



**Identification and implementation of adaptation response to Climate Change impact for Conservation and Sustainable use of agro-biodiversity in arid and semi-arid ecosystems of South Caucasus**

# **Ecosystem Assessment Report**



**Baku, 2012**

## List of abbreviations

|         |   |
|---------|---|
| ANAS    | Azerbaijan National Academy of Science        |
| EU      | European Union                                |
| ECHAM 4 | European Center HAMburg 4                     |
| IPCC    | Intergovernmental Panel on Climate Change     |
| GIZ     | German International Cooperation              |
| GIS     | Geographical Information System               |
| GDP     | Gross Domestic Product                        |
| GFDL    | Global Fluid Dynamics Model                   |
| MENR    | Ministry of Ecology and Natural Resources     |
| PRECIS  | Providing Regional Climate for Impact Studies |
| REC     | Regional Environmental Center                 |
| UN      | United Nations                                |
| UNFCCC  | UN Framework Convention on Climate Change     |
| WB      | World Bank                                    |

## Table of contents

|   |    |
|---|----|
| List of abbreviations .....   | 2  |
| Executive summary .....   | 6  |
| I. Introduction.....  | 7  |
| II. General ecological and socio-economic description of selected regions .....               | 8  |
| 2.1. Agsu district.....   | 8  |
| 2.1.1. General information.....   | 8  |
| 2.1.2. Climate .....  | 8  |
| 2.1.3. Land cover .....   | 9  |
| 2.1.4. Water resources and irrigation system .....  | 11 |
| 2.1.5. Socio-economical situation .....   | 12 |
| 2.2. Shamakhi district.....   | 13 |
| 2.2.1. General information.....   | 13 |
| 2.2.2. Climate .....  | 14 |
| 2.2.3. Land cover .....   | 15 |
| 2.2.4. Water resources and irrigation system .....  | 16 |
| 2.2.5. Socio-economical situation .....   | 16 |
| 2.3. Gobustan district.....   | 18 |
| 2.3.1. General information.....   | 18 |
| 2.3.2. Climate .....  | 18 |
| 2.3.3. Land cover .....   | 19 |
| 2.3.4. Water resources and irrigation system .....  | 20 |
| 2.3.5. Socio-economical situation .....   | 20 |
| III. Analysis of agricultural sector conditions and development.....                          | 22 |
| 3.1. Agsu district.....   | 22 |
| 3.2. Shamakhi district.....   | 24 |
| 3.3. Gobustan district.....   | 26 |
| IV. Review of current situation in agro-biodiversity and changes tendency .....               | 28 |
| 4.1 The results of the inventory of the agricultural species spread in selected regions ..... | 28 |

|  |    |
|--|----|
| 4.2 Results of the inventory of the wild relatives of agricultural species and the analysis of the tendency of changes for the last 50 years ..... | 61 |
| 4.3 Results of the pastures plants inventory and analysis of the tendency of the changes for the last 50 year.....                                 | 64 |
| 4.4 Major risks of the influence on agro-biodiversity and local species, including those facing the elimination risk.....                          | 66 |
| V. Current climate change and climate change scenario.....   | 69 |
| 5.1 Assessing current change in climate elements .....   | 69 |
| 5.2 Future Climate Projections for 2020-2050.....  | 73 |
| 5.2.1. Temperature change in 2020-2050 years .....   | 74 |
| 5.2.2. Change in rainfalls in 2020-2050 years .....  | 74 |
| VI. Assessment of Ecosystems and agro-biodiversity vulnerability to climate change .....   | 76 |
| 6.1 Selection of indicators for assessment of vulnerability and detailed description .....   | 76 |
| 6.2 Assessment of ongoing climate change and possible influence on forecast climate change (2020-2050) to agro-biodiversity .....                  | 77 |
| 6.3 Calculation of vulnerability indices and selection of pilot regions.....   | 79 |
| VII. Conclusions and Recommendations .....   | 82 |
| <i>Agriculture and agro-biodiversity:</i> .....  | 82 |
| <i>Institutional gaps:</i> .....   | 83 |
| <i>Environmental knowledge and access to environmental information:</i> .....  | 83 |
| VIII. List of references.....  | 85 |

## List of tables

|   |    |
|---|----|
| Table 1: Information on basic infrastructure of Agsu district .....   | 12 |
| Table 2: Labor, agricultural labor and average salary in Agsu district .....  | 13 |
| Table 3: Information on basic infrastructure of Shamakhi district .....   | 17 |
| Table 4: Labor, agricultural labor and average salary in Shamakhi district .....  | 18 |
| Table 5: Information on basic infrastructure of Gobustan district .....   | 20 |
| Table 6: Labor, agricultural labor and average salary in Gobustan district .....  | 21 |
| Table 7: # of cattle and poultry in Agsu district (data of 2010).....   | 23 |
| Table 8: # of cattle in Shamakhi district (data of 2010) .....  | 25 |
| Table 9: # of cattle and poultry in Gobustan district (data of 2010).....   | 27 |
| Table 10: Information on zoned agriculture plants (south-east part of Shamakhi district and lowland part of Gobustan district).....               | 28 |
| Table 11: Information on second zoned agriculture plants (foothills and plain part of Aghsu district and south border of Shamakhi district) ..... | 32 |

|  |    |
|--|----|
| Table 12: Information on 3 <sup>rd</sup> zoned agriculture plants (south border of Aghsu district and north part of Shamakhi district).....                  | 35 |
| Table 13: Information on 4 <sup>th</sup> zoned agriculture plants (foothills and plains of Gobustan district and south-east part of Shamakhi district) ..... | 39 |
| Table 14: Information on 5 <sup>th</sup> zoned agriculture plants (midlands of Shamakhi district) .....  | 41 |
| Table 15. Temperature change in 2020-2050 years.....   | 74 |
| Table 16. Change of rainfalls in 2020-2050 year, in percentage.....  | 75 |
| Table 17: Vulnerability indices, weights and coefficients .....  | 79 |
| Table 18: Results of calculations of vulnerability indices for each component .....  | 80 |

## List of figures

|   |           |
|---|-----------|
| <b>Figure 1: Income distribution by sectors (Agsu district) .....</b>   | <b>13</b> |
| <b>Figure 2: Income distribution by sectors (Shamakhi district) .....</b>   | <b>17</b> |
| <b>Figure 3: Income distribution by sectors (Gobustan district) .....</b>   | <b>21</b> |
| <b>Figure 4. Map of differences between average annual temperatures and climate data for 1961-1990 .....</b>                            | <b>73</b> |
| <b>Figure 5. Difference between amounts of rainfall norms (mm/day) calculated by PRECIS model and CRU climate data .....</b>            | <b>73</b> |
| <b>Figure 6. Increase of average annual temperature in the region (difference between data of 1961-1990 and 2020-2050 period) .....</b> | <b>74</b> |
| <b>Figure 7. Change of rainfall in the region (comparison of data 2020-2050 years with data of 1961-1990), %.....</b>                   | <b>75</b> |

## Executive summary

Ecosystem Assessment Report is the summary of provided assessments by experts in the field of geomorphology, agro-biodiversity, agriculture, climate, socio-economic situation and situation at pastures of the selected project regions and aims to substantiate the selection of pilot regions based on proposed methodology and the available data. Current report provide brief description of ecosystems of selected regions in Azerbaijan focusing on general ecological and socio-economic description, analysis of agricultural sector (including pasture) conditions and development, current situation in agro-biodiversity and changes tendency, the results of the inventory of the agricultural species ant its wild relatives, current climate change and climate change scenarios and finally assessment of ecosystems and agro-biodiversity vulnerability to climate change and identification of the most vulnerable areas.

After brief introduction provided in Chapter I, it is provided general information on ecological and socio-economic situation in selected 3 administrative districts – Aghsu, Shamakhi and Gobustan in Chapter II, including information on geographic position, relief, climate, demographic indicators, social indicators, economy, land resources, water resources, land cover and agricultural production.

Chapter III provides detailed information on agricultural sector and its development tendency of the 3 districts, mostly focusing on the main sub-sectors such as grain-growing, vine-growing and cattle-breeding.

Chapter IV includes field inventory and comparative analysis of scientific data existed for the last 50 years based on which the trends analysis in agro-biodiversity degradation and changes providing the results of the inventory of the agricultural species and its wild relatives spread in selected districts, and also information on the major risks of the influence on agro-biodiversity and local species, including those facing the elimination risk.

Current climate change and climate change scenario for selected districts is provided in Chapter V, assessing current change in climate elements and forecasting future Climate Projections for 2020-2050.

In Chapter VI, it is provided assessment of Ecosystems and agro-biodiversity vulnerability to climate change of selected districts based on proposed methodology and according to the provided calculations it was identified the most vulnerable areas and pilot communities. In case of Azerbaijan, Gobustan district has been identified as the most vulnerable area with vulnerability indices of 0.91. As communities should be selected from both and semi-arid zones, 2 communities in arid zone from Gobustan district and one community in semi-arid zone from Shamakhi district has been selected as pilot communities base on the results on field observations and experts judgments.

