms of leasing are as follows:

- ▶ the leasing contract is signed up to five years
- ▶ the leasing is provided in Armenian dram at an annual interest rate of up to 12 percent per annum, of which up to 10 percentage points are subsidized or in foreign currency with an annual interest rate of up to 9% per annum, of which up to 6 percentage points are subsidized
- ▶ the lessee pays an advance payment of 20% of the value of the leased item
- ▶ the cost of the subject of leasing includes the purchase price of the subject of leasing, the costs associated with the importation of the subject of leasing into the Republic of Armenia.

3.2.3 Program on subsidizing the interest rates on loans provided to the agricultural sector

The businesses interested in construction of greenhouses or modernizing their technologies can benefit from another state support programme: **Program on subsidizing the interest rates on loans provided to the agricultural sector**. The main aim of the program is to contribute to the improvement of economic capacity of business entities, introduction of modern technologies, and increase of agricultural efficiency by improving the loan conditions and partially subsidizing the interest rates on loans provided to individuals and legal entities engaged in the agri-food sector of Armenia.

In the framework of the programme business entities are provided with subsidized loans in the amount of 3-15 million drams with an annual interest rate of 0% (for entities operating in bordering areas), 3% (for agricultural cooperatives) or 5% (for other entities) for up to 3 years. Target areas of the loan include:

- ▶ acquisition of seeds and seedlings,
- ▶ acquisition of agricultural land,
- ▶ acquisition of working assets and services necessary for the cultivation of land and crops, carrying out agrotechnical activities, etc.

Besides the state support programmes, donor and international organisations, such as USAID, UNDP, ADA, provide grants and supporting programmes to small farmers and households in construction of greenhouses. However, these are small social programmes, that offer construction of small or medium greenhouses to rural population, supporting them to cover daily needs, especially during the cold season.

4 DUTCH TECHNOLOGY AND APPROACH

4.1 ADVANTAGES OF DUTCH TECHNOLOGY

Horticulture, particularly the cultivation of plants in high tech greenhouses, has been developing rapidly in Armenia over the last 8 years. Taking into account the fact that agriculture is best developed in the Netherlands, Armenia, as well, takes the Netherlands as an example of development, bringing the experience and skills to the local market of greenhouses.

Today, most of the technology, plants, pest management means (mechanical, biological, and chemical) and different types of cultivation accessories used in local greenhouses are imported from the Netherlands. There is also a high demand for the introduction and usage of new Dutch technologies in Armenia for both indoors and outdoors cultivation, which can play an important role in the development of the agricultural sector in the country.

Due to high level of research knowledge existing in the Netherlands, the Dutch greenhouse technology sets the global standard for commercial horticulture for decades. Thanks to the Dutch technologies, today it is possible to grow tomatoes or other crops not only in favourable climatic conditions, but also in cold areas. These technologies give a possibility to fully control the climate inside the greenhouse and reach the highest results in term of quality and quantity of harvested crops. Premium technology, proficient education and coaching are key to meet the current demands of greenhouse industry – all these are available in the Netherlands. Moreover, the country is ready and able to share its experience and knowledge around the world.

Armenian farmers and operators of greenhouses are very well familiar with Dutch technologies and the opportunities it provides. Majority of high-tech greenhouses try to use these technologies. Moreover, greenhouse operators regularly invite experts from the Netherlands to train their specialists or to support in improvement of their production capacities. However, as it was mentioned by majority of operators, the costs of these services and technologies are high.

4.2 DUTCH SUPPLIERS AND COMPETITION

Dutch technology and suppliers are well known in Armenia, as companies, involved in construction of greenhouses, particularly high-tech greenhouses, very often recommend Dutch technologies, equipment and materials, chemicals and fertilizers as well as laboratory services. However, when we speak with medium and small greenhouses, which are not equipped with high-tech and innovative tools, they have a lack of such information. Dutch companies don't have offices in Armenia and either work through Russia based branches or directly with Armenian buyers. Working with branches existing in Russia is not an optimal solution because of two reasons: 1) these branches don't conduct active marketing in Armenia, b) products suggested by them are expensive, as the price includes their profit margin as well. Because of this, today the preferred option of working with Dutch suppliers is direct contacts.

During discussions and interviews with local operators and construction companies, the following list of Dutch suppliers was identified:

Construction of greenhouses

- ▶ Agrotech-Didam BV (<https://agrotech.net/>)
- ▶ Certhon (<https://certhon.com/>)
- ▶ Dalsem Complete Greenhouse Projects (<https://www.dalsem.com/en>)

Equipment/materials

- ▶ Lumiforte Holding BV (<https://www.lumiforte.com/>)
- ▶ Bato Plastics B.V. (<https://www.bato.nl/en/>)
- ▶ FruitSecurity Holland BV (<https://www.fruitsecurityholland.com/en>)
- ▶ Priva BV (<https://www.priva.com/>)
- ▶ Hortilife B.V. (<https://www.hortilife.com/>)

Chemicals

- ▶ Ceradis.B.V. (<https://ceradis.com/>)
- ▶ Simonis B.V. (<https://www.simonisbv.nl/>)
- ▶ Certis Europe (<https://www.certiseurope.com/>)
- ▶ Woodchem B.V. (<https://woodchem.nl/>)
- ▶ Luxan B.V. (<https://www.luxan.nl/>)
- ▶ Pherobank B.V. (<https://www.pherobank.com/>)

Fertilizers/substrats

- ▶ Van Iperen International B.V. (<https://www.vaniperen.com/>)
- ▶ BVB Substrates (<https://www.bvb-substrates.nl/>)
- ▶ Grodan B.V. (<https://www.grodan.com/>)

Seeds/plants

- ▶ Flevoplant B.V. (<https://www.flevoplant.nl/>)
- ▶ Thwan van Gennip BV (<http://www.thwanvangennip.nl/>)
- ▶ Van den Elzen Plantenkwekrij Erp BV (<https://www.vandanelzenplants.com/>)
- ▶ Vissers aardbeiplanten BV (<https://vissers.com/en>)
- ▶ Enza Zaden (<https://www.enzazaden.com/>)
- ▶ Rijk Zwaan (<https://www.rijkzwaan.com/>)

Tests/analysis

- ▶ Nova Crop Control (<https://www.novacropcontrol.nl/en>)
- ▶ Eurofins Agro (<https://www.eurofins.com/agro/>)

However, beside with Dutch technologies and materials, other suppliers are also available and provide services in Armenia.



Richel Group (France) is one of famous and well operating greenhouse design and construction company in Armenia. In general, they design the main high-tech greenhouses in the country (80% of high-tech greenhouses constructed in Armenia). The services of the group include not only developing the main design of the greenhouse, but also supplying all necessary equipment and materials. Being a France based company, Richel provides greenhouse structures originated in France and suggests construction of “hybrid” type of greenhouses, where equipment and materials of various origins (Dutch, Italian, Spanish, etc) are used. Only European origin technologies and equipment are used in their constructed greenhouses. The selection of recommended materials is based on financial capacity of the operator. It is worth to mention also that Richel has a branch office in Armenia, however it delegates constructional activities to local (Armenian) construction companies.



Europrogress S.r.l. (Italy) is another greenhouse design/production company, which sells its services in Armenia. Unlike the Richel group, this company is involved in construction of medium-sized greenhouses (around 3000m²) and cooperates mainly with local design/construction companies. This company also

suggests “hybrid” type of greenhouses using equipment and other materials produced in different countries, including the Netherlands.

Fertilizers, substrates or chemicals are imported from other countries as well (Israel, Russia, Turkey). As to the polyethylene films, which are widely used in Armenian greenhouses, these are mainly imported from Israel, Iran, China, Russia. Small greenhouses prefer to work with Chinese and Iranian concepts, which are cheaper. The Dutch concepts cannot work for greenhouses, even if they are high-tech, less than 3000m², as it will be difficult to compete with China and Iran. Moreover, according to interviews, Iran wins competition with China, as the quality of Iranian construction materials is higher.

There are also greenhouses constructed by the design and concept of Israel. It is worth to mention that majority of equipment and greenhouse materials suggested by Israel are produced in China. These materials are of low quality and don't withstand Armenian weather conditions (despite the fact that their quality is controlled by Israeli specialists). Regardless, only very small farmers with the greenhouse areas less than 500m² prefer this technology.

Comparing these technologies and equipment with what is suggested by the Dutch companies, it is worth to quote one of greenhouse operators: *“The Dutch technology is advanced and it would be desirable to have a fully equipped greenhouse with Dutch technologies. However, it is expensive and hence, we need to find alternatives, even if these technologies are not so advanced.”*

Summary

- ▶ Dutch technology is well known in Armenia, particularly in high-tech greenhouses.
- ▶ Nonetheless, Dutch companies don't have offices in Armenia. Some of them have branches in Russia, but local operators prefer to work with Dutch companies without middlemen
- ▶ Richel (France) is the main competitor of Dutch companies in Armenia, as they are involved in construction of 80% of high-tech greenhouses in Armenia.
- ▶ There are other greenhouse concepts (Italian, Israeli, Iranian, Chinese) in Armenia, which are not direct competitors to the Dutch concepts.

4.3 INTEREST OF OPERATORS IN USE OF GREENHOUSE FACILITIES AND TECHNOLOGIES OF DUTCH ORIGIN

Interviews with greenhouse operators and relevant suppliers showed precise interest toward the Dutch technologies. However, as it was mentioned by the respondents, 1) Dutch technologies are expensive and require lot of investments. Some of operators will not be able to use them until Dutch companies have offered a competitive price or appropriate financial mechanisms. 2) Armenian farmers prefer to see first then act. That's why construction of a pilot glasshouse fully equipped with Dutch technologies is important.

5 CONCLUSIONS AND RECOMMENDATIONS

Besides development of agriculture sector, the area features will determine possibilities and opportunities of development of greenhouse sub-sector of Armenia. This includes the availability of land for establishing greenhouses, the climate (temperature, solar radiation, humidity, snow cover, water availability), infrastructure (road quality, availability of railroads, the proximity of airports, travel time to cities), available resources (including labor) and population size) and consumer markets. Based on the conducted research and analysis and taking into account the importance of the mentioned features we have reached the following conclusions and recommendations.

5.1 CONCLUSIONS

Conclusion 1. Potential areas

As it was presented in the first chapter, Armenia has a **favourable climate** for greenhouse development: the extremes in climate are rare, solar radiation and number of sunny days are comparably higher than in the Netherlands or other countries of the region. There is an availability of water resources in the form of precipitation and existing of water resources (rivers, lakes and groundwater). However, based on these features, not all regions are suitable for greenhouse construction.

Figure 9. Global Tilted Irradiation Map of Armenia, 2020



Sunlight, water and carbon dioxide are essential ingredients to produce carbohydrate and oxygen in photosynthesis process occurred in the chlorophyll of chloroplasts of plant cells. Sunlight intensity varies from beginning of day to time of noon from 0 to 150,000 lux respectively. It also varies for weather difference like in cloudy days light intensity goes lower and some types of plants could not grow appropriately. The Global tilted irradiation map of Armenia (see Figure 9) as well as discussions with specialists involved in the greenhouse sub-sector shows that preferable regions for greenhouse construction are Aragatsotn, Kotayk, Gegharkunik, Shirak and Tavush provinces. Kotayk province is one of the most preferable provinces, as it has the highest number of sunlights per year. Temperature here

is lower by 3-5 degrees compared to Ararat or Armavir provinces and in summer less energy will be required for the cooling of greenhouses. Because of high number of sunlight and sunny days, in winter heating costs are also less than in Ararat or Armavir provinces.

Aragatsotn, Gegharkunik and Shirak provinces also have high number of sunlight and sunny days, though the temperature in these provinces is lower. Humidity and temperature are higher in Tavush region and this region is mostly suitable for flower growing.

Aragatsotn and Kotayk provinces are closer to Yerevan, the main **infrastructural hub** of Armenia: here is located the biggest international airport of the country. Roads of these provinces are in good condition and relevant labour force is available. Shirak and Tavush regions are closer to the border of Georgia and transportation from here will be less expensive. Moreover, the second international airport is located in Gyumri (Shirak province). In both provinces labour force is available as well. As to the Gegharkunik province, though it is not far from Yerevan (1-2 hours drive) and from Tavush province (2-2.5 hours drive to the border of Georgia), there is an issue relating to availability of labour force.

The **availability of land** for greenhouse production depends to a large extent on the land characteristics: not too covered with forests and grassland, does not have high altitude, has no high slope, and population density is not too high. Protected areas are excluded as a suitable area for greenhouse production. In this regard the preferable provinces are Aragatsotn, Kotayk and Shirak provinces: there are no high slope areas here, not so much forests. Tavush is covered with forests and has protected areas.

An important factor in the search for suitable area for high-tech greenhouses is the availability of energy (resources). In this regard, the energy aspect includes power plants, small hydro-electric resources, solar photovoltaic and gas pipelines. Energy resources are available in all above-mentioned provinces.

Taking into account the above mentioned, more suitable areas for greenhouse construction are Kotayk and Aragatsotn provinces. Greenhouses are constructed and operating in Shirak and Tavush regions and selection of these regions mainly depends on the type of crops that should be produced in the greenhouse.

Because of climatic conditions and geographical position of Armenia, other provinces can also be considered for the construction of greenhouses, however the operators should take into account pros and cons of each province (Ararat and Armavir have suitable human and labour resources, Syunik is close to Iran, temperature in Vayots Dzor is high etc.)

Conclusion 2. Market

Geographical advantages of Armenia are not limited to excellent climate conditions, weather and availability of agricultural resources. The location is beneficial also from the perspective of trade. Armenia is located in the crossroad of Europe and Asia and benefits from preferential trade regimes.

Armenia is a member of Eurasian Economic Union (EEU) and has a free trade with the member countries (Belarus, Kazakhstan, Kyrgyzstan and Russia) with the market of more than 200mln people. As a member of the EEU, Armenia has preferential trade agreement with Iran, free trade agreements with Vietnam, Singapore and Serbia. Neighbourhood with Iran and Georgia opens access to the Middle East and European markets respectively. Armenia also benefits from preferential trade regime (GSP) with the U.S., Switzerland and Canada. Ultimately, Armenia maintains free trade agreements with Georgia and CIS countries.

Russia is the main market of Armenian agricultural products, particularly produced in greenhouses. Around 98% of greenhouse produce goes to Russian market, which still is not self-sufficient and is one of the biggest importers of agricultural products, including flowers. Middle East market is also one of interesting markets, that needs and purchases strawberries and other type of barriers from Armenia. Improvement of packaging and sorting capacities of greenhouse producers will allow to capture this market as well.

Given the high-tech greenhouse development in Armenia, it seems logical to focus on high-value speciality products for high-end markets to earn back the investments. On the other hand, the product itself will require different types or differently equipped greenhouses because of specific crop requirements.

Conclusion 3. Technical aspects of greenhouse production

Greenhouses come in different shapes and sizes. A commonly used typology is a distinction between low-tech, mid-tech and high-tech greenhouses. Low-tech are plastic greenhouses with passive or without climate control. Mid-tech greenhouses have usually plastic structures with limited environmental control. Hightech greenhouses have mainly glass structures with a high degree of active environmental control and automation.

There are more than 1,000 ha greenhouses operating in Armenia. There is a wide range of operating greenhouses, starting with the small-scale tunnel plastic models to modern glasshouses, where yields are usually higher with a better-quality control system. However, it is worth to mention that the majority of operating greenhouses are low- or mid-tech greenhouses.