## I. Introduction

The overall objective of the “Identification and implementation of adaptation response to Climate Change impact for Conservation and Sustainable use of agro-biodiversity in arid and semi-arid ecosystems of South Caucasus” project funded by EU and co-financed by GIZ is to develop adaptive capacity in order to ensure the sustainability of agro-biodiversity of vulnerable arid and semiarid ecosystems, as well as local capacity for the possible existence of climate change.

Being regional scale, project considers the development of a package of proposals for the harmonization of local legislation and the decision of the institutional issues in the South Caucasus, as well as carrying out adaptation activities in selected rural communities located in the arid and semi-arid areas, in order to preserve agro-biodiversity and implementation of sustainable practices in their communities to reduce the risk of adverse effects of possible climate change that will benefit the rural population and the environment.

Based on the available literature, cartographic, statistical and other materials, as well as visual observation of national experts of the project there had been selected three administrative districts (Agsu, Shamakhi and Gobustan) in arid and semiarid areas in order to implement the project. The selected areas are located in the eastern part of southern slope of Great Caucasus.

This ecosystem assessment report provides a summary of work carried out by national experts under the project that have provided below listed reports based on Terms of References.

- GIS and geomorphology of the regions;
- The status of agriculture and crop yield analysis for 50 years and the current state of productivity;
- Climate characteristics and climate change tendencies in target regions;
- Analysis and recommendations for improving the political and legal framework for the country's agro-biodiversity issues from the point of view of the risks of climate change;
- Current condition of agro-biodiversity in Azerbaijan and affecting factors;
- Condition of pastures in selected arid and semi-arid ecosystems and last tendency at pastures in context of climate change;
- Analysis of socio-economic status of the regions.

Along with this, there have been used published materials of scientific researches and statistical data of relevant organizations. Particular importance was attached to the results of I and II National Communication on Climate Change of the Azerbaijan Republic.

At the end of the report, it was provided calculations of vulnerability indices of selected regions using available data provided in the reports submitted by project experts.

## II. General ecological and socio-economic description of selected regions

In this chapter it is provided ecological and socio-economical description of selected regions: Agsu, Shamakhi and Gobustan districts.

### 2.1. Agsu district

#### 2.1.1. General information

Administrative region was established in 1943. Its area is – 10834 km<sup>2</sup>, the population - 72.1 thousand people, density of population - to 71 person per 1 km<sup>2</sup> (01.01.2011). 72.4% of the population lives in rural areas. The southern part of the district is located on the plain of Shirvan, and the north - on the spur of the southern slope of the Greater Caucasus, at the height of to 2000 m. The district is crossed by rivers Girdiman and Agsu. The region is crossed in plain are by Up Shirvan channel. Forests cover about 3% of the area and it is 3.1 thousand ha.

#### 2.1.2. Climate

There are 3 climate types in the region area depending on attitude:

- mild semi-deserts and dry steppes with dry summers (up to 400m above sea level);
- warm mild with dry winters (400 - 1000 m a.s.l.);
- cold with wet winters (above 1500 m a.s.l.).

The average annual temperature varies between 15 – 5 °C, temperature in January is 3 – 5 °C, and in July - 27-15 °C. Absolute minimum and maximum temperatures change within the -16 -32 °C and 43 -27 °C.

Amount of the absolute annual minimum air temperature (T sr.abs.min.), that characterizes the conditions for overwintering plants varies here from -10 °C to – 20 °C. The territory of the district is divided into two thermal zones based on heat supply plants as determined by the sum of daily mean air temperatures above 10 °C:

- warm ( $\sum_{T>10} \text{ } ^\circ\text{C} > 38000 \text{ } ^\circ\text{C}$ )
- moderate ( $\sum_{T>10} \text{ } ^\circ\text{C} = 3800 - 20000 \text{ } ^\circ\text{C}$ )

The annual quantity of precipitation varies from 400-450 mm in the plains and lower foothills to 900-1000 mm in the mountains. And, if the humidification of mountain areas can be considered satisfactory, plain-piedmont and low areas where the main and rural development, humidification is not enough. Thus, in this area (up to an altitude 1000m above sea level) evaporability (potential evaporation) during the active vegetation (April - October) exceeds precipitation till 600-650mm (6.0 - 6.5 thousand m<sup>3</sup>/ha) in plain and 50 - 100 mm (0.5 - 1.0 thousand m<sup>3</sup>/ha) in low-mountain areas. Lack of water necessary is to be filled by artificial irrigation.



Isolation of humid areas in the district is made by the most popular in Azerbaijan humidification indicator Md (Shashko, 1963; 1985)

$$Md = P/f,$$

P - annual precipitation, mm,

f - conditional evaporation is determined by the formula

$$f = 0.45 \sum E - e,$$

$\sum E - e$  – the amount of daily air humidity deficit, rΠa.

Moisture zones in the district area are identified based on this indicator: arid and semiarid in plains and foothills, humid and excessively humid in mountain areas.

### 2.1.3. Land cover

Relief of Aghsu district differing from each other with vertical zoning, climate condition, replacement each other of mountain-forest stepped and semiarid plant group, hydrogeology condition of Aghsu district create an opportunity for forming of mountain-forest grass-carbonate, mountain black, mountain-forest-brown, mountain stepped brown, mountain-grey-brown, mountain chestnut (strong, ordinary, light), mountain meadow chestnut, meadow-grey, meadow-swampy and boggy land types, their semi types and variety of types.

Mountain-forest turf-carbonate soils – this type of soil is spread in beginning part of Aghsu river basin, forest areas surrounding the villages Udquq, Hadjimal, Dilma, Kalva, also some parts along Sulut river basin (under the forests of oaks, hornbeam, pistachio at the height of 1000-1400 m).

Mountain-forest grass carbonate soils are characterized by strong color of up layer, granular structure, low layers color is brown, then it becomes grey, whole profile especially low layers have skeleton shape. By increasing of skeleton, after that the structure weakens and up humus layer sharp crosses in carbonate layer.

High amount of humus 5,0-12,0% mainly is spread in sharp cracked area especially in arid forest and stepped forest fields, in up layers of turf soil. But there is observed sharp decreasing of humus in low layers. Amount of nitrogen is 0,50-0,60%.

Thickness of humus horizon changes between 30-40sm. Skeleton increases from up to low layer. Turf-carbonate soils in terms of mechanical content are light and middle clayed. Amount of physical clay hesitates between 62-74%. Amount of silt particles is 20-32% and it is decreasing along the profile directed to bottom.

According with total resources of nutrients, mountain-forest turfed carbonate soils enter to high bonitet soils group, humus reserves in 0,2sm layer of 1 ha area is 472-511tonn,

amount of agile nitrogen in 1kg soil is 50-150mg, amount of appropriated phosphorus is 10-30mg, amount of exchanged potassium is 200-300mg.

Mountain-black soils – this type of soil is spread surrounding the villages Yenikend, Nuran, Girlar, in small areas under forests with favorable hydrothermic conditions. These soils are completely plowed especially for potatoes, crops.

The main features of mountain black soils are intensive and strong color of humus horizon, thickness of granular layer is 70-80cm, structure of the whole mild granular profile is 1m. This type of soils is relatively rich with humus (5,0-8,0%), amount of humus decreases directed to low layers.

The results of mechanical content analysis shows that mountain black soils enter to the group of clayed soils. Amount of physical clay (0,01mm) in up layers is 80-85% and it decreases directed to low layers. 40-88% of this fraction consists of silt particles. Mountain black soils have being used in agriculture of Aghsu region from ancient times. Amount of humus reserves in one meter of black soils entered to the group of high bonitet is 240-260t/ha, amount of nitrogen reserve is 30-32t/ha and it in turn approves the soil fertility.

Mountain forest-brown soils- this type of soil is spread in the low zone of Aghsu river basin, nearby the villages Gurjduvan, Nuydi at the height of 500-1000m above sea level. These soils are spread under the arid forests consisting of oaks, hornbeam, hawthorn and under well developed grass plants. This type of soils had been mainly formed on the lime, lime sandy stones, clay slates and their carbonate delluvial-preluvial precipitation.

The morphological features of the typical forest-brown soils of Aghsu district are well colored of up layer with humus, falling down of whole profile for 60-70cm, clearly expressed granular structure and clayed mechanical content. High clayed is observed in the whole especially in middle part of profile.

Amount of humus in up layer is 4,0-8,0% and the amount decreases along the whole profile. Mechanical content of the soil is clayed, amount of physical clay (0,01mm) in up layer is 64,0-72,0%. But this amount decreases in middle part of the profile for 10-15%. Amount of clay particles change between 30-36%.

Mountain forest brown soils differ from ordinary brown soils by relatively short profile affected by erosion, less humus and skeleton display.

Meadow-grey soils - clay and erosion of the soils had been caused by development under impact of ground water on surface and in depth of 2,5-3,5m.

Completely meadow-grey soils are characterized by relatively high amount of humus and thickness of humus layer, amount of humus in up layer of uncultivated soils is 2,5-2,9%, in cultivated area the amount of humus is 1,5-1,9%. Mechanical structure of the soil is clayed and heavy clayed, amount of physical clay (0,01mm) is 60,0-68,8%. High amount of clay particles is observed in middle part of profile.

Weak salinization of meadow-grey soils is caused by easily dissolving of salts along the profile. Thus, amount of dry residual in up layer is 0,17-0,74%. Salinization in irrigated meadow-grey soils is caused by washing process along the profile, the analysis results show that amount of dry residual in 110-120sm layer is 1,6-1,8%.