Around 90% of high-tech greenhouses operating in Armenia have polyethylene covers. This is explained by the climatic conditions of Armenia (number of sunlight) as well as availability of financial resources (glasshouses cost 20-25% more than plastic ones). However, the owners of glass- and polyethylene houses should understand benefits of glasshouses; as it is easy to control temperature there, it doesn't require frequent updates (life of glasshouses is around 15 years, while polyethylene film should be updated every 4-5 years) and yield level is higher. Nevertheless, Armenian operators prefer to construct polyethylene film greenhouses to reduce initial investments.

Dutch technologies are used in high-tech greenhouses of Armenia. There are greenhouses that are fully equipped with Dutch technologies, other use hybrid type technologies; with equipment and materials originated in different countries. Some mid-tech greenhouses use Dutch technologies as well, though it is difficult for them to identify relevant suppliers, contact and communicate with them.

Armenian greenhouses and equipment suppliers sometimes work with Russian branches of Dutch organisations. This, however, is not effective as sometime quality of goods is not high (particularly those produced in Russia), representatives of Dutch companies located in Russia don't promote their products in the Armenian market, prices of products suggested by them are higher and include their profits.

The greenhouse construction company Richel Group (France) is already 8 years operating in Armenia. Their first client was Spayka LLC, which served as a demo-site for other greenhouse operators. Today, 80% of high-tech greenhouses were constructed by this company. Being the France based company, Richel provides greenhouse structures originated in France and suggests construction of "hybrid" type of greenhouses, where equipment and materials of various origin (Dutch, Italian, Spanish, etc.) are used. There are high-tech greenhouses constructed by Dutch and Italian companies as well.

Some greenhouse construction companies in Armenia suggest Chinese and Iranian technologies and structures as well. These technologies are comparably cheaper and are used mainly for low- and mid-tech greenhouses with up to 3 ha areas.

Conclusion 4. Knowledge and Education

Besides technology, knowledge and skills are very important to achieve the highest level of greenhouse production in Armenia. Against this background, it is necessary to educate and prepare young people for a career in greenhouse horticulture. Together with education there is a need to have a proper laboratory infrastructure, as greenhouse production and export requires regular testing of quality and composition of water, quality of produced product etc.

At this moment, only Armenian National Agrarian University has a programme in greenhouse agrotechnology. International center for agribusiness research and education provides short term trainings on greenhouse construction and operation. However, discussions with greenhouse operators identified, that there is a lack of relevant specialists in this sub-sector and greenhouses need to invite foreign specialists to support them.

Some greenhouses, during several years of operation, invested in education and capacity building of their specialists abroad and do everything to keep them. The current situation in the educational sector creates additional obstacles for development of the sub-sector and increases costs of production.

5.2 RECOMMENDATIONS

Armenian farmers, greenhouse operators and consumers clearly understand that the Netherlands is famous by its advanced agricultural technologies, education and approaches. Majority of greenhouse operators and organizations providing consultancy and other services in this sub-sector are working or are interested to communicate and establish cooperation with the Dutch companies. The same attitude was received from the Dutch side: Dutch greenhouse construction companies clearly understand advantages of Armenia and are interested to enter the Armenian market and share their knowledge and experience of construction and operation of greenhouses, particularly glasshouses. Below are some recommendations and suggestions given by Armenian operators, that will improve and deepen cooperation with the Netherlands in the greenhouse sub-sector and will become mutually beneficial.

- **Entrance to the Armenian market:** greenhouse production has a future in Armenia and it is one of dynamic growing sub-sectors of the country. The Richel Group was the first foreign company that understood this potential and entered the Armenian market 8 years ago, with a package of supporting services (including financial). In order to enter the Armenian market, Dutch organizations need to compete with already existing providers. To do so they need to:
 - *Enter the Armenian market with aggressive marketing policy;*
 - *Offer an integrated approach with clearly defined packages, which will include “single source” approach: where the company suggests everything (only Dutch origin) that is needed for construction and operation of a greenhouse in one package;*
 - *Together with the mentioned packages, Dutch organisations should suggest bonuses (free shipping, provision of services of specialists free of charge, free chief installation etc.) to attract Armenian consumers;*
 - *In addition, together with technologies and offers, in order to reduce costs of construction and operation of Dutch greenhouses, it is recommended to suggest financial support (loans with low interest rate, grants etc.¹²)*
- **Demonstration:** Armenian farmers trust what they see more than what they hear. To have a success in the market, there is a need to create a demo greenhouse fully equipped with Dutch technologies. Together with the construction of this demo greenhouse/glasshouse, visits should be regularly organized for Armenian businesses and farmers to this greenhouse. This way Armenian operators will learn advantages of Dutch greenhouses, will see results of these technologies and will express interest. Today the Armenian operators have example of Richel Group, to which they usually refer before placing an order to the constructors.
- **Distribution of Dutch technologies:** It is important that Dutch organisations distinguish the Russian market from Armenian market. The Armenian market should be considered separately, as it is dynamically growing agricultural market. Greenhouse production has a huge potential in Armenia and it is recommended to look to Armenian market separately. The branch offices and representatives of Dutch companies located in Russia don't promote their products in Armenia. Moreover, it is beneficial for Armenian companies to order products directly from the Netherlands, than to buy them from Russia: prices suggested by Russian representatives are higher as includes their profits and taxes. Establishment of offices or direct contacts with local suppliers can be considered as one of possible solutions.
- **Information dissemination:** Though Armenian society knows about advanced level of Dutch agriculture, there is no precise information about Dutch organisations and about the services or products they suggest. For these purposes it is suggested:

¹² As it was done by Richel Group

- *To organize representative events with local organizations, inviting relevant possible partner companies for the Netherlands;*
 - *To share contacts of Dutch organisations that are interested and ready to establish cooperation with Armenian colleagues and enter Armenian market*
 - *Organise study visits to the Netherlands or countries where fully constructed Dutch greenhouses operate, in order to see and get acquainted with the benefits of Dutch technologies and establish cooperation with Dutch companies.*
- **Know better the Armenian capacities:** in order to establish and promote targeted cooperation it is recommended to:
 - *Conduct a detailed analyses to understand the technological capacities of Armenian producers and greenhouse operators*
 - *To conduct detailed analyses to determine right combinations of greenhouse production, location, energy and water supply.*
 - *Further (technical) research should be done to find out the minimum size of sustainable greenhouse development in the specific location and crop variety that can be grown there*
 - *Explore new products and markets: analyse which type of high-value products (new ones) are promising to grow in greenhouses, their markets and market channels.*
 - *Further research needs to be carried out to look at potential co-locations with companies in the value chain (packaging, input suppliers, etc.) and outside the value chain (waste valuation, exchange of energy, food processing, etc.).*
- **Financial instruments - financial support:** As it was presented above, Armenian greenhouse operators very often don't construct Dutch greenhouses because of financial issues. In this respect it is suggested:
 - *To discuss and suggest financial instruments to Armenian businesses that will allow them not only to cooperate with Dutch organisations but to market their products,*
 - *Provide an opportunity and information to establish contacts with Dutch financial institutions in order to construct new greenhouses or upgrade the existing ones*
 - *To provide sources for implementation of experimental and innovative projects in Armenia in cooperation with the Dutch scientific centers. This includes provision of grants for construction of experimental greenhouses.*
- **Improvement of laboratory capacities:** To organize the cultivation of the plant, greenhouses should provide the plant with all the elements necessary for its growth and development. Industrial greenhouses regularly send plant irrigation and drainage water to agrochemical laboratories in Europe to perform nutritional analysis of the elements content in them and to prepare nutrition recipes based on the results obtained. Delivering water samples to European laboratories and obtaining test results sometimes takes a long time, which makes it impossible to respond to problems with plant nutrition in a timely manner. At the same time, the greenhouses are forced to make additional payments for the delivery of free substrates and plant samples. The establishment of an agrochemical laboratory in Armenia that meets modern standards will enable greenhouses to perform the necessary analyzes quickly and efficiently. As a result, the nutritional problems arising in the process of plant cultivation and the fight against diseases will be solved quickly.
- **Transfer of knowledge and know-how:** Along with development potential, certain problems arise due to the lack of specialists, the lack of appropriate professionals and lack of innovative researches. For the cultivation in greenhouses, there is high demand for specialists, especially for the following fields: Agronomy; Plant protection; Agribusiness and Management; Greenhouse technology. Thus, it is suggested to support in implementation of following activities:

- *Develop support projects in order to provide relevant specialists to local greenhouses for consultation or advice purposes. PUM is well known, but it should be more flexible and well presented in Armenia;*
 - *Conduct trainings and capacity building activities for greenhouses. Training and education in suitable Dutch companies and universities, especially at Wageningen University, can be an excellent opportunity for local specialists. Priority should be given to training specialists in artificial lighting, climate control, and plant nutrition. It is also important to attract new specialists (consultants) to these issues. Also provide sales or scholarships for education of specialists in the universities or training centers of the Netherlands;*
 - *Invest in establishment of a joint greenhouse educational center in Armenia. It will train specialists not only for Armenian market, but for other countries as well;*
 - *Introduce innovative approaches of constructing greenhouses: generally, greenhouses around the world use sunlight to meet their lighting needs, but they are not ready to use the sun for heat. Rather, they rely on conventional energy sources, such as gas, to produce greenhouse temperatures for winter plant growth. However, solar-powered greenhouses can build to use solar energy for both heating and lighting. As heating of greenhouses is expensive in Armenia, the usage and transfer of new technologies that can reduce these costs would be beneficial for Armenian operators.*
 - *Promote development and implementation of innovative and scientific research programmes with the Government of Armenia.*
- **Promote investments in Armenia:** Along with proper nutrition, an important component of the effective organization of the activities of large industrial greenhouses is pollination and the protection of plants from pests/diseases. At present, due to the high cost of goods (only transport costs are 40-100% of the value of the goods), unstable supplies and long supplying deadlines, the product quality is falling. That's why not all greenhouses use biological protection agents. Meanwhile, the development of the modern greenhouse industry and their further effective operation is impossible to imagine without the use of biological protection means and pollinating bumblebees. The establishment of the production of biological protection means and pollinating bumblebees will allow to reduce import-related costs, as well as the time of product transfer from the production to the greenhouse. As a result, the greenhouses will be provided with high-quality biological protection means and pollinating bumblebees at an affordable price, which will enable them to obtain high-quality, ecologically clean products. Such kind of production capacities can be established also for fast-wearing materials: irrigation systems, injection systems, quick wear parts, equipment etc.
 - **Recommendations to the Government of Armenia:** the above-mentioned recommendations are applicable to the Government of Armenia, as some of them cannot be implemented without involvement of state institutions. Nevertheless, below are provided other recommendations, where the Government of Armenia can have a leading role.
 - *Support to the subsector development:* Greenhouse subsector has a great potential in Armenia. According to different estimations, today there is a capacity to construct at least 1000ha high-tech greenhouses in Armenia. However, to achieve this target, the interviewed producers, constructors and experts highlighted the importance of continuation and improvement of the government support. There are already several Government support programs: "Program on state assistance for introduction of small and medium-sized greenhouses", "Program on State assistance of leasing, for financial lending of agri-food equipment in the Republic of Armenia" and "Program on Subsidizing the interest rates on loans provided to the agricultural sector" which contribute to the subsector development. However, construction of high-tech greenhouses with innovative Dutch technologies (the effectiveness of these technologies is proved not only in Armenia but in nearby countries) require significant financial investments. Taking into consideration the

issues existing in the subsector and effects that the subsector development can have on the economy of Armenia it is suggested to introduce new initiatives and support measures, or improve existing ones, to accelerate the subsector development. Particularly:

- *Capital costs:* land fragmentation and not availability of infrastructure (electricity, water or gas stations) very often create problems for establishing high-tech big greenhouses. Sometimes businesses need to communicate with number of owners in order to purchase the land and establish a greenhouse. Very often these lands are not close to existing infrastructures and greenhouse owners need to construct gas stations, solve issues related to electricity and water distribution. There is a need of a government support in the form of subsidy, other type of financial support or new support mechanisms for establishment of infrastructures and minimization of the capital costs for establishment of high-tech greenhouses.
- *Operational costs:* Operational costs (or soft costs) have a direct impact on prices of products. The current situation in Ukraine, Russia and Belarus influence on export markets of greenhouse producers. The increase of gas prices will have another impact of producers. Thus, the diversification of export markets and governmental support can have positive effects on greenhouses. As is provided below, the government should try to work faster and establish a task force to discuss these issues and identify solutions.
- *State support programs:* The state support program for introduction of small and medium-sized greenhouses has important social component, as provides necessary assistance to those who wants to construct a greenhouse. However, construction of 3000 square meter greenhouse with polyethylene cover is not cost wise and will not support to the development of the industrial high-tech greenhouses. In order to promote establishment of high-tech greenhouses it is recommended to make changes in the “Program on State assistance of leasing for financial lending of agri-food equipment in the Republic of Armenia” and increase the threshold of financial support for greenhouses and spread this support not on the small or medium greenhouses, but for construction of greenhouses with capacity of at least 3ha.
- *Type of greenhouses:* as it was mentioned above, greenhouses with polyethylene covers are widespread in Armenia. However, the studies conducted by Dutch innovative companies prove effectiveness and sustainability of glasshouses. Though glass, particularly tempered glass is more expensive than polyethylene, it is generally the most durable option for greenhouse construction:
 - The light transmission of a glass greenhouse is around 15% higher compared to the light transmission of a film greenhouse. Light clarity of glasses is higher compared to polyethylene, which ensures provision of relevant wave so needed for the growth of crops. According to studies, 1% of additional light equals to 1% additional production.
 - Plastic changes colour over time and needs to be changed every few years, while lifecycle of glass is more than 20 years. Plastic is cheap to buy, but needs to be changed every few years. Glass is more expensive at first, but needs less maintenance. Moreover, there are self-cleaning glasses that uses sunlight to break down dirt accumulation on the panels.
 - Due to the weight of the glass covering the glass greenhouse structure is generally stronger than other greenhouses.
 - With glass greenhouses it is possible to choose from single layer to double or triple paned tempered glass¹³, to improve insulation and ventilation and

¹³ Tempered glass is four to six times more shatter-resistant than annealed glass, and when it breaks it breaks into small square pieces, making it unlikely to cause injury.

to use less energy and to provide better crop protection. To maximize the heat-reflecting properties of glass, Low-E tempered glass panels can be considered, which will block heat more effectively than regular glass.

- And last but not least, glass is environmentally friendly and doesn't produce toxic fumes.

Though significant initial investments are needed for construction of glasshouses and may cause difficulties for Armenian businesses, in the long-term perspective this investment is justified. The Government of Armenia may support construction of high-tech glasshouses by applying different type of support mechanisms (subsidy, covering some costs etc.) The government may develop main criteria (with support of sector specialists) and provide assistance, if those criteria are met. Moreover, it is recommended to the government to provide additional incentives to those companies who intends to construct hightech glasshouses in Armenia.

- Input prices fluctuations and impact on the sector. Sanctions applied to Russia and Belarus because of the war in Ukraine as well as the upcoming increase of gas prices in Armenia, for sure, will have an impact on the greenhouse sector of Armenia. Today, it is difficult to evaluate the possible impact (positive or negative) of these changes as it requires detailed market analysis, analysis of supply and demand changes in Armenia and abroad, risk assessment etc. One of the possible actions the Government can undertake, to identify and minimize the possible negative impact of these changes, is urgent establishment of a *task force*, with involvement of sector specialists, professionals working in the financial sector, export promotion experts etc. The objective of the task force could be review and analyse tendencies in the sector, identify sector improvement options (based also on the international best practice and innovations) and provide relevant recommendations to the Government.