According to agro production indicators, meadow-grey soils had been high bonitet soils and the soils have being used under cotton-growing, crops and garden vegetables plant. This type of soil has enough amount of nutrients elements, amount of humus in 0,5sm layer of one ha area is 40-200tonn, amount of adopted nitrogen is 100-250mg in 1kg of soil, amount of phosphorus is 5-20mg, amount of exchanged potassium is 150-300mg.

Meadow-marsh soils – this type of soil is mainly spread nearby of villages Arabushagi, Kandoba and Kukesh, Karasu area. This type had been formed by impact of surface and subsoil waters, especially by the waters covered the area for long term and afterwards coming of the waters to surface.

Subsoil waters had been weakly mineralized. The stratum that formed the soils consist of alluvial, in some areas alluvial-proluvial carbonate, salted, clayed and stony particles.

Morphological features of this type of soil is 5-8sm thickness of grassy turf in uncultivated soils, well coloring of profile with humus and forming of clay horizon in low part of profile. There are formed big cracks in arid soil surface. Meadow-marsh soils are usually observed in little areas affected by constantly mineralization of subsoil waters and clayed and salted stratum.

In terms of agro production, meadow-marsh soils had been middle bonitet soils and have high fecundity potential. Humus reserve in up layer 0-20sm of one ha area is 100-200tonn, amount of easily adopted nitrogen in one kg of soil is 70-100kg, amount of adopted phosphorus is 10-40mg, amount of exchanged potassium is 150-300mg.

#### **2.1.4. Water resources and irrigation system**

Most of the Aghsu district is characterized by lack of moisture. The reason is the uneven distribution of water or a minimum of Aghsuchay River.

In the plains and foothills of the district where the precipitation amount is 440 mm per year, only 11% or 80 mm of them is from river flow, 40% of which are formed by underground water. Small river flow - 2.22 m<sup>3</sup> / s creates a shortage of irrigation water in the lowland area.

In the direction to Shirvan plain the water is distributed from Aghsu river to channels by various agriculture lands. But not satisfactory condition of irrigation and drainage system, inefficient irrigation methods lead to such negative phenomena as loss of 50% irrigation water and as a consequence of the secondary salinization of soil.

Thus, currently there is no any modern water-saving irrigation system in Aghsu district due to low fees for water. It in turn leads to irrational use of water.

Conducted assessment of water resources carried out based on statistical models shows that last years there is observed decreasing of water resources. It is directly connected with climate change. Based on modeled forecasts, increase of temperature for 3-40C will lead to decreasing of river flow for 10-20%. Based on this with a fairly high probability it could be assumed that the failure to take appropriate measures will lead to further water shortages.

The length of the irrigation system of the district is 987 km of which only 62.5 only reinforced (concrete), 6.2 km are a closed system, and the rest of the network takes place in earthen channel. 425.6 km of irrigation system in need of repair.

In the district 20,944 ha has horizontal closed drainage system. Length of drainage system is 1227.6 km, 106.9 of which are collectors, 338.4 km are open drains, 782.3 km are closed drains. 200 km of this system is in need of repair and reconstruction.

This state of irrigation and drainage system had led to the emergence and strengthening of the processes of secondary salinity. For example, 568 hectares of agricultural land is strong and very salty, 6068 ha is semi saline and 7178 hectares are low saline and alkaline.

#### 2.1.5. Socio-economical situation

There are 69 secondary schools, 8 early school and 5 other education entities in the district. 6 hospitals, 18 ambulatory medical units and 22 medical points provide medical services for the population. There is 1 cultural center, 10 cultural houses, 47 libraries, 1 children music-school and 1 history museum in the district.

*Table 1: Information on basic infrastructure of Aghsu district*

| <b>Infrastructure</b>                              | <b>#</b> |
|--|----------|
| No. of farmers' markets                            | 3        |
| Asphalt roads (km)                                 | 75       |
| Rural population with public gas supply system (%) | 55       |
| Rural population with electricity (%)              | 100      |
| Rural population with public water supply (%)      | 3        |

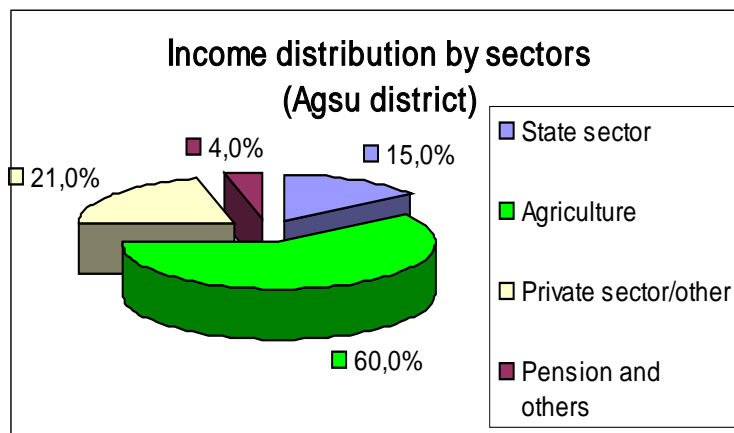
Aghsu district is mainly agricultural region. Vine-growing, cotton-growing, fruit-growing, grain-growing and cattle-breeding are the leading agricultural sectors. Pomegranate growing, silkworm breeding and apiculture (bee-keeping) in mountain areas are other alternative sectors developed. Local population of the district is dealing with pomegranate, fruit growing, melon plants and vegetables as supportive farming activities.

After privatization process (1997-2000), it was provided special attention to vine-growing activities and new private vineyards (368 ha) have been established in the region. Since 2001 to 2011, total amount of yearly production was increased from 1047 tons to 1647 tons. 2 vine processing units are active at present time. Along with vine-growing, grain-

growing is also takes important role in agricultural sector of the district. In 2011, total production was 66.80 thousand tons.

**Figure 1: Income distribution by sectors (Agsu district)**

Regards the income distribution of local population by sectors, as it is clear from the diagram most part of income of local population is generated from agricultural activities. This indicates the importance of agricultural development for livelihoods of local population, as well the importance of current applied project. The second important sector is related private sector, which is somehow linked with agriculture such as agro-processing, small trade of agricultural production, transportation services and so on.



**Table 2: Labor, agricultural labor and average salary in Agsu district**

|   |        |
|---|--------|
| Total labour in the region (No. of employees)           | 20,188 |
| Agricultural labour (No. of those working in farming)   | 12,113 |
| of which female workers (No.)                           | 3,634  |
| Average national salary (EUR)                           | 368    |
| Average salary in the region (EUR)                      | 187    |
| Average salary in the agric. sector of the region (EUR) | 165    |
| Total labour in the region (No. of employees)           | 20,188 |

Based on available data it was identified that, due to diverse farming activities, as well as a result of some natural and anthropogenic factors the area of fertile lands has decreased, some lands has become degraded leading to reduce in total productivity at district level. There are 568 ha of land with sharp salinisation, and 6068 ha of land with average and high level of salinisation. 7178 ha of land with salinisation is provided with collector-drainage system. Besides, traditionally provided dry-farming cultivation activities at open glade areas makes negative impact to the development of drought and surface erosion. In order to prevent all these negative impact it is expedient to take measures against drought, support to natural rehabilitation process, stop pasturing at grassy areas of forests and use grass surfaced areas as hayfields to improve fodder basis for cattle-breeding. Reduce of hayfields area, almost non-existence of natural pastures has significant impact on the cattle-breeding activities.

## 2.2. Shamakhi district

### 2.2.1. General information

The administrative district was formed in 1930. The territory is 1611 km<sup>2</sup>. Number of population referring to 01.01.2011 is 93,8 thousand, population density is 58 people per 1

km<sup>2</sup>. 61% of population lives in villages. There is located Kurdu Shirvan plain in the south part of the district, the rest part of the district is located on spurs of south slope of Great Caucasus at the height of 2500 m above sea level. About 80% of population live in piedmont and lowland areas. The district is crossed by Pirsaat river, Chigilchay river and Qozluchay river and by inflow of Aghsu river. 11,5 thousand ha or 7,4% of the district area is under forests.

### 2.2.2. Climate

There are spread four climate types depending on altitude:

- Mild warm semiarid and dry steppe with dry summer (400 m above sea level);
- Mild warm with dry summer (400-1000 m above sea level);
- Mild warm with equable precipitation (1000-1500m above sea level);
- Cold with humid winter (over 1500m above sea level).

Average annual temperature changes between 14-15 °C in plain area, 2-3 °C in highlands, January temperature changes accordingly between 0 and -6 -7 °C, temperature in July from 27 °C till 15-12 °C. Absolute minimum temperature changes between -16 °C and 32 °C and maximum temperature changes between 43 °C and 25 °C.