6 ANNEXES

6.1 LIST OF EXISTING GREENHOUSES IN ARMENIA

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
ARAGATSOTN PROVINCE					
1	Roz Field LLC Hayk Vardanyan (director)	2.5	Flowers	Saralanj	Tel: +374 93 080 809
2	Avalanzh Greenhouse	4.2	Flowers	Agarak	Tel: +374 91 222 257 +374 93 205 384
3	Gegham Movsisyan	0.3	Strawberry	Oshakan	Tel: +374 91 411 266
4	Karapet Hovhannisyan	N/A	N/A	Voskevaz	Tel: +374 98 402 282
5	Ghazar Shmavonyan	N/A	N/A	Voskevaz	Tel: +374 98 455 663
6	Ashot Injighulyan	N/A	N/A	Voskevaz	Tel: +374 94 933 504
7	Suren Sahakyan	N/A	N/A	Voskevaz	Tel: +374 99 217 420
8	Hayk Hovhannisyan	N/A	N/A	Oshakan	Tel: +374 91 341 123
9	Samvel Suqisyan	N/A	N/A	Aghdzq	Tel: +374 93 063 774
ARARAT PROVINCE					
10	Garush Hakobyan	0.15	N/A	Narek	Tel: +374 98 435 745
11	Fedya Martirosyan`	0.1	Tomato	Narek	Tel: +374 77 806 940
12	Ruben Baghdasaryan	0.03	Tomato	Urtsadzor	Tel: +374 93 278 304
13	Shushan Asatryan	0.04	Tomato	Urtsadzor	Tel: +374 77 939 910
14	Martik Avetisyan	0.07	Tomato	Urtsadzor	Tel: +374 94 102 071
15	Manvel Ghukasyan	0.02	Tomato	Urtsadzor	Tel: +374 94 391 137
16	Hayk Gharibyan	0.04	Tomato	Urtsadzor	Tel: +374 91 906 067
17	Ghukas Simonyan	0.3	Cucumber	Darakert	Tel: +374 94 200 766
18	Armen Simonyan	1	Tomato	Darakert	Tel: +374 93 781 015
19	Samvel Khachatryan	0.5	Tomato	Darakert	Tel: +374 93 008 066
20	Ashot Sargsyan	0.5	Tomato, Cucumber	Darakert	Tel: +374 77 204 402
21	Poghos Ladoyan	0.4	Cucumber	Darakert	Tel: +374 91 733 443
22	Elfik Hovsepyan	0.6	Tomato	Darakert	Tel: +374 94 764 034
23	Varuzhan Khudedanyan	0.14	Cucumber	Darakert	Tel: +374 94 400 766
24	Garik Simonyan	0.2	Tomato	Darakert	Tel: +374 93 964 499
25	Shahen Mkrtchyan	0.3	Lettuce	Darakert	Tel: +374 98 804 088
26	Rafik Malkhasyan	0.4	Tomato	Darakert	Tel: +374 93 587 738
27	Armen Hovhannisyan	0.3	Tomato	Darakert	Tel: +374 94 997 702
28	Gagik Sargsyan	0.2	Tomato, Cucumber	Darakert	Tel: +374 93 766 378
29	Marieta Barseghyan	0.2	Cucumber	Darakert	Tel: +374 93 132 232
30	Andranik Kabujyan	0.1	Tomato	Darakert	Tel: +374 98 456 454
31	Artak Vardanyan	0.05	Tomato	Darakert	Tel: +374 94 197 790
32	Manvel Gashumyan	0.1	Tomato	Darakert	Tel: +374 93 918 308
33	Artak Simonyan	0.13	Tomato, Cucumber, Broccoli	Darakert	Tel: +374 77 826 080
34	Gagik Hovhannisyan	0.06	Vegetables	Pokr Vedi	Tel: +374 77 636 380
35	Valerik Hovhannisyan	0.02	Vegetables	Pokr Vedi	Tel: +374 93 152 288
36	Mnatsakan Hovhannisyan	0.06	Vegetables	Pokr Vedi	Tel: +374 94 595 444
37	Hamest Kirakosyan	0.02	Non-cultivated	Pokr Vedi	Tel: +374 77 625 064

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
38	Vahag Soghomonyan	0.02	Vegetables	Pokr Vedi	Tel: +374 93 114 767
39	Derenik Soghomonyan	0.04	Non-cultivated	Pokr Vedi	Tel: +374 77 139 213
40	Petros Petrosyan	0.02	Vegetables	Pokr Vedi	Tel: +374 93 389 135
41	Harutyun Hovhannisyan	0.02	Non-cultivated	Pokr Vedi	Tel: +374 94 570 294
42	Hrant Sargsyan	0.02	Vegetables	Pokr Vedi	Tel: +374 93 722 043
43	Tigran Sargsyan	0.02	Vegetables	Pokr Vedi	Tel: +374 77 512 178
44	Ghukas Ghukasyan	0.02	Non-cultivated	Pokr Vedi	Tel: +374 93 229 501
45	Mamikon Sargsyan	0.02	Flowers	Pokr Vedi	Tel: +374 93 335 569
46	Gagik Asatryan	0.07	Vegetables	Pokr Vedi	Tel: +374 93 568 239
47	Gevorg Sheroyan	0.03	Tomato	Pokr Vedi	Tel: +374 94 349 603
48	Manuk Sheroyan	0.04	Vegetables	Pokr Vedi	Tel: +374 93 435 659
49	Zohrab Ghazaryan	0.03	Vegetables	Pokr Vedi	Tel: +374 93 048 304
50	Sevak Manukyan	0.06	Greens, Tomato, Cucumber	Pokr Vedi	Tel: +374 98 879 199
51	Hovhannes Muradyan	0.012	Tomato, Cucumber, Greens	Pokr Vedi	Tel: +374 93 799 581
52	Armen Ghazaryan	0.03	Tomato, Cucumber, Greens	Pokr Vedi	Tel: +374 77 007 095
53	Marine Hakobyan	0.035	Tomato	Taperakan	Tel: +374 93 720 448
54	Vyacheslav Yakovlev	0.05	Tomato	Verin Dvin	Tel: +374 77 999 613
55	Simon Abdalov	0.05	Tomato	Verin Dvin	Tel: +374 93 582 292
56	Kamo Altunyan	0.06	Tomato	Verin Dvin	Tel: +374 94 934 204
57	Lyova Yukhanaev	0.08	Tomato	Verin Dvin	Tel: +374 77 910 305
58	Iosiph Dinkhiev	0.2	Tomato	Verin Dvin	Tel: +374 98 339 830
59	Nikadim Yukhanaev	0.04	Strawberry	Verin Dvin	Tel: +374 93 507 571
60	Panosyan Zvart	0.18	Tomato, Beans	Verin Dvin	Tel: +374 41 444 148
61	Greenhouse LLC Davit Ghazaryan	50	Tomato, cucumber, radish	Taperakan	Tel: +374 060 704 444 E-mail: spayka@spayka.com
62	Spayka LLC Davit Ghazaryan	55	Tomato, cucumber, pepper	Taperakan	Tel: +374 060 704 444 E-mail: spayka@spayka.com
63	EcoGreen LLC Karen Hambarchyan	3	Tomato, Cucumber	Ghukasavan	Tel: +374 93 099 660
ARMAVIR PROVINCE					
64	Mihran Hovhannisyan	0.09	Cucumber, tomato, pepper	Norapat	Tel: +374 93 661 888
65	Karen Shahnazaryan	0.06	Cucumber	Norapat	Tel: +374 77 852 881
66	Avet Harutyunyan	0.06	Tomato	Norapat	Tel: +374 93 271 475
67	Gegham Hayrapetyan	0.04	Potato	Norapat	Tel: +374 77 374 892
68	Hambardzum Tovmasyan	0.03	Potato	Norapat	Tel: +374 98 893 760
69	Henrik	0.03	Cucumber	Norapat	Tel: +374 94 087 878
70	Vahram Khachatryan	0.02	Blackberry	Norapat	Tel: +374 93 430 003
71	Ani Sahakyan	0.04	Tomato, roses	Hatsik	Tel: +374 98 575 931
72	Edik Khachatryan	0.04	Tomato, flowers	Hatsik	Tel: +374 77 565 646
73	Tadevos Martirosyan	0.04	Tomato	Hatsik	Tel: +374 77 646 395
74	Ishkhan Yeghiazaryan	0.04	Tomato	Hatsik	Tel: +374 93 000 212
75	Tornik Amiryan	0.25	Pepper, tomato	Yeraskhahun	Tel: +374 98 878 709
76	Gevorg Budaghyan	0.25	Pepper, tomato	Yeraskhahun	Tel: +374 93 420 608

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
77	Kolya Avetisyan	0.25	Pepper, tomato	Yeraskhahun	Tel: +374 94 930 505
78	Grigor Karapetyan	0.25	Pepper, tomato	Yeraskhahun	Tel: +374 77 677 954
79	Vahan Yeghiazaryan	0.22	Pepper, tomato, potato	Yeraskhahun	Tel: +374 77 001 959
80	Ghazar Panosyan	0.2	Cucumber, pepper	Yeraskhahun	Tel: +374 93 459 359
81	Armenuhi Gevorgyan	0.2	Pepper, tomato	Yeraskhahun	Tel: +374 94 010 179
82	Sahak Karapetyan	0.18	Pepper, tomato	Yeraskhahun	Tel: +374 93 184 068
83	Mher Galstyan	0.15	Pepper, tomato	Yeraskhahun	Tel: +374 94 232 046
84	Amster Flower JV LLC Rafik Yeganyan	1	Tomato	Echmiadzin	Tel: +374 10 542 024 E-mail: sempetro@yandex.ru
GEGHARKUNIK PROVINCE					
85	"Yield House" Social Enterprise (women group) Nune Mirzoyan	0.01 + 0.01	Tomato	Chambarak	Tel: +374 93 072475
86	Husik Poghosyan	0.03	Tomato, Cucumber	Tsovagyugh	Tel: +374 98 751 939
87	Artur Melikyan	0.03	Cucumber	Ddmashen	Tel: +374 94 012 286
88	Maquaponics LLC Ani Mkrtchyan	0.035 + 0.035	High value crops	Ddmashen	Tel: +374 98 228 228
KOTAYK PROVINCE					
89	Ecoland LLC Gurgen Khudaverdyan (director) Marina Arakelyan	20	Tomato, Cucumber, Raspberry	Dzoraghbyur	Tel: +374 60 430 055, +374 99 110 286 (Gurgen) +374 99 110 286 (Marina) E-mail: export@ecoland.am Url: www.ecoland.am
90	Bio Group LLC Gurgen Torgomyan	1	Tomato	Dzoraghbyur	Tel: +374 60 757 777 +374 60 757 778 E-mail: galstyan@biogroup.am
91	Agrobusiness LLC Armen Manukyan	5	Tomato	Dzoraghbyur	Tel: +374 41 868 898 E-mail: agroagrobiznes@gmail.com
92	Armyanskiy Urazhay Co. Ltd Ara Gharibyan	10	Flowers	Goght	Tel: +374 98 612 279 E-mail: arm_urajay@mail.ru
93	Ecotomato CJSC Ara Gharibyan	8	Flowers	Goght	Tel: +374 093 227 838 E-mail: rose-art@mail.ru
94	Green Farmer Robert Kotinyan Sahak Nazaryan	20	Tomato	Hrazdan	Tel: +374 94 816 161 +374 94 400 797 (Sahak) E-mail: r.kotsinyan@greenfarmer.am s.nazaryan@greenfarmer.am URL: https://greenfarmer.am/
95	Klubnichnaya Polyana LLC Rudolf Margaryan	3	Strawberry	Nor Geghi	Tel: +374 99 441 110, +374 60 278 998 E-mail: rudimarg@rambler.ru
96	Edar Food LLC	1	Tomato, Cucumber	Nor Geghi	Tel: +374 93 940 091
97	ArmFood LLC (Progress agro)	4.36	Tomato, Cucumber	Nor Geghi	Tel: +374 94 615 288
98	Ecoberry Company (K&G group) Dimitri Alekseyenko	3	Strawberry	Nor Geghi	Tel: +374 43 153 530, +374 91 993 383 (Dimitri) E-mail: info@ecoberry.am URL: https://ecoberry.am/
99	Vagharshak Petrosyan	0.3	Tomato, Cucumber,	Yeghvard	Tel: +374 99 608 885

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
			Beans		
100	Hakob Harutyunyan	0.08	Tomato, Cucumber	Yeghvard	Tel: +374 94 405 089
101	RockBerry LLC Aleksan Arakelyan Boris Ghazaryan	8+3	Strawberry + Blackberry & Raspberry	Kamaris	Tel: +374 93 000 103 (Aleksan) +374 098 111 030 (Boris) E-mail: info@rockberry.am
102	KATARAN LLC Hovhannes Sinanyan	0.3	Rucola	Mrgashen	Tel: +374 91 405 922
103	Armberry CJSC Harutyun Pakhchanyan	0.112	Berries	Zoravan	Tel: +374 91 535 305, +374 94 601 177
104	Berry House LLC Zaruhi Badalyan Samvel Petrosyan Kim Yeganyan	1	Strawberries	Akunk	Tel: +374 94 767 576
105	Biotech LLC Vahagn Kazaryan	0.1	Greens	Akunk	Tel: +374 95 200 100 +374 93 951 044 (Vahagn) E-mail: vaagnkazaryan@mail.ru
106	Tigran and Rina Harutyunyan	0.3617	N/A	Akunk	Tel: +374 44 633 333
107	Maroz Saribekyan	0.02	Beans, Tomato, Cucumber, Pepper	Akunk	Tel: +374 94 625 745
108	Ararat Sargsyan	0.005	Tomato	Akunk	Tel: +374 94 255 004
109	Vladik Abrahamyan	0.01	Tomato, Cucumber, Pepper	Akunk	Tel: +374 93 459 282
110	Voske Varder LLC Haykaz Grigoryan	0.67	Flowers	Akunk	Tel: +374 93 190 207
111	M.N.A.S. LLC Artem Terteryan	0.38	Flowers	Akunk	Tel: +374 77 744 441
112	Artemis LLC Samvel Avagyan	0.16	Flowers	Akunk	Tel: +374 91 252 004 +374 91 252 009
113	Venlo JV LLC Artur Tigranyan	1	Tomato	Akunk	Tel: +374 91 019 159 E-mail: art-tig@yandex.ru
LORI PROVINCE					
114	“Our Future” women’s cooperative Armine Muradyan	0.015	Seedlings of high value crops	Gyulagarak	Tel: +374 77 689 680
115	“Healthy Food” women’s cooperative Alvard Davoyan	0.032	Rukola, Fizalis, Artichoke, Cherry Tomato, Hot Pepper, Lettuce	Gyulagarak	Tel: +374 94 779 435
116	Hayk Harutyunyan	0.02	Greens, Tomato, Cucumber	Gyulagarak	Tel: +374 94 026 403
117	Sargis Matinyan	0.018	Tomato, Cucumber	Gyulagarak	Tel: +374 77 520 214
118	Samvel Marikyan	0.015	Greens	Gyulagarak	Tel: +374 93 789 729
119	Vahe Nalbandyan	0.02	Tomato	Gyulagarak	Tel: +374 95 123 200
120	Vardges Davtyan	0.02	Vegetables, Seedlings	Gyulagarak	Tel: +374 94 337 950
121	Pargev Sargsyan	0.035	Vegetables	Gyulagarak	Tel: +374 94 669 464
122	Kurtan school	0.3		Gyulagarak	
123	Senik Harutyunyan	0.012		Gyulagarak	Tel: +374 43 124 360
124	Dendropark	0.02	Ornamental plants	Gyulagarak	N/A
125	Vahagn Sargsyan	0.18	Flowers	Gyulagarak	N/A