The mean of the absolute annual minimum air temperature ( $T_{sr.abs.min.}$ ), characterizing the conditions for overwintering plants varies here from - 10 °C to - 20, -22 °C. And in terms of heat supply of the plants identified by the sum of their average daily air temperatures above 10 °C, the territory of the district is divided into three thermal zones:

- warm ( $\sum_{T>10} > 3800$  °C)
- mild ( $\sum_{T>10} = 3800 - 800$  °C)
- cold ( $\sum_{T>10} < 800$  °C)

The annual quantity of precipitation varies from 400-450 mm in the plains and lower foothills of the territory to 1100 mm or more in a highlands. If the moisture of mountain areas can be considered satisfactory, then in the valleys and foothills and the lowland's areas where the agriculture is mainly developed, it is like in Aghsu is not enough. Here also evaporation during the active growing season (April - October) exceeds precipitation in the 600-650mm (6.0 - 6.5 thousand m<sup>3</sup> / ha) in the plains and 50 - 100 mm (0.5 - 1.0 thousand m<sup>3</sup>/ ha), low mountain foothill areas. In the east, adjacent to the Gobustan region, there is more deficit of moisture. Lack of water must be restored mainly by irrigation.

There are identified zones of moisture in the district by the ratio of annual amount of atmospheric precipitation and evaporation (defined in terms of moisture  $M_d$ ): from arid arid and semiarid in plain and foothills, humid and excessively humid in highland areas. In the district, zones moisture from arid and semiarid in the valleys and foothills, to the excessively wet and damp in the mountainous and highland areas.

### 2.2.3. Land cover

Land cover as well as other components of nature landscape is changed in compliance with vertical direction. Various types of land replace each other from lowland to top of mountains.

Land cover is indispensable nature resource used in agricultural activities and livelihood. Together with plant cover, land cover has great role in regulation of normal condition of environment, air protection, water, food and human health.

Land cover of district is very different. Mountain-meadow, brown, mountain-forest light chestnut, strong chestnut, black and gray-brown soils are spread in this region. Mountain-meadow soil has the following types: peat, turf, mild turf and black soil.

Mountain-forest soil had been formed below of mountain-meadow soils at height of 700-2000 meters under forest plants. Mountain-forest soils are strong colored, have granular structure, low layers are brown, grey.

High amount of humus is observed in cracked area of forest zones, drought forests and stepped forests, in upper layers of turf soils, sharp decrease of humus is observed in low layers. Amount of nitrogen is 0,50-0,60%.

Humus horizon is changed between 35-45 sm. Skeleton is increased from this layer taking direction to lower layers. These soils in mechanical terms are light and middle clayed. Amount of silt particles are decreased directed to depth throughout all profile.

According to the general reserves of nutrients mountain-forest soils are in the group of high bonitet lands, development of phosphorus and content of potassium are different. Black soils mainly developed in Shamakhi region, on Southern slopes of the Great Caucasus. These lands began to spread to areas that are relatively smooth with the altitude from 700-800 m to 1500-200 m. These types of soil have high productivity since ancient times. The amount of humus is 5-8% in the upper layers. In dry-farming land is very convenient to grow wheat, potato, sunflower and grapes.

Black and gray-brown soils are spread in the number of villages in the region around the forest, under favorable hydro-thermal conditions.

The basic morphology features of black soils are strong and intensive color of humus horizon, mild, granular structure of whole profile. The structure is rich with humus, but amount of humus decreases in direction to lower layers.

Black soils are used in agriculture in Shamakhi district from ancient times. One meter of black soils included into the bonitet group consists of 240-260t/ha humus, 30-32t/ha nitrogen and it is indicator of high fertility of these soils.

Brown soils are spread around the villages situated above sea level and low zone of arid mountain forests. The plant cover of the area consists of oak, hornbeam, and hawthorn.

The morphological features of typical forest-brown soils of Shamakhi district is well concentration of humus in up layer of soils, descend for 60-70 sm along the profile, clearly expressed nut-shaped and ball shaped structure and clayed mechanic content. High concentration of clay is observed in whole profile especially in middle part.

Zone of gray brown soils is situated lower of mountain forest-brown soils at absolute height of 400-800m. Amount of humus of these soils is 4-6%. These soils are spread at the foothills part of Great and Small Caucasus at the height of 600 m.

Brown mountain-forest soils affected by the washing process in different degree differs from ordinary brown soils by relatively short profile, less amount of humus and display of skeleton, the profile is relatively short, less than the usual brown soils are characterized by the manifestation of humus and skeleton.

Salinization is observed in some parts of brown soils of the region. The reason of salinization process is irrigation and raise of ground waters.

#### **2.2.4. Water resources and irrigation system**

The main waterways of the district are Pirsaat river, Chigil river and Gozlu river Aghsu river tributaries. So far as plain-foothill area and lowland area in the east of the district are located in arid and semiarid zone, there is observed sharp deficit of humid during vegetation period. Therefore, in the 80s of last century, implementation of plan on building of small reservoirs and its quantity increased till 42. However, the construction was carried out without taking into consideration the environmental conditions of the area, which led later to the intensive development of erosion and landslides.

6870 ha area of the district is irrigated. Territory of drained agricultural lands is 68 ha, length of collector-drainage system is 19,8 km. waters of Upshirvan channel, Shirvan lake and other small reservoirs are used for the irrigation purposes. Only 22 small reservoirs of previous 4 reservoirs are under exploitation now.

#### **2.2.5. Socio-economical situation**

There are 72 schools in the district, including 50 secondary schools, 18 main schools and 4 primary schools. At the same time, there are 23 pre-school and 5 post-school units in the district. 1849 teachers and 200 educators work at those educational units. Total number of pupils is 14.526 and children in kindergartens are 1.250.



**Table 3: Information on basic infrastructure of Shamakhi district**

| Infrastructure                                     | #   |
|--|-----|
| No. of farmers' markets                            | 3   |
| Asphalt roads (km)                                 | 98  |
| Rural population with public gas supply system (%) | 60  |
| Rural population with electricity (%)              | 100 |
| Rural population with public water supply (%)      | 4   |
| No. of farmers' markets                            | 3   |

Main economic sector of the district is agriculture and agricultural processing. Main type of agricultural activities is vine-growing and cattle-breeding. Local population deals with potato growing, grain growing and fruit growing as supportive economic activities.

Industrial sector of Shamakhi district is also developing last years. Main industrial sectors are food and light industry, especially vine processing.

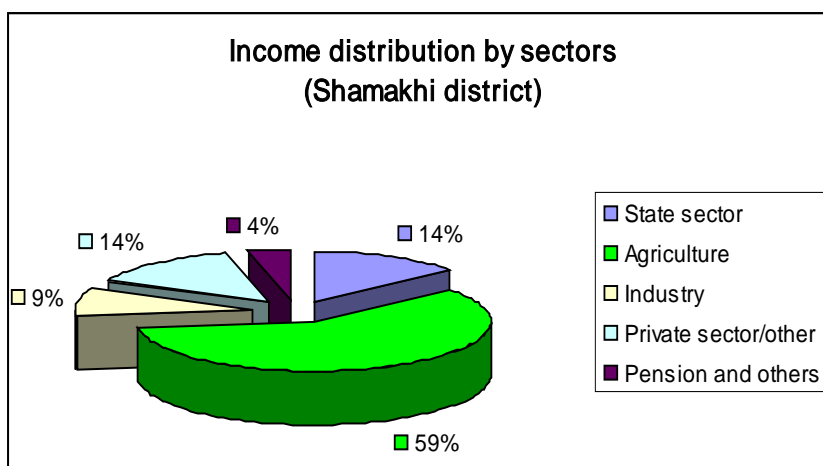
Along with grain and grapes, maize, leguminous plants, cabbage, cucumber, tomato, onion and melon plants are also cultivated in the region. There are 176 ha of non-irrigated cultivated lands with under fruits and berry gardens.

Vine-growing activities in Shamakhi district are mostly provided at non-irrigated lands. Since 2005, 1125 ha of new vineyards have settled in the region.

After land privatization, local population has increased activities in vegetable production. So as, in 2011, 668 ha of land are cultivated with potato (4863 tons of production) and 456 ha with other vegetables and water-melon products (total production of 4156 tons and 61 tons subsequently).

Regards the income distribution of local population by sectors, as it is clear from the diagram most part of income of local population is generated from agricultural activities. This indicates the importance of agricultural development for livelihoods of local population, as well the importance of current applied project. The second important sector is industrial sector that show rapid development tendency last years. The same for related private sector, which is somehow linked with agriculture such as agro-processing, small trade of agricultural production, transportation services and so on.

**Figure 2: Income distribution by sectors (Shamakhi district)**



**Table 4: Labor, agricultural labor and average salary in Shamakhi district**

|   |        |
|---|--------|
| Total labour in the region (No. of employees)           | 32,100 |
| Agricultural labour (No. of those working in farming)   | 19,260 |
| of which female workers (No.)                           | 5,778  |
| Average national salary (EUR)                           | 368    |
| Average salary in the region (EUR)                      | 188    |
| Average salary in the agric. sector of the region (EUR) | 150    |

There is wide range of opportunities for development of Shamakhi district as it has unique relief, natural resources, soil and flora. So as agriculture and agro-processing sector should be market-oriented relevant to market economy.

## **2.3. Gobustan district**

### **2.3.1. General information**

Gobustan district was formed on 24 April 1990. In 1990, the number of population of the district was 32,5 thousands. Due to statistical data of 2011, total number of population is 41.600 from which 23.870 are economically active population. Total area of the district is 1.369,4 km<sup>2</sup>. An average population density is 27 km<sup>2</sup>.