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
126	Ladik Asryan	0.04	Onion	Gyulagarak	N/A
127	Martin Sargsyan	0.035	Onion	Gyulagarak	N/A
128	Vahan Vardumyan	0.032	Tomato, cucumber	Akhtala	Tel: +374 94 355 392
129	Mikayel Siradeghyan	0.03	Tomato, cucumber	Akhtala	Tel: +374 77 600 091
130	Karapet Karapetyan	0.005	N/A	Ghursali	Tel: +374 94 278 171
131	Razmik Hakobjanyan	0.0015	N/A	Ghursali	Tel: +374 94 036 341
132	Abrik Azaryan	0.003	N/A	Ghursali	Tel: +374 39 591 637
133	Tigran Nalbandyan	0.0306	N/A	Shirakamut	N/A
134	Artsrun Sarukhanyan	0.024	N/A	Shahumyan	N/A
135	Gagik Babayan	0.058	N/A	Gugarq	N/A
136	Levon Kostandyan	0.02	Vegetable crops	Odzun	N/A
137	Agro-Ardvi cooperative	0.023	Vegetable crops	Odzun	N/A
138	Vahagn Ksotandyan	0.02		Odzun	N/A
139	Artak Khachatryan	0.14	Tomato, Cucumber	Darpas	Tel: +374 93 310 525
140	Robert Hovsepyan	0.02	Tomato	Dzoragyugh	N/A
141	Margahovit youth center	0.01	Non-traditional crops	Margahovit	Tel: +374 99 353718 E-mail: youthcenterm@gmail.com
142	Armenia Tree Project	0.025	Seedlings	Margahovit	Tel: +374 10 447 401 E-mail: yerevan@armeniatree.org URL: https://www.armeniatree.org/
143	Rafael Harutyunyan	0.018	Tomato, Cucumber, Strawberry	Tumanyan	N/A
144	Stevia LLC	0.024	Stevia	Alaverdi	Tel: +374 93 994 498
145	Suren Grigoryan	0.06	Non-traditional crops	Jrashen	N/A
146	Gevtar LLC	0.5		Vanadzor	N/A
147	Artur Tchatinyan	0.012	Tomato, Cucumber	Lori Berd	N/A
148	Garik Danielyan	0.012	Tomato, Cucumber	Lori Berd	N/A
149	Melanyan Vardanyan	0.012	Tomato, Cucumber	Lori Berd	N/A
150	Naira Kharatyan	0.03	Tomato	Dsegh	N/A
151	Movses Muradyan	0.03 + 0.02	Flowers	Dsegh	N/A
152	Hamlet Shiroyan	0.15	Flowers	Spitak	N/A
153	Spitak Farmer NGO Sargis Markosyan	0.2	Seedlings	Spitak	Tel: +374 55 805 205 E-mail: sargismarkosyan@gmail.com
154	Ofma LLC	0.1	Vegetables	Spitak	N/A
155	Aramayis Ghalechyan	0.2	Flowers	Arjut	N/A
156	Seyran Simonyan	0.1	Flowers	Arjut	N/A
157	Araqsi Dumanyan	0.05	Green Onion	Arjut	N/A
158	Susanna Grigoryan	0.065 + 0.015	Flowers, strawberry	Nor Khachakap	N/A
159	Shahen Arabchyan		Tomato, Cucumber	Nor Khachakap	N/A
SHIRAK PROVINCE					
160	Green Food LLC Adranik Ignatosyan	9	Strawberry	Artik	Tel: +374 91 014 777 +374 98 677 777

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
					+374 93 530 998 E-mail: info@greenfood.am Url: http://greenfood.am
161	Basen Development Foundation	0.07	Cucumber, Tomato	Akhuryan	N/A
162	Basen Kindergarten	0.006	Cucumber, Tomato	Akhuryan	N/A
163	Vachagan Minasyan	0.05	Green Beans, Radish	Akhuryan	N/A
164	Ara Gharibyan	0.225	Tomato, Cucumber	Akhuryan	Tel: +374 77 707 041
165	Hamlet Petrosyan	0.024 + 0.046	Cucumber, Tomato	Akhuryan	Tel: +374 98 365 400
166	Khanum Ghazaryan	0.03	Tomato, Cucumber	Akhuryan	Tel: +374 94 717 704
167	Karo Hovhannisyanyan	0.04	Flowers	Anushavan	Tel: +374 94 983 399
168	Hrachya Khachatryan	0.25	Cucumber	Arevshat	Tel: +374 77 592 609
169	"Arpi lake" national park	0.01	Vegetable	Arpi	Tel: +374 93 407 090
170	Researchers in bioheating solutions	1.2	N/A	Arpi	Tel: +374 55 295 556
171	Vardan Khachatryan	0.02	Tomato	Akhurik	Tel: +374 93 217 832
172	Hovhannes Azatyan	0.04	Vegetable	Azatan	Tel: +374 98 578 999
173	Vachagan Iklikyan	0.03	Vegetable	Azatan	Tel: +374 77 529 803
174	Yeprem Hunoyan	0.025 + 0.025	Vegetable, Strawberry	Azatan	Tel: +374 77 454 323
175	Zohrab Gasparyan	0.06	Tomato, Cucumber	Bagravan	Tel: +374 94 028 696
176	Harutyun Matsakyan	0.015	Vegetable	Dzithanqov	Tel: +374 93 108 612
177	Mesrop Khachatryan	0.03	Tomato, Cucumber	Getap	Tel: +374 94 010 205
178	Taron Poghosyan	0.015	Greens	Getq	Tel: +374 98 646 450
179	Emma Sargsyan	0.03	Flowers	Gyumri	Tel: +374 98 482 416
180	Tsolak Chadryan	2.24	Flowers	Gyumri	Tel: +374 94 215 424
181	Bariq CJSC	5.6	Seedlings	Gyumri	Tel: +374 94 927 750
182	Hrachya Manukyan	0.05	Tomato, Cucumber, Pepper	Lusaghbyur	Tel: +7 918 021 92 73
183	Anahit Nahapetyan	0.3	Does not cultivate now	Marmarashen	Tel: +374 91 413 843
184	Khachatur Tsaturyan	0.27	Tomato, Cucumber	Marmarashen	Tel: +374 94 328 845
185	Garik Hambaryan	0.4	Tomato, Cucumber, Cabbage	Marmarashen	Tel: +374 98 880 903
186	Mamikon Elbakyan	0.2	Flowers	Marmarashen	Tel: +374 98 646 448
187	Lyova	0.5	Tomato, Cucumber	Marmarashen	Tel: +374 91 415 843
188	Artak Harutyunyan	0.4	Tomato, Cucumber	Marmarashen	Tel: +374 94 328 845
189	Karen Chobanyan	0.055	Cucumber	Mets Mantash	Tel: +374 93 390 289
190	Vardan Harutyunyan	0.017	Cucumber	Mets Mantash	Tel: +374 95 177 100
191	Aghvan Baloyan	0.023	Cucumber	Meghrashen	Tel: +374 77 991 989
192	Ghevond Vardanyan	0.022	Greens	Meghrashen	Tel: +374 93 260 292
193	Zaven Qerobyan	0.03	Tomato, Cucumber	Nahapetavan	Tel: +374 98 852 052
194	Husik Tonoyan	0.018 + 0.02	Flowers, Vegetable	Nor Kyanq	Tel: +374 94 920 621
195	Never Tonoyan	0.0379	Berries	Nor Kyanq	Tel: +374 93 881 038
196	Vahan Sekhelyan	0.12	Tomato	Panik	Tel: +374 93 937 711
197	Arshaluys Aghabekyan	0.03	Greens	Pemzashen	Tel: +374 93 148 355

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198	Toros consumer cooperative	0.006 + 0.03	Tomato, Cucumber	Sarapat	Tel: +374 94 442 173
199	Rubik Petrosyan	0.035	Cucumber	Saratak	Tel: +374 98 851 480
200	Armen Gasparyan	0.12	Flowers	Sarnaghbyur	Tel: +374 93 082 091
201	Harutyun Harutyunyan	0.0408	Cucumber	Spandaryan	Tel: +374 93 434 613
202	Sayad Almastyan	0.024	Cucumber	Spandaryan	Tel: +374 94 772 570
203	Petik Avagyan	0.02	Peppermint, Blackberry	Spandaryan	N/A
204	Hovhannes Yeranosyan	0.03	Vegetable	Yerazgavors	Tel: +374 91 772 797
SYUNIK PROVINCE					
205	Pavlik Karapetyan	0.0135	Vegetable	Meghri	Tel: +374 94 557 056
206	Andranik Martirosyan	0.0700	Vegetable	Meghri	Tel: +374 94 733 023
207	Vazgen Balasanyan	0.0135	Vegetable	Meghri	Tel: +374 94 599 959
208	Vigen Grigoryan	0.2	Vegetable	Meghri	Tel: +374 93 621 236
209	Lyova Aharonyan	0.025	Seedlings, Vegetable	Meghri	Tel: +374 94 952 733
210	Albert Beklaryan	0.0135	Vegetable	Meghri	Tel: +374 94 062 026
211	Mkrtich Boyadjyan	0.013	Cucumber	Meghri	Tel: +374 94 557 001
212	Anna Tunyan	0.013	Vegetable	Meghri	Tel: +374 94 696 803
213	Ara Azizyan	0.01	Greens	Meghri	Tel: +374 94 519 601
214	Aramayis Sahakyan	0.648	Vegetable crops	Kapan	Tel: +374 93 345 137
215	Lyova Poghosyan	0.02	Vegetable crops	Kapan	Tel: +374 94 999 550
216	Sergey Harutyunyan	0.0748	Vegetable crops	Kapan	Tel: +374 93 607 464
217	Husik Manucharyan	0.0706	Vegetable crops	Kapan	Tel: +374 77 104 322
218	Nver Arakelyan	0.054	Vegetable crops	Kapan	N/A
219	Aren Khachatryan	0.399	Floriculture	Kapan	Tel: +374 93 474 424
220	Hayk Davtyan	0.1	Vegetables crops	Kapan	Tel: +374 94 382 412
221	Anahit Ayvazyan	2.5	Tomato, Cucumber, Greens, Flowers	Kapan	Tel: +374 93 101 055
222	Mushegh Grigoryan	0.005	Tomato, Cucumber, Pepper	Gorayk	Tel: +374 77 588 232
223	Karen Petrosyan	0.005	Tomato, Cucumber	Gorayk	Tel: +374 93 019 076
224	Melania Mkrtchyan	0.004	Tomato, Cucumber	Gorayk	Tel: +374 94 202 714
225	Zohrab Margaryan	0.004	Tomato, Cucumber	Gorayk	Tel: +374 93 844 212
226	Arshavir Aghajanyan	0.004	Tomato, Cucumber	Gorayk	Tel: +374 93 210 903
227	Valerik Asryan	0.08	Greens, Tomato, Cucumber	Tatev	Tel: +374 93 383 301
228	Mher Tarkhanyan	0.08	Vegetables	Tatev	Tel: +374 98 825 588
229	Mayis Sargsyan	0.04	Greens	Tatev	Tel: +374 77 870 015
230	Partnership and Training NGO Artashes Torozyan,	2x0.02	Tomato, Cucumber	Tatev	Tel: +374 94 201 817
231	Borik Hovhannisyan	1	Tomato, Cucumber, Greens	Syunik	Tel: +374 91 557 892
232	Hasmik Harutyunyan	0.6	Tomato, Cucumber, Greens	Syunik	Tel: +374 94 702 030
233	Suren Hakobyan	0.5	Greens, Flowers	Sisian	N/A
234	Styopa Mkrtumyan	2.5	Tomato, Cucumber, Greens, Flowers	Sisian	Tel: +374 93 876 482

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
TAVUSH PROVINCE					
235	Valen Garanyan	0.0135	Tomato	Berd	Tel: +374 93 113 121
236	Onik Chatyan	0.0135	Tomato, Cucumber	Berd	Tel: +374 94 161 165
237	Levon Nazaryan	0.0135	Tomato, Cucumber	Berd	Tel: +374 93 010 259
238	Yurik Yeghiazaryan	0.0135	Tomato, Cucumber	Berd	Tel: +374 93 392 406
239	Vanik Voskanyan	0.0135	Tomato, Cucumber	Berd	Tel: +374 93 228 027
240	Gevorg Petrosyan	0.0135	Tomato, Cucumber	Berd	Tel: +374 94 638 816
241	Volodya Machkalyan	0.012	Tomato, Pepper	Berd	Tel: +374 95 600 399
242	Elbrus Bozinyan	0.05	Tomato, Greens	Berd	Tel: +374 93 473 661
243	Viktor Melkumyan	0.0135	Tomato, Pepper	Berd	Tel: +374 93 108 076
244	Yuri Atoyan	0.0135	Tomato, Pepper	Berd	Tel: +374 93 250 149
245	Garnik Davtyan	0.0135	Tomato, Pepper	Berd	Tel: +374 94 326 938
246	Seda Antonyan	0.0135	Tomato	Berd	Tel: +374 77 481 006
247	3-rd school	0.0135	Tomato, Cucumber	Berd	Tel: +374 267 2 13 33
248	Ashot Mezhlumyan	0.0135	Tomato, Cucumber	Berd	Tel: +374 98 555 503
249	Hrachik Badalyan	0.012	Tomato, Cucumber	Berd	Tel: +374 93 656 025
250	Aram Hovakimyan	0.005	Tomato	Berd	Tel: +374 77 011 034
251	Hovhannes Babayan	0.0096	Tomato, Cucumber	Berd	Tel: +374 77 337 323
252	Sargis Ghlechyan	0.0096	Tomato, Cucumber	Berd	Tel: +374 93 990 674
253	Murad Grigoryan	0.0096	Tomato, Cucumber	Berd	Tel: +374 93 907 963
254	Robert Papyan	0.013	Tomato, Cucumber, Greens	Berd	Tel: +374 94 995 966
255	Mkrtich Yakumyan	0.012+ 0.012	Tomato, Cucumber, Beans	Berd	Tel: +374 94 231 764
256	Andranik Hovakimyan	0.012	Tomato, Cucumber, Beans	Berd	Tel: +374 94 801 871
257	Roza Melikyan	0.012	Tomato, Cucumber	Berd	Tel: +374 93 634 572
258	Hamlet Margaryan	0.012	Tomato, Cucumber, Beans	Berd	Tel: +374 98 150 358
259	Vachik Virabyan	0.0135	Tomato, Pepper	Berd	Tel: +374 93 831 252
260	Hripsime Ohanyan	0.0135	Tomato, Pepper	Berd	Tel: +374 93 141 419
261	Gagik Yesayan	0.0135	Tomato, Pepper	Berd	Tel: +374 93 624 829
262	Norashen school	0.009	Tomato, Cucumber	Berd	Tel: +374 77 121 777
263	Seryozha Aghasyan	0.012	Tomato, Cucumber	Berd	Tel: +374 77 560 233
264	Samvel Saghoyan	0.012	Tomato, Cucumber	Berd	Tel: +374 93 733 990
265	Hayk Petrosyan	0.012	Tomato, Cucumber	Berd	Tel: +374 94 572 837
266	Andranik Mirzoyan	0.012	Tomato, Cucumber	Berd	Tel: +374 93 739 641
267	Masis Tserunyan	0.012	Tomato, Cucumber	Berd	Tel: +374 94 942 948
268	Shahen Makaryan	0.012	Tomato, Cucumber	Berd	Tel: +374 93 984 445
269	Chinar Kindergarden	0.012	Tomato, Cucumber	Berd	Tel: +374 94 816 261
270	Chinar school	0.012	Tomato, Cucumber	Berd	Tel: +374 94 357 716
271	Tigran Vanyan	0.0096	Tomato, Cucumber	Berd	Tel: +374 93 260 942
272	Vachagan Tserunyan	0.0096	Tomato, Cucumber	Berd	Tel: +374 93 441 969
273	Ofik Voskanyan	0.0096	Tomato, Cucumber	Berd	Tel: +374 93 679 158
274	Samvel Vanyan	0.0096	Tomato, Cucumber	Berd	Tel: +374 94 356 575
275	Sipan Saghoyan	0.0096	Tomato, Cucumber	Berd	Tel: +374 77 656 366

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
276	Hmayak Vanyan	0.0135	Tomato, Cucumber	Berd	Tel: +374 93 471 315
277	Seyran Mirzoyan	0.0135	Tomato, Cucumber	Berd	Tel: +374 98 568 961
278	Chinar Seedling Women cooperative	0.05	Seedlings	Berd	Tel: +374 93 181 853
279	Gegham Kalantaryan	0.135	Tomato	Berd	Tel: +374 98 879 587
280	Zhorik Udumyan	0.135	Tomato	Berd	Tel: +374 77 628 909
281	Hayk Udumyan	0.135	Tomato	Berd	Tel: +374 93 978 747
282	Svetlana Yesayan	0.0135	Tomato	Berd	Tel: +374 94 661 108
283	Qanqaros Musinyan	0.0135	Tomato, Cucumber, Beans	Berd	Tel: +374 94 179 260
284	Shushanik Ghalichyan	0.0135	Tomato, Greens	Berd	Tel: +374 94 902 023
285	Ruzanna Gevorgyan	0.0135	Tomato, Onion, Greens	Berd	Tel: +374 77 414 424
286	Sophya Ohanyan	0.0135	Tomato, Cucumber, Pepper, Beans	Berd	Tel: +374 77 482 916
287	Davit Khalatyan	0.0135	Tomato, Greens	Berd	Tel: +374 93 337 855
288	Hayk Grigoryan	0.0135	Tomato, Greens	Berd	Tel: +374 94 577 501
289	Marusya Poghosyan	0.0135	Tomato, Beans	Berd	Tel: +374 94 414 136
290	Khachik Arzumanyan	0.01	Tomato	Berd	Tel: +374 77 351 077
291	Viktor Arzumanyan	0.01	Tomato	Berd	Tel: +374 77 672 523
292	Andranik Gyurjinyan	0.012	Tomato, Hot pepper	Berd	Tel: +374 94 004 415
293	Vardges Dallakyan	0.012	Tomato	Berd	Tel: +374 93 116 296
294	Artur Hovhannisyanyan	0.012	Tomato	Berd	Tel: +374 93 484 909
295	Armen Garanyan	0.012	Tomato, Pepper	Berd	Tel: +374 93 114 247
296	Zaven Machkalyan	0.012	Tomato, Pepper	Berd	Tel: +374 77 629 578
297	Garush Machkalyan	0.012	Tomato	Berd	Tel: +374 93 702 560
298	Arsen Maralyan	0.012	Tomato, Hot Pepper	Berd	Tel: +374 93 094 356
299	Tigran Arzumanyan	0.012	Tomato	Berd	Tel: +374 94 976 794
300	Vardges Arzumanyan	0.012	Tomato, Pepper	Berd	Tel: +374 77 637 176
301	Grisha Arzumanyan	0.0135	Tomato, Pepper	Berd	Tel: +374 93 769 374
302	Misha Machkalyan	0.0135	Tomato, Pepper	Berd	Tel: +374 94 094 529
303	Artavazd Poghosyan	0.0135	Tomato, Pepper	Berd	Tel: +374 98 680 828
304	Anna Khalatyan	0.0135	Tomato, Pepper	Berd	Tel: +374 94 064 455
305	Ofelya Muradyan	0.0135	Tomato, Pepper	Berd	Tel: +374 94 506 220
306	Babken Vardanyan	0.01	Cucumber	Berd	Tel: +374 93 675 040
307	Artak Aghababyan	0.01	Cucumber	Berd	Tel: +374 94 858 288
308	Levon Lobyan	0.01	Green	Berd	Tel: +374 77 047 451
309	Mkhitar Mkhitaryan	0.013	Onion	Berd	Tel: +374 94 850 954
310	Onik Chobanyan	0.013	Green	Berd	Tel: +374 77 621 582
311	Edik Galstyan	0.013	Tomato	Berd	Tel: +374 77 958 475
312	Rafik Galstyan	0.012	Tomato	Berd	Tel: +374 93 844 735
313	Armen Adamyan	0.012	Tomato	Berd	Tel: +374 93 036 089
314	Garnik Ghukasyan	0.012	Tomato	Berd	Tel: +374 93 468 467
315	Armen Simonyan	0.010	Tomato	Berd	Tel: +374 94 666 807
316	Edik Arakelyan	0.013	Tomato	Berd	Tel: +374 98 435 843
317	Andranik Adamyan	0.012	Tomato	Berd	Tel: +374 77 316 792

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
318	Lyudmila Maryanyan	0.006	Tomato	Berd	Tel: +374 093 767 6 81
319	School after Hayk Ghazaryan	0.007	Tomato, cucumber, Green	Berd	Tel: +374 98 060 104
320	Rafik Ohanyan	6*0.012 +1*0.02	Tomato, cucumber, strawberry	Ayrum	Tel: +374 94 570 757
321	Ptghavan agricultural cooperative	0.04	Tomato	Ayrum	Tel: +374 94 570 757
322	Vladislav Avagyan	0.015	Tomato	Ayrum	Tel: +374 93 490 096
323	Shahen Silikyan	0.015	Tomato	Ayrum	Tel: +374 93 503 124
324	Ararat Abovyan	0.024	Tomato	Ayrum	Tel: +374 93 130 933
325	Armen Ghazaryan	0.015	Tomato	Ayrum	Tel: +374 99 105 205
326	Nazar Muradyan	0.015	Beans	Ayrum	Tel: +374 77 093 396
327	Vardan Jilavyan	0.03	Seedlings	Ayrum	Tel: +374 94 806 031
328	Artur Montyan	0.012	Beans	Ayrum	Tel: +374 77 700 198
329	Sargis Aghajanyan	0.015	Tomato	Ayrum	Tel: +374 77 936 027
330	Ruben Margaryan	0.06	Flowers	Ayrum	Tel: +374 77 476 256
331	Mekhak Harutyunyan	0.012	Seedlings	Ayrum	Tel: +374 94 227 703
332	Debed cooperative	0.05	Vegetable	Ayrum	Tel: +374 99 449 779
333	Nikolay Vanesyan	0.07	Tomato	Ayrum	Tel: +374 93 475 840
334	Grigory Vanesyan	0.05	Tomato	Ayrum	Tel: +374 93 453 622
335	Artak Araqelyan	0.05	Tomato	Ayrum	Tel: +374 93 456 541
336	Faniel Yegurchyan	0.03	Strawberry	Ayrum	Tel: +374 93 808 248
337	Hovani agricultural cooperative	0.05	Strawberry	Ayrum	Tel: +374 94 886 689
338	Hakob Vardanyan	0.025 + 0.025	Seedlings, Tomato, Cucumber, Pepper	Berkaber	Tel: +374 93 333 441
339	Paruyr Zargaryan	0.015	Seedlings, Tomato, Cucumber, Pepper	Berkaber	Tel: +374 77 728 772
340	Suren Khudaverdyan	0.015	Seedlings, Tomato, Cucumber, Pepper	Berkaber	Tel: +374 93 594 401
341	Roman Tamrazyan	>0.02	Seedlings, Tomato, Cucumber, Pepper	Berkaber	Tel: +374 94 120 033
342	Vahram Velumyan	>0.02	Seedlings, Tomato, Cucumber, Pepper	Berkaber	Tel: +374 93 032 017
343	Armine Yeganyan	>0.02	Seedlings, Tomato, Cucumber, Pepper	Berkaber	Tel: +374 98 456 815
344	Tereza Matinyan	0.01	Tomato	Berkaber	Tel: +374 98 055 727
345	Karine Alikhanyan	0.01	Tomato	Berkaber	Tel: +374 98 089 108
346	Sultan Khudaverdyan	0.01	Tomato	Berkaber	Tel: +374 93 573 933
347	Grisha Dilbaryan	0.013	Tomato	Berkaber	Tel: +374 77 111 882
348	Grisha Dilbaryan	0.01	Eggplant	Berkaber	Tel: +374 77 111 882
349	Lusya Badalyan	0.01	Tomato	Berkaber	Tel: +374 77 761 177
350	Liza Madatyan	0.01	Tomato	Berkaber	Tel: +374 93 032 017
351	Mher D. Mayilyan	0.01	Tomato	Berkaber	Tel: +374 93 252 402
352	Paruyr Zargaryan	0.012	Tomato	Berkaber	Tel: +374 77 728 772
353	Hakob Vardanyan	0.01	Tomato	Berkaber	Tel: +374 93 333 441
354	Hakob Vardanyan	0.01	Cucumber	Berkaber	Tel: +374 93 333 441
355	Sevan Arzumanyan	0.01	Tomato	Berkaber	Tel: +374 98 932 761

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
356	Suren Khudaverdyan	0.012	Tomato	Berkaber	Tel: +374 94 594 456
357	Sonya Matinyan	0.01	Tomato	Berkaber	Tel: +374 77 229 099
358	Yurik Tamrazyan	0.01	Tomato	Berkaber	Tel: +374 94 007 732
359	Vladimir Tamrazyan	0.014	Tomato	Berkaber	Tel: +374 93 854 754
360	Lusya Dilbaryan	0.014	Tomato	Berkaber	Tel: +374 94 570 022
361	Grisha Mantashyan	0.01	Tomato	Berkaber	Tel: +374 94 809 886
362	Robert Khudaverdyan	0.01	Tomato	Berkaber	Tel: +374 94 020 547
363	Aleksan Khudaverdyan	0.01	Tomato	Berkaber	Tel: +374 94 370 088
364	Emil Mayilyan	0.01	Tomato	Berkaber	Tel: +374 94 320 701
365	Hamlet Matinyan	0.06	Cucumber, Pepper, Bean, Tomato	Aygehovit	Tel: +374 77 415 101
366	Aram Achinyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 77 837 482
367	Ivan Gevorgyan	0.01	Cucumber	Aygehovit	Tel: +374 77 507 223
368	Henrik Hovsepyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 93 639 098
369	Aram Aghinyan	0.01	Beans	Aygehovit	Tel: +374 98 005 593
370	Kamo Azatyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 93 193 953
371	Hakob Shahinyan	0.01	Cucumber	Aygehovit	Tel: +374 93 402 310
372	Arshavir Aharonyan	0.01	Tomato	Aygehovit	Tel: +374 93 805 770
373	Edik Ghukasyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 77 774 264
374	Ararat Achinyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 77 323 630
375	Hrant Dallakyan	0.01	Beans	Aygehovit	Tel: +374 98 934 128
376	Serozh Karapetyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 93 472 248
377	Varlam Saribekyan	0.01	Beans	Aygehovit	Tel: +374 98 838 815
378	Aleksandr Achinyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 77 797 773
379	Armen Tchagharyan	0.01	Beans	Aygehovit	Tel: +374 94 444 129
380	Hovsep Amirjanyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 98 174 767
381	Artur Gevorgyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 94 803 811
382	Onik Ghazaryan	0.01	Beans	Aygehovit	Tel: +374 94 612 401
383	Ara Khojumyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 94 012 900
384	Samvel Grigoryan	0.01	Beans	Aygehovit	Tel: +374 77 893 225
385	Nvard Khojumyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 94 100 059
386	Karapet Gevorgyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 94 111 232
387	Yurik Vardanyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 93 691 359
388	Ivan Arustamyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 93 666 483
389	Avetiq Vardanyan	0.01	Vegetable	Aygehovit	Tel: +374 94 849 142
390	Albert Gevorgyan	0.01	Tomato	Aygehovit	Tel: +374 93 342 541
391	Artur Yesayan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 93 395 724
392	Armen Simonyan	0.01	Beans	Aygehovit	Tel: +374 93 867 912
393	Vardan Simonyan	0.01	Beans	Aygehovit	Tel: +374 93 967 515
394	Hamlet Aharonyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 77 042 764
395	Vardan Hamzyan	0.013	Beans, Spinach	Aygehovit	Tel: +374 77 724 646
396	Karo Shahinyan	0.01	Beans	Aygehovit	Tel: +374 93 400 278
397	Artur Aharonyan	0.01	Tomato, Cucumber	Aygehovit	Tel: +374 94 000 134
398	Samvel Manucharyan	0.02	Beans	Aygehovit	Tel: +374 93 476 369
399	Ashot Dallakyan	0.012	Beans	Aygehovit	Tel: +374 94 203 072
400	Lyova Grigoryan	0.006	Flowers	Aygehovit	Tel: +374 93 469 092

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
401	Kamo Avagyan	0.1	Tomato, Cucumber, Pepper	Dilijan	Tel: +374 77 334 341
402	Gagik Shahnazaryan	0.1	Tomato, Cucumber, Pepper	Dilijan	Tel: +374 93 302 959
403	Bagrat Movsesyan	0.1	Tomato, Cucumber, Pepper	Dilijan	Tel: +374 93 760 591
404	Sirak Poghosyan	0.2	Flowers	Dilijan	Tel: +374 93 797 992
405	Sergey Movsesya	0.01	Cucumber, Pepper	Dilijan	Tel: +374 98 861 529
406	Rima Arushanyan	0.01	Tomato, Cucumber	Dilijan	Tel: +374 94 508 428
407	Anzhela Harutyunyan	0.01	Tomato, Cucumber	Dilijan	Tel: +374 98 488 726
408	Artur Mkrtchyan	0.01	Tomato, Cucumber	Dilijan	Tel: +374 931 81 274
409	Elina Budaghyan	0.01	Tomato, Cucumber	Dilijan	Tel: +374 94 143 965
410	Ashot Khojoyan	0.01	Tomato, Cucumber	Dilijan	Tel: +374 93 057 518
411	Ofelya Petrosyan	0.01	Tomato, Cucumber	Dilijan	Tel: +374 77 405 276
412	Mkhitar Gosh cooperative	0.04	Tomato, Beans	Dilijan	Tel: +374 94 003 120
413	Zaven Tamrazyan	0.012	Tomato	Dilijan	Tel: +374 77 431 308
414	Yasha Hakhverdyan	0.02	Tomato	Dilijan	Tel: +374 93 614 554
415	"Hovq women's association" cooperative	0.03	Vegetable	Dilijan	Tel: +374 94 851 418
416	Gevorg Yengibaryan	0.0060	Vegetable	Dilijan	Tel: +374 94 085 381
417	Emma Tirabyan	0.0137	Tomato, Cucumber, Pepper	Lusahovit	Tel: +374 93 416 712
418	Nakhshun Sarhatyan	0.0137	Tomato, Cucumber, Pepper	Lusahovit	Tel: +374 93 002 098 +374 77 946 704
419	Aleksandr Gurjinyan	0.675	Strawberries	Lusahovit	Tel: +374 98 411 619
420	Norayr Davtyan	0.15	High value crops	Achajur	Tel: +374 94 506 252
421	Vachik Vardumyan	0.06	Cucumber, Tomato, Greens	Achajur	Tel: +374 94 202 702
422	Gegham Yeganyan	0.06	Beans, Cucumber, Tomato	Achajur	Tel: +374 94 094 043
423	Karen Kokobelyan	0.015	Beans, Tomato	Achajur	N/A
424	Vahe Kokobelyan	0.0135	Tomato, Cucumber	Achajur	Tel: +374 94 988 033
425	Ararat Gasparyan	0.0135	Tomato, Cucumber, Radish, Beans	Achajur	Tel: +374 98 997 974
426	Tatul Gasparyan	0.0135	Tomato, Cucumber	Achajur	Tel: +374 94 034 717
427	Vahe Aghbalyan	0.0135	Tomato, Cucumber	Achajur	Tel: +374 77 120 127
428	Lyudmila Ohanyan	0.0135	Tomato, Cucumber	Achajur	Tel: +374 77 456 186
429	Artsrun Atabekyan	0.0135	Tomato, Cucumber	Achajur	N/A
430	Daniel Yeganyan	0.0135	Tomato, Cucumber	Achajur	Tel: +374 94 470 590
431	Aghabek Galstyan	0.0135	Tomato, Cucumber	Achajur	Tel: +374 93 790 797
432	Mkhitar Melikjanyan	0.02	Onion	Achajur	Tel: +374 77 453 066
433	Greenhouse LLC Anzhela Khachatryan	5.5	Flowers	Achajur	Tel: +374 55 582 908 E-mail: greenhouse.arm@gmail.com
434	Ecofruit LLC Anzhela Khachatryan	3.5	Flowers	Achajur	Tel: +374 55 582 908 E-mail: ecofruitarmenia@gmail.com
435	Ashot Vardapetyan	0.14	Vegetable	Achajur	Tel: +374 93 043 000