The district has borders with Tahtayaylag system of Shamakhi district in the North, along with Chingil river of Xizi district in the North-East, and with Absheron, Hacıqabul districts in East and South East and in South subsequently.

### **2.3.2. Climate**

There are spread 3 climate types depending on altitude:

- mild warm semiarid and drought steppes with dry summer (till 600-700m above sea level)
- mild warm with dry summer (600 - 1500 m above sea level)
- cold with wet winter (high 1500 m above sea level).

The average annual temperature ranges from 14-15 °C in the plains area, 6-7 °C at the upper border of the region in midlands, January temperature, respectively changes between 3 to-4 °C and the July 27 to 18 °C. The absolute minimal air temperature respectively, varies in the range -16 - 25 °C and below, and maximum 43 - 32 °C. The mean of the absolute annual minimum air temperature (T sr.abs.min.), which characterizes the conditions for overwintering plants ranges from -10 to -16 °C, -18 °C.

According to the heat supply of the plants, the amount determined by the average daily air temperatures is above 10 °C, the territory of the district is divided into two thermal zones:

- warm ( $\Sigma_T > 0$  with  $10 > 3800$  °C)
- mild ( $\Sigma_T > 10$  °C = 3800 - 800 °C)

The annual quantity of precipitation varies from 300 mm in the plains area, 600 - 650 mm in the middle mountain. During the active growing season (April - October) the amount of precipitation is no more than 50-60% of annual norm and evaporation over the same period is 800-850 mm in the lower plains of the district, and 400-450 mm in the middle mountain. These figures show that throughout the area during the growing season there is a lack of moisture, which varies from 650-700 mm (6.5-7.0 thousand m<sup>3</sup> / ha ) in the plains up to 50 – 100 mm (0.5 - 1.0 thousand m<sup>3</sup> / ha) - in the middle mountain.

Unlike Agsu and Shamakhi regions, there is no practically wet area. The moisture index Md here ranges from 0,12-0,15 in the plains, to 0.45 in the upper part of the midlands. Thus, there are areas of natural moisture from arid to humid.

### 2.3.3. Land cover

The factors influencing to land cover, agriculture spheres, productivity and fertility of Gobustan district that covers South-East part of Great Caucasus with the area of 187,2 thousand ha and 2,17% of total country had been comprehensively analyzed in terms of science and practice.

The following types of the soil are spread in area of Gobustan district:

- mountain-black soils;
- stepped mountain brown soils;
- mountain strong brown soils;
- mountain-chestnut soils;
- mountain light chestnut soils;
- meadow-chestnut soils;
- grey-brown soils.

Grey-brown soils are characterized by weak wave shape, arid condition, plastered stratums, weak expressing of genetic layer.

According to the chemical analysis, amount of humus in up layer is 0,8-2,0%, amount of nitrogen is 0,10-0,18%. Absorption capacity was weak, soil condition is alkali. Humus reserve in the layer of 0-50sm of one ha area is 65t/ha, nitrogen reserve is 4 t/ha. Amount of easily dissolved salts in saline soil in up layer of 0-50sm is 1,6% and it is mainly with sulphate.

The above mentioned type and sub types of soils are divided into 25 diversities according to their humus thickness, salinization degree and salinization features. 26,0% of grey-brown soils in weak form, 10,3% middle, 13,5% severe are exposed to erosion process.

### 2.3.4. Water resources and irrigation system

The district is crossed by 4 rivers – Pirsaat river, Sumqayit river, Gozlu river and Dzheyrankechmyaz river. River network density is low. Relatively large rivers Pirsaaatchay and Sumqayitchay border south-western and north-eastern edge of the district. Shallow river Dzheyrankechmaz takes its source not far from the administrative center of the district Gobustan and flows through the central part of the district. Its length is 12 km. River feeds mainly by precipitation. Flow occurs within 40-70 days in the year, and in some particularly dry years - 15-25 days.

The length of Pirsaaatchaya through the district is about 15 km. Due to the fact that its waters are widely used in neighboring Shamakhi district in summer and in the absence of rainfall and in autumn the river dries up, and thus its waters do not reach the Caspian Sea. Power of river is mainly due to precipitation. The share of snowmelt and groundwater accounts for respectively 12 and 14% of the flow.

Mineralization of river water of district have the highest rates in the country (more than 1000mg / l), which to some extent, making them difficult to use.

The density of river network, especially in the southern part of the area is negligible. Its indicator is in general, for areas under consideration, varies in the range 0.05 - 0.10 km / km<sup>2</sup>. Water resources of the district is 0.19 km<sup>3</sup>, or 5% of total water resources of the Southern slope of the Greater Caucasus, which leads to a significant shortage of moisture. The situation is exacerbated by the fact that groundwater is also mineralized, even drinking water is slightly brackish.

The territory of irrigated area in the district is 1577 ha for irrigation that use water of rivers Pirsaaatchay and Gozluchay. However, the irrigation system of the district is almost not suitable and requires major reconstruction.

### 2.3.5. Socio-economical situation

There are 18 secondary, 10 main and 2 preliminary schools in Gobustan district. 5756 pupils studying at those educational units with total contingent of teacher of 572. Central District hospital, Sundu village hospital, Tekle village field hospital and 12 medical points provide medical services for the population of the district.

*Table 5: Information on basic infrastructure of Gobustan district*

| Infrastructure                                     |     |
|--|-----|
| No. of farmers' markets                            | 2   |
| Asphalt roads (km)                                 | 77  |
| Rural population with public gas supply system (%) | 45  |
| Rural population with electricity (%)              | 100 |
| Rural population with public water supply (%)      | 2   |

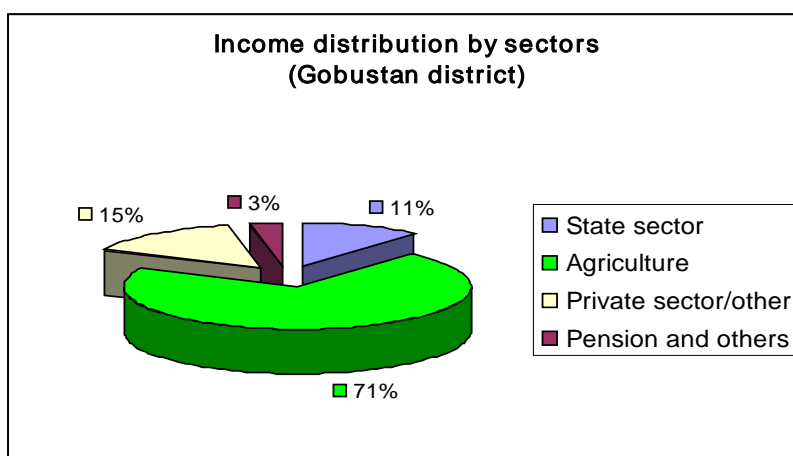
Despite of fact that there are large land areas under administration of Gobustan district, total area of lands used for agricultural activities is 112,8 thousands ha which is 60,3% of total area of the district..

The crop production is the traditional sector in the district. Grain-growing activities are the main agricultural activity and mostly are produced under dry-farming methods. Total annual production of grain is up to 40 thousand tons and it creates suitable conditions for the development of cattle-breeding and poultry activities.

Current summer-winter pasture areas of Gobustan district create suitable conditions for the development of livestock activities, mainly sheep-breeding (at present, the number of small-horn cattle is more than 180.000). Poultry is other alternative sector in the region.

**Figure 3: Income distribution by sectors (Gobustan district)**

Regards the income distribution of local population by sectors, as it is clear from the diagram most part of income of local population is generated from agricultural activities (71%). This indicates the importance of agricultural development for livelihoods of local population, as well the importance of current applied project. The second important private sector, which is somehow linked with agriculture such as agro-processing, small trade of agricultural production, transportation services and so on.



**Table 6: Labor, agricultural labor and average salary in Gobustan district**

|   |        |
|---|--------|
| Total labour in the region (No. of employees)           | 12,064 |
| Agricultural labour (No. of those working in farming)   | 8,565  |
| of which female workers (No.)                           | 2,570  |
| Average national salary (EUR)                           | 368    |
| Average salary in the region (EUR)                      | 200    |
| Average salary in the agric. sector of the region (EUR) | 180    |

Along with vine-growing and grain-growing activities local farmers are also deals with potato growing, vegetable production and production of melon plants, as well with pomegranate production. More than 95% of cultivation is provided using dry-farming method. There are 1577 ha of conditionally irrigated lands in the district, which uses water from Pirsaat and Gozlu rivers passing the district.

### III. Analysis of agricultural sector conditions and development

#### 3.1. Agsu district

Agriculture is most important directions of the district. Based on data from 01.01.2011, there were 75133 ha useful for agriculture area. 35379 ha of them is arable, 2467 ha is perennial plants (1751ha vineyard), 34961ha – pastures, 497ha-hayfields, 829 ha – reserve lands.

The mainly spread soils are the following: brown mountain-forest, mountain grey-brown, chestnut meadow-grey, marshy-meadow and salinized.

As a result of conducted reforms on 1994 there were established 3 form of land ownership-state, municipal and private. Subsequently, 43,2% of total area of the district, 7,8% of cultivated area, 8,1% of irrigated lands transferred to property of municipality; 24,3% of the territory, 1,6% of cultivated area and 1,1% of irrigated area were transferred to state property; 35,2% of the territory, 90,8% of cultivated area and 87,1% of irrigated area were transferred to private property.

It should be noted that from middle of 90 years there has been observed tendency of decreasing of area of farmlands. Thus, the territory of farmlands for 3 years (1996-1998) had been decreased for 5381 ha. 1444 ha of them are arable areas, 2942 ha are perennial plants, territory of pastures has been decreased for 13 thousand ha, and pastures have been decreased for 1537 ha.

**Crop production:** 15746 ha of arable area is used from 35338 ha or 45%. 12967ha of them or 82,4% is used under crops and legumes. Average productivity is 14,1 quintal/ha and is lower than average medium indicator of the country.

527 ha is used for vegetables, 86 ha for mulberry, 3367 ha for vineyards and pomegranates, 14 ha for fruits.

Vegetables take 527 hectares, 86 hectares for mulberry gardens (for the cultivation of silkworms), 3367 ha for grape and pomegranate plantations, as well as 14 hectares for orchards.

Cotton is grown on flat land area in square 1329ga, the average yield is only 6.8 kg / ha, which is 3 times less than 20 years ago.

**Viticulture** has been developed since 1970 in the area. Since 1985 there were laid 13,200 ha of vineyards. During 1982-1985 the harvest of grapes was 45-52 thousand ton. Due to the fact that over 80% of gardens were presented by technical varieties, the crop had been mainly used for the production of quality wine. Sugar content of grape juice was 19-25%. Initial processing of raw materials made available on the five factories in the area. However, in the second half of the 1980s in connection with the outbreak of anti-alcohol

campaign in the Soviet Union there had been begun intensive vineyards cut down and by the 1994 and 1995 they were completely destroyed. As a result of conducted reforms during 1997-2000 there was again laid vineyards and in 2010 and 2011 the harvest collected from 368ha was 1449 and 1067 ton accordingly or average 39,3 and 43,7 quintal/ha.

**Grain production:** In 1960-1990 the land cultivated under winter crops was 11,5 ha-21,0 thousand ha, currently the area is 30-32 thousand ha. In 2011 30,8 thousand ha was cultivated under crops. 15,5 thousand ha of them was cultivated under wheat and 14,7 thousand ha under rye. 29.0 thousand ha of cereals are irrigated, the others are grown without irrigation. The average productivity was 7.21 q / ha.

During 1965-1982 there was cultivated cotton in plain area of the district in 7-8 thousand ha area and the harvest was 15-17,5 thousand ton. However, in 1983 its cultivating was stopped (priority was given to viticulture). Later because of above mentioned reasons the vineyards had been destroyed. Cotton had been revived again and in 1995 -1997 2,8-3,0 ha area was cultivated under cotton and harvest was 1.8 - 2.2 thousand tons. Currently, due to number of reasons the interest for cotton has been reduced and as a result 52 ha of area was cultivated under cotton in 2011 and harvest was 11,5 quintal/ha.

If before such areas of agriculture as pomegranate growing, fruit growing and melon had added significance and had been cultivated mainly in farms, at the present time interest in the pomegranate and vegetables - melon crops has grown significantly. Thus, in 2000 456 ha of area was cultivated under pomegranate and the harvest was 2811 ton. In 2010 these figures were respectively increased till 2770 ha and 3535 tons. However, it should be noted reduction in harvest of pomegranate orchards.

In 2010, 521 ha was cultivated under vegetables, 726 ha under melons, 184 ha under potatoes. The area of mulberry gardens (for silkworm cultivation) was 86 ha. Along with mentioned crops, there are also cultivated in small quantities sunflower, onion, garlic.

**Cattle breeding** has developed recent years. Cattle population is 36.9 thousand, sheep and goats - 121.1 thousand. Further development of this industry will be hampered by the lack of pasture and lack of forage on natural.

*Table 7: # of cattle and poultry in Agsu district (data of 2010)*

| Name                 | #       |
|----------------------|---------|
| # of big-horn cattle | 40 155  |
| # of sheep and goats | 152 880 |
| # of poultry         | 231450  |

The length of the irrigation system of the district is 987 km of which only 62.5 only reinforced (concrete), 6.2 km are a closed system, and the rest of the system takes place in earthen channel. 425.6 km of irrigation system in need of repair.

In the area of 20,944 hectares are horizontal in the closed drainage system. Length of drainage system 1227.6 km, of which 106.9 collectors, 338.4 km of open drains, 782.3 km of closed drains. 200 km of this system is in need of repair and reconstruction.

Main market for agricultural products produced by local farmers is agricultural markets of capital city – Baku as the region in close distance. There are fruit processing unit in Agsu district (3 fruit processing units) and farmers have chance to sold their fruit products locally. Some farmers sell their product at local markets.

The area of pastures and pastures near village is of 48.2 hectares or 39.5% of the area. The development of extensive livestock in the area led to extremely negative consequences - a decrease in their productivity and biodiversity in general.

### 3.2. Shamakhi district

The main direction of economy of the district is agriculture and cattle breeding. As a subsidiary there are cultivated cereals, potatoes, vegetable and fruit crops.

Referring to 01.01.2011 there was 112,500 ha suitable for agricultural production in the district. 34 840 ha of them are arable land, 3145 ha - perennial plants (1157 hectares of vineyards), 25 226 ha - winter pastures, 15000 ha - summer pastures, 31 225 hectares – pasture near the villages, 1643 hectares (may 1634) - hayfields, 590 ha-fallow lands and 2668 ha unproductive land. Territory of irrigated area is 6870 ha.

As a result of reforms in agriculture system there had formed three forms of land ownership - the state (46.8%), municipal (29.4%) and private (23.8%) property.

The territory under of forests is 11447 ha or 7,4%. Main forest-forming species are oak (*Qeурcus longipes*) Hornbeam (*Carpinus cauc asica*) and beech (*Fagus grandifolia*).

The soils of the district consist mainly of the following types: of the mountain-meadow, brown, mountain-forest, light - brown, dark – chestnut, mountain black soil, gray - brown and gray.

**Viticulture:** Although viticulture in the area was engaged from the beginning of the 30s of last century, it became the most intensively developed since the 70's. There was laid 23300 ha vineyards till 1989. the most spread technical sorts were the following: Madrasa, Rkaticeli, Bayanshire I Takveri, and edible sorts - Agadai, Marandi and Tabrizi.

The annually harvesting of grapes during 1980-1985 years was 200-250 thousand tonn, 80-85% of the harvest was used for production of high quality wine. The preliminary production was carried out in 15 enterprises in the district.

As a result of the spoil of vineyard by pest Filloksera (as well as the beginning of the anti-alcohol campaign in the USSR) there was started mass felling of vineyards in 1986-1989. The process continued due to market of produced wine. However, in recent years,



attention to viticulture has been increasing again. There were laid 1125 ha new vineyards beginning from 2005, 80% of them is located in dry lands.

**Grain-growing:** Until the 1970s, special attention has been paid to the grain. In the 1960 winter grain crops accounted for 38-45 thousand ha. However, with the development of viticulture area under grain crops were reduced. In 2011 harvesting of winter grain was carried out on an area of 17339 ha. (Wheat-8753 ha, barley – 8586 ha). There was harvested 29913t of grain (17.2 q / ha). In comparison with 2001 in 2011 under cereals there were exploited 5579 ha land. Accordingly, the grain yield was more for 4982t. At the same time the yield has been decreased by 4 kg / ha. Such situation was also observed in other years, which was mainly associated with frequent droughts, often leading to total loss of crop. In 1993 to 1997 it was observed in the villages of Chel Geiler, Bagirli, Hachgadirlı, Odzhulu.

There are grown also potatoes, vegetables, melons, sunflowers. Although during 1960-1970 potatoes occupied 178-250ha, vegetables-230-240ha, melons-50-60ha, the area was reduced till 1970-1990. A result of carried out land reform in the district, the interest to those cultures was increased. Thus, in 2011 potatoes occupied 668ha, vegetables-456ha, the harvest amount was 4156 and 61 ton.

**Cattle breeding:** The cattle is traditionally developed in the district by extensive methods. The cattle number is 37 thousand, number of sheep and goats is 180 thousand and it in turn exceeds pastures norms for 2,5-5 times. Due to little productivity of pastures near villages, cattle pasture in summer and winter pastures. Here, as in Aghsu district, development of this industry will be hampered by lack of pastures and the shortage of forage on natural ones.

*Table 8: # of cattle in Shamakhi district (data of 2010)*

|                      |         |
|----------------------|---------|
| # of big-horn cattle | 36 548  |
| # of sheep and goats | 179 151 |
| # of poultry         | 207540  |

Main market for agricultural products produced by local farmers is agricultural markets of capital city – Baku as the region in close distance. There are 2 vine processing units in Shamakhi district and farmers have chance to sold their grapes of technical species locally. Some farmers sell their product at local markets.

Overall territory of pastures and pastures near the villages is 71,456 hectares. Over the last few years here, as in neighboring areas, there is rapid development of cattle breeding, which is implement by extensive methods and it in turn negatively impacts to productivity and biodiversity of pastures.

### 3.3. Gobustan district

The base of economy of the district is agriculture, the main direction is - cattle. As subsidiary there are cultivated crops and partly grapes and fruit crops.