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
436	Marine Baghiyan	0.0135	Vegetable	Achajur	Tel: +374 98 900 884
437	Rita Khojayan	0.0135	Vegetable	Achajur	Tel: +374 94 988 033
438	Andranik Ghaltakhchyan	0.0135	Vegetable	Achajur	Tel: +374 77 456 775
439	Saro Aghbalyan	0.0135	Vegetable	Achajur	Tel: +374 94 901 509
440	Gevorg Aghbalyan	0.01	Vegetable	Achajur	Tel: +374 94 034 098
441	Susanna Vardapetyan	0.0135	Vegetable	Achajur	Tel: +374 94 303 098
442	Aknaghbyur cooperative Hakob Yeganyan	0.09	Tomato, Cucumber	Aknaghbyur	Tel: +374 94 608 840
443	Karen Dolmazyan	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 94 160 022
444	Lorik Harutyunyan	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 77 112 099
445	Davit Petrosyan	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 93 194 447
446	Vachik Harutyunyan	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 93 558 456
447	Serozh Mirzoyan	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 77 037 818
448	Bakhchiman Shahnazaryan	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 93 781 318
449	Araz Mirzoyan	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 98 091 919
450	Avetik Shahnazaryan	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 77 692 010
451	Sirak Shahnazaryan	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 98 103 133
452	Martik Mkhitarian	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 98 200 013
453	Onik Mkhitarian	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 94 151 521
454	Yenok Shahnazaryan	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 94 631 795
455	Vrezh Mkhitarian	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 77 244 131
456	Hakob Yeganyan	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 94 608 840
457	Armen Mirzoyan	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 94 025 585
458	Spartak Tukhikyan	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 94 180 294
459	Edik Mkhitarian	0.006	Tomato, Cucumber	Aknaghbyur	Tel: +374 94 786 057
460	Stella Mayilyan	0.0135	Tomato, Cucumber	Aknaghbyur	Tel: +374 93 635 570
461	Vache Mirzoyan	0.0135	Tomato, Cucumber	Aknaghbyur	Tel: +374 93 037 818
462	Aram Harutyunyan	0.0135	Tomato, Cucumber	Aknaghbyur	Tel: +374 98 000 676
463	Atabek Mirzoyan	0.0135	Tomato, Cucumber	Aknaghbyur	Tel: +374 94 057 544
464	Vruyr Mayilyan	0.0135	Tomato, Cucumber	Aknaghbyur	Tel: +374 77 036 046
465	Mher Petrosyan	0.0135	Tomato, Cucumber	Aknaghbyur	Tel: +374 93 609 668
466	Grigor Yeganyan	0.0135	Tomato, Cucumber	Aknaghbyur	Tel: +374 77 051 052
467	Aghabek Mirzoyan	0.0135	Tomato, Cucumber	Aknaghbyur	Tel: +374 98 990 122
468	Larisa Shahnazaryan	0.0135	Tomato, Cucumber	Aknaghbyur	Tel: +374 77 151 629
469	Mikayel Barseghyan	0.0135	Tomato, Cucumber	Aknaghbyur	Tel: +374 94 050 655
470	Zarighalam Aghinyan	0.01	Potato	Gandzakar	Tel: +374 93 644 600
471	Leonid Shahinyan	0.01	Tomato, Cucumber	Gandzakar	Tel: +374 98 362 616
472	Levon Khalatyan	0.01	Tomato, Pepper	Gandzakar	Tel: +374 94 140 745
473	Marat Baghmanyanyan	0.01	Tomato, Cucumber	Gandzakar	Tel: +374 77 373 939
474	Nune Yolchyan	0.01	Tomato, Cucumber	Gandzakar	Tel: +374 94 347 464
475	Artak Grigoryan	0.01	Flowers	Gandzakar	Tel: +374 77 176 772
476	Yervand Marutyan	0.01	N/A	Ditavan	N/A
477	Armen Hakhverdyan	0.01	Vegetable	Ditavan	Tel: +374 77 808 660
478	Qajik Zaqaryan	0.01	Vegetable	Ditavan	Tel: +374 98 251 257
479	Armen Marutyan	0.01	Vegetable	Ditavan	Tel: +374 77 506 178
480	Vrezh Gabrielyan	0.01	Vegetable	Ditavan	Tel: +374 93 910 300

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
481	Shirak Usubov	0.01	Vegetable	Ditavan	Tel: +374 98 737 571
482	Hakob Saribekyan	0.01	Vegetable	Ditavan	Tel: +374 93 738 303
483	Svetik Elaryan	0.01	Vegetable	Ditavan	Tel: +374 77 560 176
484	Galina Shushanyan	0.01	Vegetable	Ditavan	Tel: +374 77 737 551
485	Zhora Manucharyan	0.01	Vegetable	Ditavan	Tel: +374 93 271 832
486	Rima Manucharyan	0.01	Vegetable	Ditavan	Tel: +374 94 651 729
487	Benik Zakaryan	0.01	Vegetable	Ditavan	Tel: +374 93 786 243
488	Seyran Sargsyan	0.01	Vegetable	Ditavan	Tel: +374 94 648 657
489	Gohar Saribekyan	0.01	Vegetable	Ditavan	Tel: +374 94 137 361
490	Hayk Alikhanyan	0.01	Vegetable	Ditavan	Tel: +374 98 444 543
491	Arsen Gabrielyan	0.01	Vegetable	Ditavan	Tel: +374 98 898 683
492	Varsik Shahinyan	0.01	Vegetable	Ditavan	Tel: +374 93 281 051
493	Argam Saribekyan	0.01	Vegetable	Ditavan	Tel: +374 93 679 541
494	Razmik Avetyan	0.01	Vegetable	Ditavan	Tel: +374 77 898 684
495	Vahan Avetyan	0.01	Vegetable	Ditavan	Tel: +374 93 640 790
496	Anushavan Hakhverdyan	0.01	Vegetable	Ditavan	Tel: +374 77 518 850
497	Arshak Saribekyan	0.01	Vegetable	Ditavan	Tel: +374 93 173 597
498	Ditavan Cooperative	0.06	Tobacco, Vegetable	Ditavan	Tel: +374 93 048 576
499	Artsruni Saribekyan	0.04	Vegetable	Ditavan	Tel: +374 94 132 363
500	Volodya Pashinyan	0.004	Tomato	Yenokavan	Tel: +374 094-75-73-18
501	Norayr Gyozyan	0.006	Vegetable	Lusadzor	N/A
502	Aram Nazaryan	0.006	Vegetable	Lusadzor	Tel: +374 094-24-88-82
503	Leyli Ayvazyan	0.006	Vegetable	Lusadzor	Tel: +374 094-69-19-69
504	Yerjanik Ayvazyan	0.015	Vegetable	Lusadzor	N/A
505	Garnik Ayvazyan	0.009	Vegetable	Lusadzor	N/A
506	Sofik Antonyan	0.006	Vegetable	Lusadzor	Tel: +374 094-33-18-23
507	Khachik Turjyan	0.009	Vegetable	Lusadzor	Tel: +374 077-35-36-94
508	Vardan Sardaryan	0.006	Vegetable	Lusadzor	Tel: +374 094-55-86-59
509	Lorik Simonyan	0.018	Vegetable	Lusadzor	Tel: +374 094-45-29-95
510	Suren Kocharyan	0.018	Vegetable	Lusadzor	Tel: +374 093-75-67-85
511	Hayk Sardaryan	0.006	Vegetable	Lusadzor	Tel: +374 094-11-17-15
512	Karen Nazaryan	0.018	Vegetable	Lusadzor	Tel: +374 093-30-76-47
513	Zina Nazaryan	0.006	Vegetable	Lusadzor	Tel: +374 098-60-65-06
514	Armenuhi Gyochoyan	0.006	Vegetable	Lusadzor	N/A
515	Norik Kocharyan	0.006	Vegetable	Lusadzor	Tel: +374 094-70-77-06
516	Shushan Davtyan	0.006	Vegetable	Lusadzor	Tel: +374 098-00-71-37
517	Nina Sardaryan	0.006	Vegetable	Lusadzor	Tel: +374 098-76-32-60
518	Aram Kocharyan	0.006	Vegetable	Lusadzor	Tel: +374 094-96-77-70
519	Karo Ayvazyan	0.006	Vegetable	Lusadzor	Tel: +374 093-66-46-74
520	Roza Gyozyan	0.006	Vegetable	Lusadzor	Tel: +374 094-52-85-68
521	Hamlet Nazaryan	0.009	Vegetable	Lusadzor	Tel: +374 094-44-33-70
522	Armen Sardaryan	0.006	Vegetable	Lusadzor	Tel: +374 094-52-27-07
523	Shamir Sardaryan	0.012	Vegetable	Lusadzor	Tel: +374 077-55-07-00
524	Arzuman Ayvazyan	0.006	Vegetable	Lusadzor	Tel: +374 093-45-78-08
525	Adik Matinyan	0.009	Vegetable	Lusadzor	Tel: +374 077-90-75-76
526	Frontik Kocharyan	0.006	Vegetable	Lusadzor	Tel: +374 094-70-77-06

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
527	Berq LLC Mher Khachatryan	0.3	Strawberry	Ijevan	Tel: +374 098459988
528	Luiza Revazyan	0.04	Tomato	Sarigyugh	Tel: +374 093-67-20-89
529	Marine Manucharyan	0.025	Tomato	Sarigyugh	Tel: +374 077-03-20-22
530	Aram Amirkhanyan	0.038	Tomato	Sarigyugh	Tel: +374 093-08-75-17
531	Never Amirkhanyan	0.03	Cucumber	Sarigyugh	Tel: +374 077-45-09-96
532	Arman Yeganyan	0.013	Beans	Sarigyugh	Tel: +374 094-76-93-97
533	Sergey Yeganyan	0.013	Tomato	Sarigyugh	Tel: +374 077-78-87-76
534	Bakhshi Poghosyan	0.013	Tomato	Sarigyugh	Tel: +374 094-02-08-80
535	Darpas Cooperative Marine Brutyan	0.0400	Strawberry	Sevkar	Tel: +374 077-45-22-19
536	Samvel Tchagharyan	0.0850	Flowers, Tomato	Sevkar	Tel: +374 093 30-04-45
537	Armen Baghdasaryan	0.0380	Cucumber, Beans	Sevkar	Tel: +374 093-82-62-46
538	Karine Baghdasaryan	0.0200	Tomato, Cucumber, Pepper	Sevkar	Tel: +374 093-97-70-10
539	Lorik Badiryan	0.01	Beans	Vazashen	Tel: +374 077060955
540	Samvel Sarhatyan	0.01	Tomato, Cucumber, Pepper	Vazashen	Tel: +374 098284048
541	Radik Gabrielyan	0.01	Tomato, Cucumber, Pepper	Vazashen	Tel: +374 094202320
542	Seryozha Grigoryan	0.01	Tomato, Cucumber, Green	Vazashen	Tel: +374 093663092
543	Grigor Sarhatyan	0.01	Tomato, Pepper, Beans	Vazashen	Tel: +374 077311718
544	Tornik Mkhitarian	0.01	Beans	N. Tsaghkavan	Tel: +374 094 14 10 20
545	Serozh Atabekyan	0.01	Tomato, Pepper	N. Tsaghkavan	Tel: +374 094 67 07 30
546	Mkhitar Revazyan	0.162	Beans	N. Tsaghkavan	Tel: +374 077 77 30 57
547	Rudik Mkhitarian	0.01	Tomato, Pepper	N. Tsaghkavan	Tel: +374 094 82 28 08
548	Davir Yolchyan	0.01	Tomato, Cucumber, Pepper	N. Tsaghkavan	Tel: +374 093 30 36 24
549	Tsaghkunq cooperative	0.04	Tomato, Cucumber, Pepper, Beans	N. Tsaghkavan	Tel: +374 094 82 28 08
550	Vahagn Saribekyan	0.0135	Tomato	Khashtarak	Tel: +374 093-57-11-48
551	Vahagn Sarhatyan	0.04	Cucumber	Khashtarak	Tel: +374 094-41-04-01
552	Harutyun Virabyan	0.0135	Cucumber	Khashtarak	Tel: +374 098-22-33-17
553	Artak Virabyan	0.0135	Beans	Khashtarak	Tel: +374 094-00-70-79
554	Narek Mkhitarian	0.0135	Cucumber	Khashtarak	Tel: +374 098-88-87-27
555	Gerasim Taribyan	0.0135	Cucumber	Khashtarak	Tel: +374 094-63-96-16
556	Sahot Saribekyan	0.0135	Cucumber	Khashtarak	Tel: +374 094-09-05-19
557	Henrik Avalyan	0.01	Beans	Kirants	Tel: +374 093-06-56-76
558	Rafayel Apinyan	0.01	Tomato	Kirants	Tel: +374 077-43-51-50
559	Atom Asiryan	0.01	Tomato	Kirants	Tel: +374 094-11-16-96
560	Garik Asiryan	0.01	Tomato, Beans	Kirants	Tel: +374 094-57-14-11
561	Gevorg Simonyan	0.01	Cucumber, Beans	Kirants	Tel: +374 098-63-22-20
562	Alvard Nazaryan	0.01	Cucumber, Beans	Kirants	Tel: +374 093-94-68-46
563	Aram Machkalyan	0.0132	Vegetable	Noyemberyan	Tel: +374 077013363
564	Smbat Amiraghyan	0.012	Vegetable	Noyemberyan	N/A
565	Levon Mantashyan	0.045	Flowers, Vegetable	Noyemberyan	Tel: +374 0266-2-24-19