Referring to 01.01.2011 there was 92,252 ha of suitable land for agricultural production. 32256 ha of them is arable, 2544ha-lea, 55752ha0pastures near village (32579 ha of them is winter pasture and 15611ha is summer pasture), 24ha-gardens and vineyards. Territory of irrigated are is 1577ha. 242 ha of the district is forests and shrubs. Territory of unusable area is 47,6 thousand h or 25,4%.

As a result of reforms in agriculture there have been formed three forms of land ownership - state ( 58.5% ), Municipal (26.8%) and private (14.7%) ownership.

There are mainly spread the following types of soil: mountain dark gray-brown, mountain grey-brown, mountain light gray-brown, dark grey-brown, grey-brown, light grey-brown. Due to physical and geographical features of the area almost 60% of the territory in more or less is caused to erosion processes - 26.2% low, 18.6% medium and 15, 2% - greatly eroded. Area in varying degrees of saline lands is 51,050 hectares

**Viticulture:** In 1990 the area of vineyards was about 9tys ha. By 1995, its area decreased till 1800ha. During this period (1991 and 1995) amount of annually harvesting of grapes was about 3-7 thousand tons. At the same time 90-95% of the crop was grapes technical varieties. By 2000, the district saved about 5 ha of vineyards (the main cause of reduction in area vineyards specified in Section 3.3 of the report). Since 2007 the district started to grow vineyards and currently there is 20 ha of vineyards. But along with it there is decreased their productivity. Thus, if in 1998 and 2004 yield was 130-255th/ha, during subsequent years it has decreased and yield amount in 2010 was 38,6 quintal/ha and in 2011-25,4 quintal/ha. One of the main causes of yield loss is a growing shortage of water, inadequate and inefficient irrigation technologies.

**Grain-growing:** Crop farming is the main direction of agriculture. In 1991, the area under winter crops was 17,203 ha of which 24,198 tons were harvested yield (14.1 quintal / ha). For 20 years the area under cereals has increased by almost 7 thousand ha, and yield - 2.7 q / ha. In 2011 in the whole region has been charvested 40,415 tons of grain. There are mainly sowed the following winter wheat: Bezostaya, Gobustan, Aran, Ezemetli-95-99 Nurlu, Bereketli and winter rye: Jalilabad-19-22 Garabag.

Due to the extremely hot weather, which was observed in May - June of last year in the villages Chayirli, Arabgadim and Derekend yield of winter cereals was fully spoiled, and in other districts the yield has fallen sharply.

Along with noted, there also cultivated potato, vegetable and melon crops. In 1996 under potatoes there were occupied 350 ha, 57 ha under vegetable, 6 ha under melons. In 2011, they increased significantly and amounted to 442, 342 and 305 hectares accordingly.

Harvesting in these years was, respectively, 152 and 1352 tons, 2702 and 1094 tons, 781 and 713 tons.

**Cattle breeding:** Extensive cattle is one of the main agricultural direction of the district. Total number of cattle is 30 thousand and 70-80% of them is representatives of the local breeds. Number of sheep and goats is 189 thousand. Preference is given to local conditions adapted and characterized by high fertility and weighing breed Gala. Livestock of the district exceeds the grazing norm, but taking into account the fact that some of the available pasture leased to other areas in which there are no winter pastures, grazing cattle is much higher. This in turn, as in neighboring areas, leads to the negative consequences such as the development of erosion processes, reduction of agricultural biodiversity. Further development will be hampered by the lack of cattle pasture and lack of forage on natural.

*Table 9: # of cattle and poultry in Gobustan district (data of 2010)*

|                      |         |
|----------------------|---------|
| # of big-horn cattle | 28 908  |
| # of sheep and goats | 183 848 |
| # of poultry         | 72170   |

Main market for agricultural products produced by local farmers is agricultural markets of capital city – Baku as the region in close distance. Some farmers sell their product at local markets.

The total area of pastures and pastures near village is 55,752 ha (32,579 ha is winter pasture and 15,611 ha - summer pastures). Over the last few years here, as in neighboring areas, there is rapid development of cattle breeding, which is carried out by extensive methods, which leads to the degradation of available pasture.

## IV. Review of current situation in agro-biodiversity and changes tendency

### 4.1 The results of the inventory of the agricultural species spread in selected regions

In terms of zoning of agriculture plants, studied districts are divided into the following zones:

1. South-East part of Shamakhi district and low mountain part of Gobustan district;
2. Plain foothills part of Aghsu district and South border of Shamakhi district;
3. South border of Aghsu and South part of Shamkhi;
4. Desert foothills part of Gobustan and South-East border of Shamakhi.

Observing the zoning species of agriculture plants in south-east part of Shamakhi and low foothills of Gobustan during last 50 years, we can see that 30 species of crops, 11 species of cereals of leguminous plants, 9 species of oil crops, 4 species of fodder plants, 3 species of technical crops, 11 species of foot-crops plants, 3 species of vegetable plants, 11 of them hybrid, water melon crops plants, 65 species of fruit plants, 38 species of decorative plants (3 local) were zoned and used in agriculture (Table 10).

*Table 10: Information on zoned agriculture plants (south-east part of Shamakhi district and lowland part of Gobustan district)*

| Year | Plant                          | Sort   | Origin |
|------|--------------------------------|--|--------|
| 1961 | Summer white-headed cabbage    | Yujanka 31   | X      |
| 1963 | Mild autumn wheat              | Bezostaya 1  | X      |
|      | Sunflower                      | Qiqant 549   | X      |
|      | Edible pumpkin                 | Plav kadu 268  | X      |
| 1962 | Pepper                         | Kirovabad mest.  | Y      |
| 1965 | Turnip                         | Odesskaya 5  | X      |
|      | Maroon                         | Ag uclu cahrayi qirmizi  | X      |
|      |                                | Rubin  | X      |
|      |                                | Dunqanskiy 12/8  | X      |
|      | Spinach                        | Ispolinsky 10  | X      |
|      | <i>Pastináca (wild carrot)</i> | Gereyskiy  | X      |
|      | Celery                         | Delikates  | X      |
|      | Parsley                        | Urojaynaya   | X      |
|      | Apple                          | Red qrafshteyn, Landsberg renet, Champain renet, Simerenko renet, Red winter parmen, London pepini | X      |
|      |                                | Yellow sour  | Y      |
|      | Pear                           | Lyubitsa Klarra, Vilyams, Bere Ardanpron, Kure, Dushes Anqulem                                     | X      |
|      |                                | Pear apple   | Y      |
|      | Quince                         | Yellow quince  | Y      |

|                  |   |   |           |
|------------------|---|---|-----------|
|                  | Plum  | Anna Shpet, Persikovaya , Altay Renkold,<br>Green Renkold, Bon-de Bri | X         |
|                  |   | Yellow albukhara  | Y         |
|                  | Cherry  | Anadolu, largeshpanka, Podbelski                                      | X         |
|                  | Cherry  | Yellow droqana, Farash Kasimi, Biqqaro,<br>Roman Oliva, Bianka Beaute | X         |
|                  | Apricot   | Shalax, Krasnoshekiy, Abutalibi                                       | Y         |
|                  |   | Krasniy partizan  | X         |
|                  | Peach   | Red yubiley, Elberta  | X         |
|                  | Edible grape  | Round white currant,  | Y         |
| Khalili, Sultani |   | X   |           |
| Technical grape  | Rkatsiteli, Rusling, Aliqote, Kabane<br>sorinyon, Xindoqni, Kushinski | X   |           |
| 1966             | Peach   | Chempion  | X         |
| 1969             | Onion   | Local Masalli   | Y         |
| 1971             | Sweet pepper  | Novoqoqoshari   | X         |
| 1973             | Apple   | Azerbaijan  | Y         |
|                  | Quince  | Chilechi  | Y         |
|                  | Medlar  | Kitil   | Xalq sel. |
|                  |   | Black medlar  |           |
|                  |   | Qobelya   | X         |
|                  | Strawberry  | Festivalnaya  | X         |
| Corn             | Azerbaijan 3 (hybrid)   |   |           |
| 1976             | Sweet pepper  | Podarok Moldavi,  | X         |
| 1977             | Water grass   | Shirokolistaya  | X         |
| 1978             | Hazel   | Oil hazel   | Y         |
| 1980             | tomatoes( for closed area)  | Mosk. osen. F1  | X         |
|                  | Spring edible carrot  | Yubileynaya 60, Absheronkaya winter                                   | Y         |
|                  | Mangel-wurzel   | Lvovskaya yellow  | X         |
| 1981             | Spring barley   | Donetsk 8   | X         |
|                  | Bean  | Krasnodarskaya  | X         |
|                  | Lentil  | Azerbaijan  | Y         |
|                  | Silosluq sorqo  | Stavropol fodder hybrid   | X         |
|                  | Spring white headed<br>cabbage  | Azerbaijan  | Y         |
|                  | Summer white headed<br>cabbage  | Azarbaijan  | Y         |
|                  | Garlic  | Djalilabad  | Y         |
|                  | Apple   | Qolden Delishes   | X         |
| 1982             | Potatoes  | Oqonyok   | X         |
|                  | Autumn white headed<br>cabbage  | Absheronkaya oz.  | Y         |
| 1983             | Sunflower   | VNIIMK8833 yax.   | Y         |
|                  | Sorrel  | Shirokolistniy  | Y         |
| 1984             | Aubergine   | Almaz   | Y         |
| 1985             | Soybean   | Plamya  | X         |
| 1986             | Pea   | Az.NIIZ 304   | Y         |
|                  | Cucumber for closed area  | Mosk. tep. F1   | X         |