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
566	Davit Harutyunyan	0.012	Vegetable	Noyemberyan	Tel: +374 077858989
567	Hayk Mamyán	0.004	Vegetable	Noyemberyan	Tel: +374 0266-2-36-46
568	Zarzand Simonyan	0.004	Vegetable	Noyemberyan	N/A
569	Garnik Gishyan	0.0108	Vegetable	Noyemberyan	Tel: +374 093071848
570	Lusatsir NGO	0.012	Vegetable	Noyemberyan	Tel: +374 0266-2-20-61
571	Rubik Gishyan	0.026	Vegetable	Noyemberyan	Tel: +374 094925892
572	Parsadan Aleksanyan	0.016	Vegetable	Noyemberyan	Tel: +374 094013173
573	Artur Vardanyan	0.0100	Vegetable	Noyemberyan	Tel: +374 0266-2-30-93
574	Astghik Karyan	0.0130	Tomato, Cucumber, Greens	Noyemberyan	Tel: +374 077-041240
575	Karen Zurabyan	0.0130	Cucumber, Beans	Noyemberyan	Tel: +374 094-065166
576	Volodya Zurabyan	0.0130	Tomato	Noyemberyan	Tel: +374 091-265966
577	Mareta Muradyan	0.0130	Tomato	Noyemberyan	Tel: +374 096-042941
578	Arayik Atoyán	0.0130	Tomato, Cucumber, Beans	Noyemberyan	Tel: +374 055-190807
579	Berdavan school	0.0130	Tomato, Cucumber	Noyemberyan	Tel: +374 093-445999
580	Mher Atabekyan	0.012	Tomato, Cucumber, Greens	Noyemberyan	Tel: +374 091-910016
581	Nerses Chilingaryan	0.012	Cucumber	Noyemberyan	Tel: +374 77 100 106
582	Tatul Asatryan	0.012	Tomato	Noyemberyan	Tel: +374 94 144 437
583	Armen Ghazaryan	0.012	Broccoli	Noyemberyan	Tel: +374 93 057 470
584	Arayik Hanisyan	0.012	Tomato, Cucumber	Noyemberyan	Tel: +374 94 107 844
585	Vardan Vardanyan	0.0130	Tomato	Noyemberyan	Tel: +374 266 2 17 89
586	Gagik Vardanyan	0.0130	Tomato	Noyemberyan	Tel: +374 266 2 30 35
587	Rita Gishyan	0.0130	Tomato, Cucumber	Noyemberyan	Tel: +374 266 2 30 72
588	Tatul Beglaryan	0.0102	Tomato, Cucumber, Pepper	Noyemberyan	Tel: +374 93 836 689
589	Garnik Bayramyan	0.0102	Tomato, Cucumber, Pepper	Noyemberyan	Tel: +374 77 433 241
590	Nairi Sahakyan	0.0102	Tomato, Cucumber, Pepper	Noyemberyan	Tel: +374 77 045 777
591	Artavazd Sahakyan	0.0102	Tomato, Cucumber	Noyemberyan	Tel: +374 93 509 490
592	Gayane Davtyan	0.012	Vegetable	Noyemberyan	Tel: +374 94 334 506
593	Sosik Melikyan	0.012	Vegetable	Noyemberyan	Tel: +374 94 239 875
594	Hrachya Azibekyan	0.012	Vegetable	Noyemberyan	Tel: +374 94 440 425
595	Hermine Khachatryan	0.012	Vegetable	Noyemberyan	Tel: +374 77 434 049
596	Nora Khachikyan	0.012	Vegetable	Noyemberyan	Tel: +374 93 706 823
597	Susanna Melikyan	0.012	Vegetable	Noyemberyan	Tel: +374 77 022 006
598	Arshavir Harutyunyan	0.012	Vegetable	Noyemberyan	Tel: +374 93 020 121
599	Neli Amirkhanyan	0.012	Vegetable	Noyemberyan	Tel: +374 93 686 310
600	Karen Amirkhanyan	0.012	Flowers	Noyemberyan	Tel: +374 93 440 939
601	Karen Amirkhanyan	0.0230	Flowers	Noyemberyan	Tel: +374 93 440 939
602	Qnarik Alaverdyan	0.012	Vegetable	Noyemberyan	Tel: +374 93 151 317
603	Hayk Tumanyan	0.012	Vegetable	Noyemberyan	Tel: +374 77 433 428
604	Zhenik Hakhverdyan	0.012	Vegetable	Noyemberyan	Tel: +374 93 067 890
605	Ara Melikyan	0.012	Vegetable	Noyemberyan	N/A
606	Roza Mamyán	0.012	Vegetable	Noyemberyan	Tel: +374 77 857 141

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
607	Gagik Ganjalyan	0.0032	Vegetable	Noyemberyan	Tel: +374 94 781 870
608	Robert Amirkhanyan	0.0100	Vegetable	Noyemberyan	Tel: +374 94 300 709
609	Sahak Ghazaryan	0.0100	Vegetable	Noyemberyan	Tel: +374 77 433 767
610	Hovik Veranyan	0.0100	Vegetable	Noyemberyan	Tel: +374 77 814 108
611	Garnik Shahnazaryan	0.0100	Vegetable	Noyemberyan	Tel: +374 77 707 174
612	Samvel Ghazinyan	0.0100	Vegetable	Noyemberyan	N/A
613	Jonik Mikayelyan	0.0100	Tomato. Cucumber	Noyemberyan	Tel: +374 94 006 681
614	Jonik Mirzoyan	0.005	Tomato. Cucumber	Noyemberyan	N/A
615	Tatul Siradeghyan	0.0135	Tomato. Cucumber. Pepper	Noyemberyan	Tel: +374 94 578 704
616	Manvel Alaverdyan	0.0135	Tomato. Cucumber. Pepper	Noyemberyan	Tel: +374 77 872 998
617	Armen Sahakyan	0.0135	Vegetable	Noyemberyan	Tel: +374 91 853 981
618	Voskan Grigoryan	0.0135	Vegetable	Noyemberyan	Tel: +374 93 284 940
619	Seyran Aleksanyan	0.0135	Vegetable	Noyemberyan	Tel: +374 99 434 540
620	Hunan Saribekyan	0.0100	Vegetable	Noyemberyan	Tel: +374 93 449 097
621	Alik Yeganyan	0.0100	Vegetable	Noyemberyan	Tel: +374 77 888 507
622	Jivan Sahakyan	0.0100	Vegetable	Noyemberyan	Tel: +374 94 150 649
623	Valeri Aleksanyan	0.0100	Vegetable	Noyemberyan	Tel: +374 94 803 373
624	Radik Safaryan	0.0100	Vegetable	Noyemberyan	Tel: +374 98 063 393
625	Hayk Sahakyan	0.0100	Vegetable	Noyemberyan	Tel: +374 94 252 243
626	Arsen Budaghyan	0.0135	Tomato	Koghb	Tel: +374 94 444 450
627	Sedrak Ananyan	0.0400	Tomato. Cucumber	Koghb	Tel: +374 93 602 685
628	Varuzhan Gharakhanyan	0.0135	Tomato. Cucumber	Koghb	Tel: +374 93 762 888
629	Slavik Baghiyan	0.0400	Tomato. Cucumber	Koghb	Tel: +374 94 040 103
630	Vladimir Baghinyan	0.0100	Tomato. Cucumber	Koghb	Tel: +374 266 5 27 44
631	Suren Bejanyan	0.0135	Tomato. Pepper	Koghb	Tel: +374 266 5 31 01
632	Arsen Gasparyan	0.0100	Tomato	Koghb	Tel: +374 94 855 371
VAYOTS DZOR PROVINCE					
633	Davit Hovhannisyan	0.5	Rucola. Basil	Yeghegis	Tel: +374 94 413 313
634	Nairi Martirosyan	0.08	Greens	Areni	Tel: +374 98 079 809
635	Edvard Petrosyan	0.08	Cucumber. Tomato	Areni	Tel: +374 93 632 081
636	Garik Matevosyan	0.015	Cucumber. Tomato	Areni	Tel: +374 77 040 427
637	Badik Baghdasaryan	0.015	Cucumber. Tomato	Areni	Tel: +374 77 179 207
638	Gagik Gasparyan	0.03	Cucumber	Areni	Tel: +374 98 625 861
639	Armine Kostanyan	0.03	Tomato	Areni	Tel: +374 77 074 274
640	Samvel Harutyunyan	0.07	Pepper. Tomato. Cucumber	Gladzor	Tel: +374 93 369 882
641	Gheghecik Asryan	0.075	Tomato	Gladzor	Tel: +374 77 849 015
642	Lyudvig Khachatryan	0.035	Tomato	Gladzor	Tel: +374 93 884 290
643	Ashot Khachatryan	0.25	Cucumber	Gladzor	Tel: +374 93 369 629
644	Arthur Hovhannisyan	0.18	Tomato	Gladzor	Tel: +374 93 366 695
645	Surik Safaryan	0.05	Tomato	Gladzor	Tel: +374 93 101 914
646	Sirekan Danielyan	0.045	Tomato	Gladzor	Tel: +374 281 2 28 81
647	Martik Danielyan	0.06	Tomato	Gladzor	Tel: +374 98 740 816
648	Marat Aloyan	0.03	Tomato	Gladzor	Tel: +374 93 033 216

N	Farmer/Organisation (Contact Person)	Size (ha)	Crop types	Sa	Contact (tel., e-mail)
649	Lyudvig Ghukas Khachatryan	0.15	Tomato	Gladzor	Tel: +374 98 843 080
650	Gagik Aloyan	0.064	Tomato	Gladzor	Tel: +374 94 045 484
651	Nune Avagyan	0.03	Tomato. cucumber. pepper	Zaritap	Tel: +374 94 625 139

6.2 LIST OF GREENHOUSE CONSTRUCTORS OPERATING IN ARMENIA

N	Name of the organisation	Short description	Address	Contact information
1	Agrotech LLC Naira Khachatryan	Ggronomic consultation to greenhouse producers. greenhouse materials	2-nd industrial district 3. Abovyan city. 2225. Kotayk province	Tel.: +374 91 206 220 +374 98 216 220 E-mail: info@agrotech.am URL: https://agrotech.am/
2	AgroTechnik International Co. LTD	Smart Greenhouse Engineering		Tel: +374 10 205 513 +374 10 205 512 +374 10 205 514 E-mail: agrotechnik.int@gmail.com
3	Agrotrend CJSC Anna Karapetyan	Greenhouse related setvices. distribution of greenhouse materials	Darakert Community. Ararat province	Tel: +374 98 992 313 E-mail: anna.karapetyan@agrotrend.am
4	Alfa Progress LLC Vahe Gulanyan	Automatic system for greenhouses	Room 609. 58/2 Karapet Ulnetsu Street. Yerevan	Tel: +374 77 021 920 E-mail: alfaprog@list.ru
5	Artcon CJSC Davit Ghazaryan	Construction of greenhouses	55 Artsakh Avenue. Yerevan	Tel: +374 10 470 897 +374 10 471 215 +374 44 919 000 +374 98 150 683 E-mail: info@artcon.am URL: http://www.artcon.am/
6	Eco Jermoce LLC	Construction of hydroponic greenhouses (Iranian)	28/15 Artsakh Avenue. Yerevan	Tel: +374 94 415 133 E-mail: ecojermoc@gmail.com
7	Green Lad LLC Tigran Gharajyan	Agricultural engineering	6/1 Acharyan street. Yerevan	Tel: +374 77 730 770
8	Green Leader Varuzhan Khodedanyan	Construction of greenhouses	Darakert. 154 Kentronakan	Tel: +374 94 400766
9	Greenhouse engeneering LLC Haroutyun Sahakyan	Supervision of greenhouse construction	Yeraz business center. 2/1 Adonts street. Yerevan	Tel: +374 93 202210 +374 10 201 620 E-mail: hsahakyan@ghe.am URL: https://ghe.am/
10	Infrared LLC	Production and installation of arched greenhouses	Marmarashen community. Ararat province	Tel: +374 91 335 541 +374 91 479 729 E-mail: info@infrared.am URL: http://www.infrared.am/
11	Integral Design & Engineering LLC Tigran Hatsagortsyan	Heating equipment/system installation	8 Tumanyan Street. Yerevan	Tel: +374 10 520 188 +374 77 520 188 E-mail: info@integral.am URL: http://integral.am/
12	Irrisal LLC Karen Poghosov	Irrigation systems for agriculture		Tel: +374 99 000 559 E-mail: irrisal@yahoo.com
13	Jermater LLC Hayk Sarikjan	Construction of greenhouses	41/45 Artashisyan Street. Yerevan	Tel: +374 98 422 383 +374 91 664 866

N	Name of the organisation	Short description	Address	Contact information
				E-mail: jermaterltd@gmail.com hsarikyan@mail.ru
14	Landshaft LLC	Construction of greenhouses and import of materials for greenhouse construction	Unit 9. Charents Street. Yerevan	Tel: +374 10 555 048 + 374 91 555 048 +374 93 663 111 +374 10 575 451 E-mail: info@landshaft.am URL: http://landshaft.am/
15	Organik Miniborsa LLC Abraham Abrahamyan	Construction of greenhouses (Chinese)	15 Nikoghayos street. Tigranyan Yerevan	Tel: +374 99 810991 +374 10 204015
16	Ros Agro LLC	Construction of hydroponic greenhouses		Tel: +374 94 440 299
17	Vard Agro LLC	Design and construction of hydroponic greenhouses	8 Mayrakaghakain Street. Tairov community. Armavir province	Tel: +374 55 882 121 URL: http://www.vardagro.am/
18	Ves Group Greenhouse Company	Greenhouse design and consultation		Tel: +374 93 405 151

6.3 EXAMPLES OF COSTS CALCULATIONS FOR GREENHOUSE CONSTRUCTION

6.3.1 Offer for construction of a greenhouse covering 3ha area

The offer is provided by Europrogress S.r.l. (Italy) for construction of 3ha greenhouse. This offer is presented by a separate file with the name "Offer Europrogress 3ha.pdf".

6.3.2 Offer for construction of a glasshouse 3,500m² area

The offer is provided by Agrotech Didam (The Netherlands) for construction of 3,500m² greenhouse with glass cover. This offer is presented by a separate file with the name "Offer Europrogress.pdf".

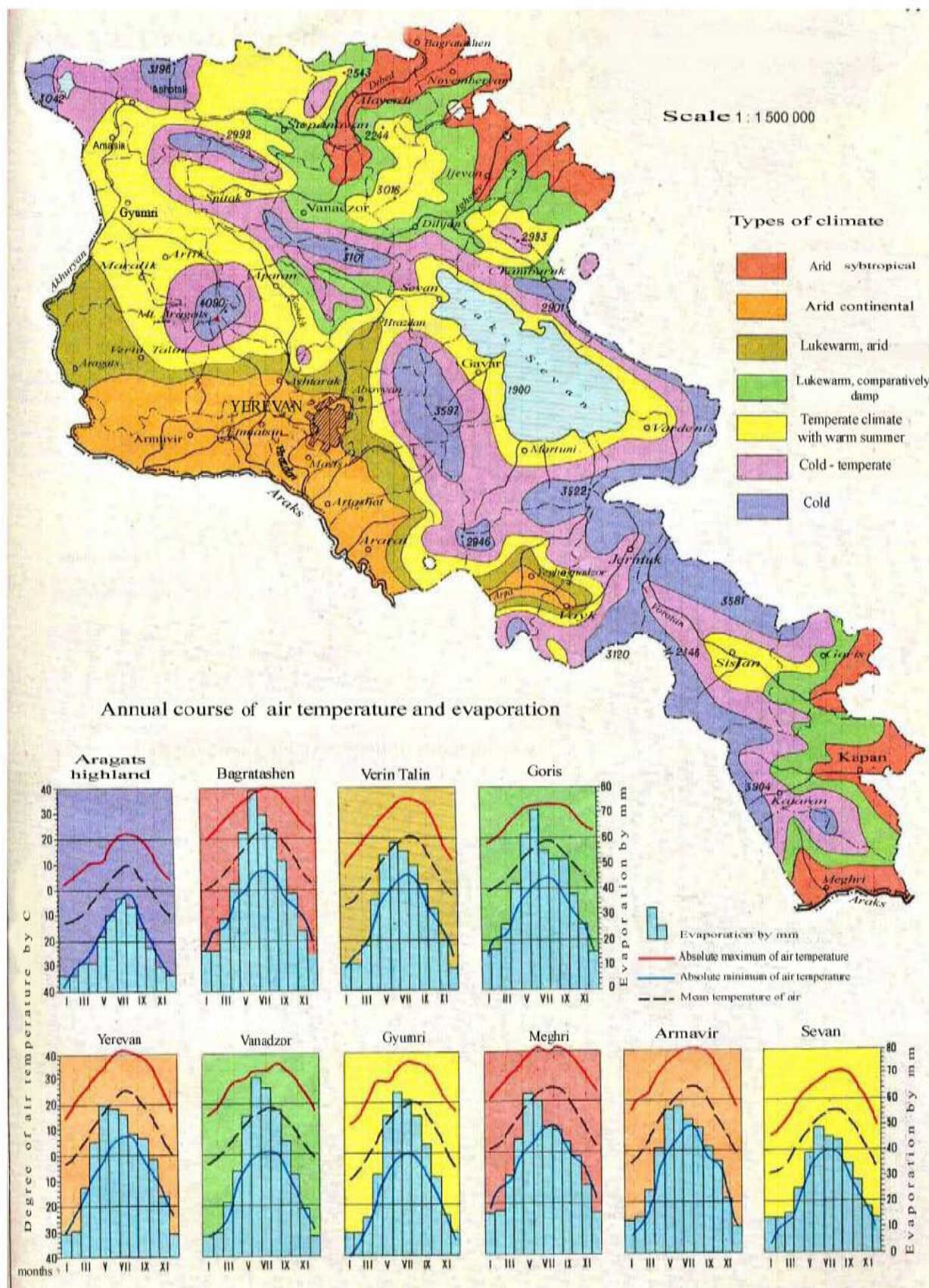
6.3.3 Tomato greenhouse business plan

By a separate file attached to this report is provided financial model (in Armenian) of a tomato greenhouse business plan (see the file named "Greenhouse financial model.xls".)

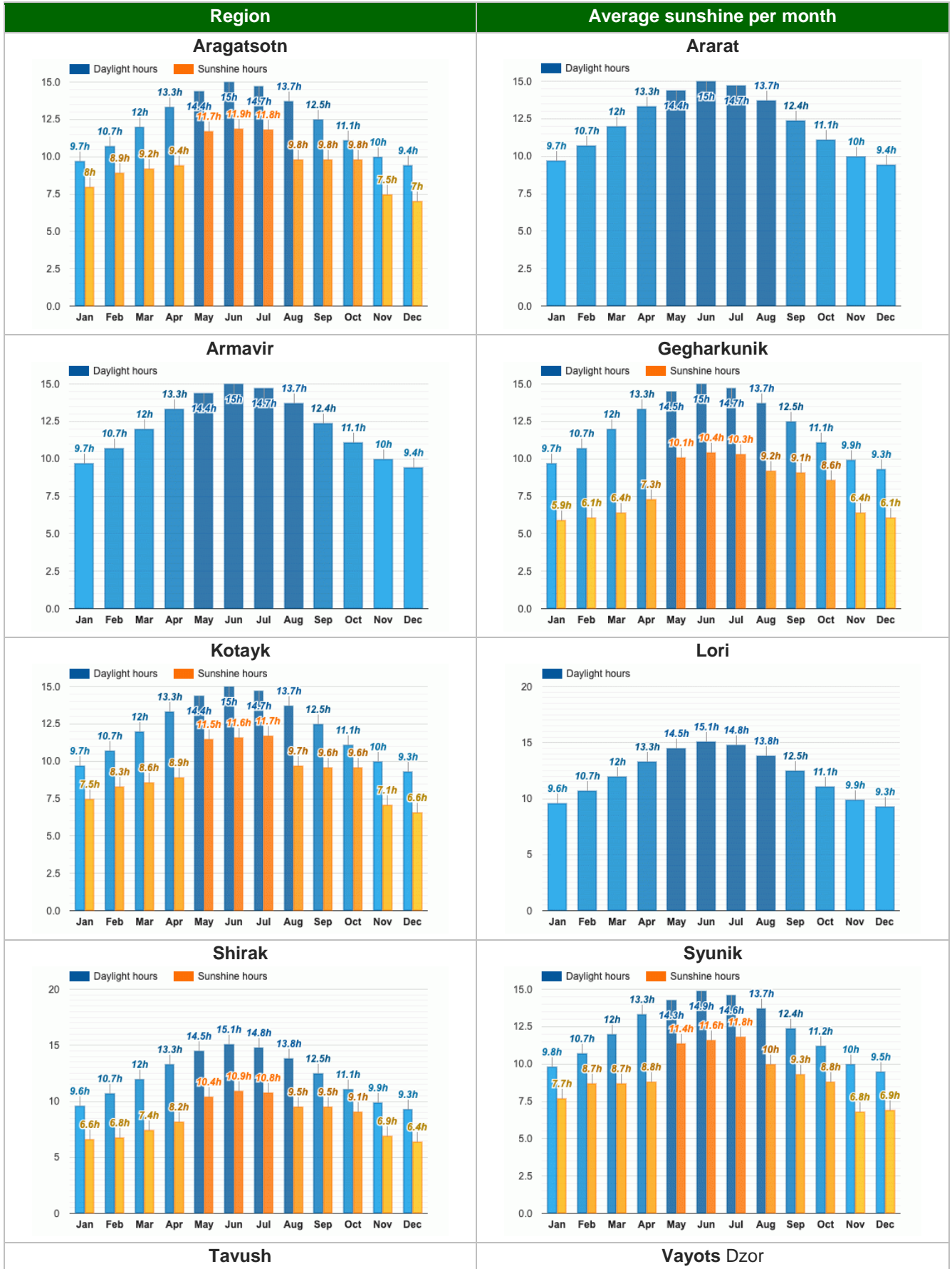
6.3.4 Financial calculations for small greenhouses

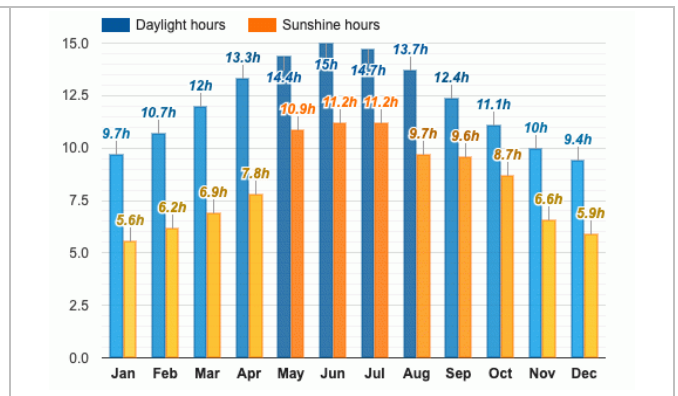
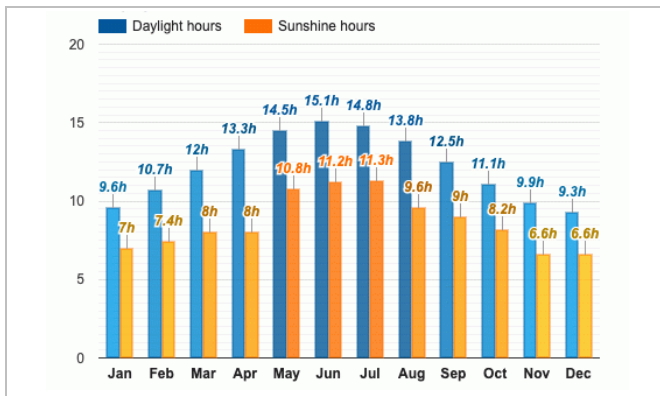
By a separate file (in Armenian) the financial calculations for small greenhouses of three different sizes (100m². 300m² and 500m²) is provided. The file name is "Financial calculations small greenhouses.xls).

6.4 CLIMATE MAP OF ARMENIA

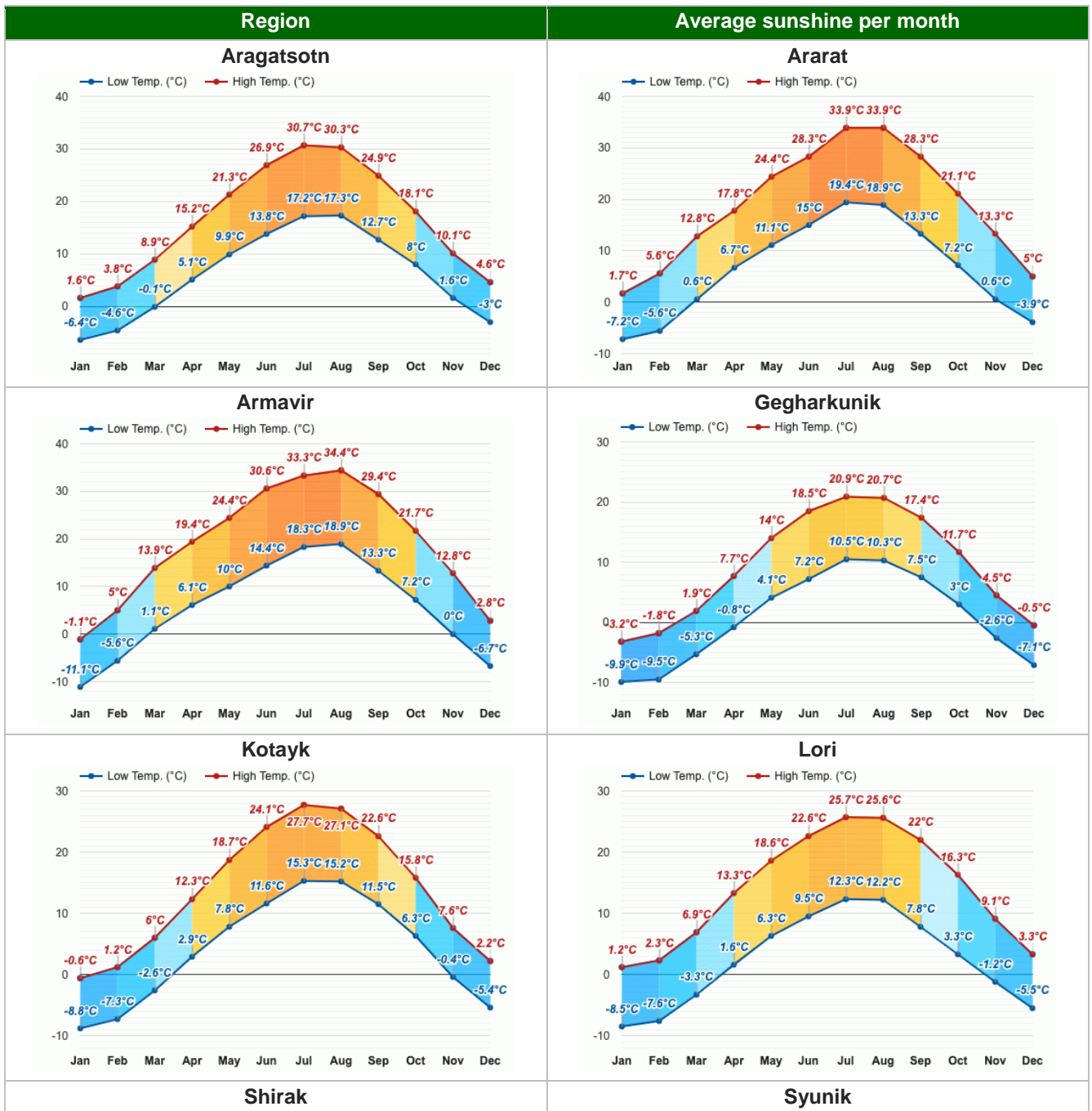


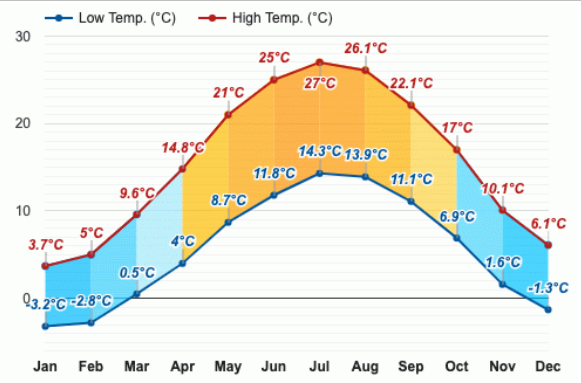
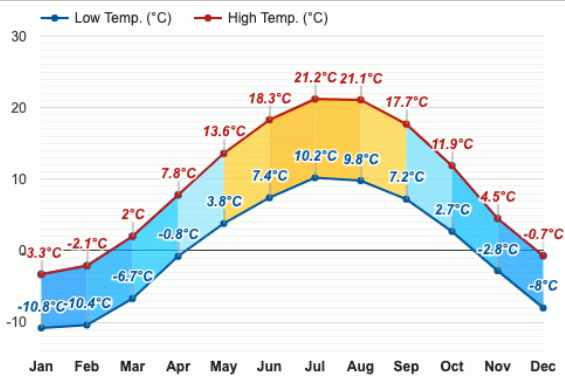
6.5 AVERAGE DAYLIGHT / AVERAGE SUNSHINE IN ARMENIA



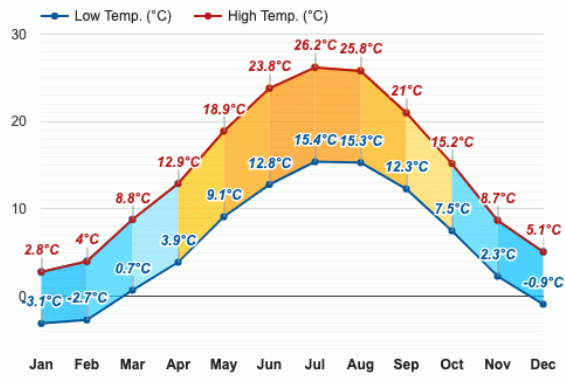


6.6 AVERAGE TEMPERATURE IN REGIONS

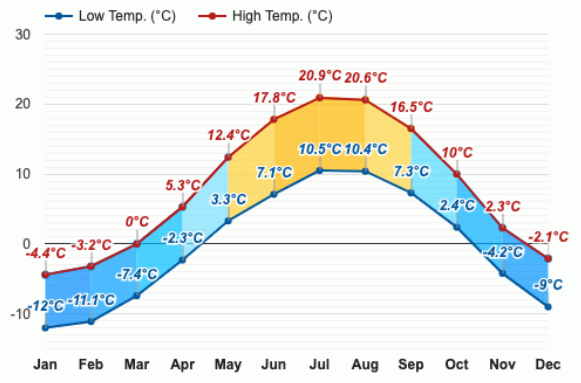




Tavush



Vayots Dzor



Source: <https://www.weather-atlas.com/>