|                     |                          |                               |   |
|---------------------|--------------------------|-------------------------------|---|
|                     | Peach                    | Salani                        | X |
|                     | Hazel                    | Qalib                         | Y |
| 1987                | Lettuce                  | Krupnokochanniy               | X |
| 1988                | Hard autumn wheat        | Mirbashir 50                  | Y |
|                     | Oats                     | Azarbaijan 60                 | Y |
| 1989                | Autumun mild wheat       | Birlik                        | Y |
|                     | Autumun raps             | Tsimlirskiy                   | X |
|                     | Sweet pepper             | Topolin                       | X |
|                     | Cucumber for open area   | Konkurent, Parad              | X |
|                     | Cucumber for closed area | Stela F1                      | X |
|                     | Onion                    | Dusti                         | X |
|                     | Melons                   | Yantarnaya                    | Y |
|                     | Apple                    | Korey                         | X |
|                     | Cherry                   | Generalski                    | X |
| 1990                | Autumn hard wheat        | Qaraqilchiliq 2               | Y |
|                     | Soybean                  | Umanskaya                     | X |
|                     | Tomatoes                 | Ultra, Volqograd 323,Novichok | X |
|                     | Dill                     | Xarkovskiy 85                 | X |
|                     | Apple                    | Red Europa                    | X |
| Samarqand perventsi |                          | X                             |   |
| 1991                | Pea                      | Az.NIIZ303                    | Y |
|                     | Tomatoes for closed area | Rusich F1                     | X |
|                     | Apple                    | Naila                         | Y |
|                     | Pear                     | LatiFa                        | Y |
|                     | Tea thorn                | SheFa                         | Y |
| 1992                | Bean                     | Krupinka                      | X |
|                     | Cauliflower              | Qarantiya                     | X |
|                     | Graoe                    | Kyrgyz casus                  | X |
| 1993                | Winter barley            | Seltik                        | X |
|                     | Tomatoes                 | Elim, Ikin                    | Y |
|                     | Sweet pepper             | Murad                         | Y |
|                     | Pepper                   | Goy-gol                       | Y |
|                     | Cherry                   | Rinochnaya, Vistavochnaya     | X |
|                     | Cherry                   | Rubinova                      | Y |
|                     | Tea thorn                | Torlayan                      | Y |
| 1994                | Cucumber for open area   | Fenix 640                     | X |
|                     | Tea thorn                | Zafarani                      | Y |
| 1995                | Tomatoes                 | Astol                         | X |
|                     | Tomatoes for closed area | Banovsha                      | Y |
|                     | Vegetable bean           | Zulal                         | Y |
|                     | Vegetable pea            | Fidan                         | Y |
|                     | Anise                    | Aghdjabadi                    | Y |
|                     | Apple                    | Quba reneti                   | Y |
| 1996                | Autumn mild wheat        | Mirbashir 128                 | Y |
|                     | Tomatoes                 | Vatan 1                       | Y |
|                     | Dill                     | Otello                        | X |

|      |                          |   |   |
|------|--------------------------|---|---|
|      | Water melon              | Mardjan   | Y |
| 1997 | Autumn barley            | Qarabagh 21   | Y |
|      | Autumn tritikali         | Samur   | Y |
| 1998 | Cucumber for open area   | Azeri   | Y |
|      | Hazel                    | Red hazel   | Y |
| 1999 | Autumun mild wheat       | Azeri   | Y |
| 2000 | Autumn hard wheat        | Alindja a 84  | Y |
|      | Bean                     | Az.NIIZ 352   | Y |
|      | Sweet pepper             | Shefa   | Y |
|      | Apple                    | Shahdagh, Quba saffron, Samed Vurgun, Winter Quba, Arzu | Y |
| 2001 | Autumn barley            | Djhalilabad 19  | Y |
| 2002 | Autumn barley            | Qarabagh 22   | Y |
|      | Pea                      | Nail  | Y |
|      | Sunflower                | Kazino  | X |
|      | Sugarcane                | Kiva F1, Lena F1  | X |
|      | Tomatoes for closed area | Shahin, Shalala   | Y |
| 2005 | Autumn mild wheat        | Nurlu 99  | Y |
|      | Corn                     | Kapaz   | Y |
| 2006 | Pea                      | Narmin  | Y |
|      | Soybean                  | Majestva  | X |
|      | Potatoes                 | Filea, Solara, Nora                                     | X |
|      | Tomatoes for closed area | Opera F 1   | X |
|      | Cucumber for closed area | Pasha F 1   | X |
|      | Garlic                   | Qusarchay   | Y |
| 2007 | Autumun mild wheat       | Qobustan  | Y |
| 2008 | Sugarcane                | Az.NIIKL va P495  | Y |
|      |                          | Ameli F1  | X |
| 2009 | Autumn mild wheat        | Kroshka, Moksvish, Tanya, Krasnodar 99, Fakhtor         | X |
|      | Autumn barley            | Basharli  | Y |
|      | Corn                     | Zaqatala 420  | Y |
|      | Lentil                   | Arzu  | Y |
|      | Tomatoes for closed area | Ralli F1,   | X |
|      | Tomatoes                 | Belle F1  | Y |
|      | Cucumber for closed area | Pikolina F1   | X |
| 2010 | Autumn mild wheat        | Tale38  | Y |
|      | Tomatoes                 | Yubiley 60  | Y |
|      |                          | Nikoter, Nikogren                                       | X |
| 2011 | Autumn mild wheat        | Qirmizigul I 1  | Y |
|      |                          | Akteur, Nuttrisk, Sneva Lier                            | X |
|      | Autumn barley            | Shieshliet  | X |
|      | Lucerne                  | Aghstafa 1  | Y |
|      | Tomatoes                 | Khazar  | Y |
|      | Tomatoes for closed area | Monro F1, Elmida F1, Berberena F1                       | X |
|      |                          | Sultan F1   | Y |

|  |                          |           |   |
|--|--------------------------|-----------|---|
|  | Aubergine                | Tirkan    | Y |
|  | Cucumber for closed area | Jazzer F1 | X |

There were zoned 13 species of crops, 7 species of cereals of leguminous plants, 5 species of fodder plants, 13 species of technical plants, 10 species of root-crops, 77 species of vegetable plants, 11 of them hybrid, 86 species of fruit plants, 2 species of mulberry tree during 1961-2011 years in second region (plain foothill part of Aghsu and south border of Shamakhi).

**Table 11: Information on second zoned agriculture plants (foothills and plain part of Aghsu district and south border of Shamakhi district)**

| Year                  | Plant                          | Species   | Origin    |
|-----------------------|--------------------------------|---|-----------|
| 1960                  | Tomatoes                       | Volqograd 5/95  | X         |
|                       | Quince                         | Djardam   | Y         |
|                       | Apricot                        | Haqverdi, Novrast   | Y         |
|                       | Adible grape                   | White shashala, Muskat Aleksandrski                                       | X         |
|                       | Technical grape                | White Muskat, Saperavi, Pink Muskat                                       | X         |
| Bayanshira, Hamashira |                                | Y   |           |
| 1961                  | Edible allberry                | Valas   | Y         |
|                       | Fig                            | Dalmatski   | X         |
|                       | East date                      | Sidles  | X         |
| 1962                  | Lucerne                        | Az.NIXI 5   | Y         |
|                       | Cucumber for open area         | Kirovabad mest.   | Y         |
| 1963                  | Edible pumpkin                 | Palav kadu 263  | X         |
| 1965                  | Winter pea                     | Az.NIXI 1528  | Y         |
|                       | Maroon                         | White udjlu – pink red, Rubin, Dunqanskiy 12/8                            | X         |
|                       | Spinach                        | Ispolinskiy 10  | X         |
|                       | <i>Pastinaca (wild carrot)</i> | Germeyskiy  | X         |
|                       | Celery                         | Delikates   | X         |
|                       | Parsley                        | Urojaynaya  | X         |
|                       | Edible carrot (spring plant)   | White radish  | X         |
|                       | Apple                          | Red QraFshteyn, Landsberg Reneti, Champain Reneti, Winter red parmen      | X         |
|                       | Pear                           | Vilyams, Bere Ardanpon, Dushes Anqulem                                    | X         |
|                       |                                | Pear apple  | Y         |
|                       | Quince                         | Yellow quince   | Y         |
|                       | Medlar                         | Kitil, Black medlar   | Xalq sel. |
|                       |                                | Qobelya   | X         |
|                       | Plum                           | Anna Shpet, Persikovaya, Yashil Renklod, Bon – de Bri                     | X         |
|                       |                                | Yellow Albuxara   | Y         |
|                       | Plum                           | Large Shpanka   | Y         |
|                       |                                | Podelski, England Farash  | X         |
|                       | Berry                          | Yellow droqana, Farash Kaimi, Biqqaro Qroliya, Roman Oliva, Bianka Gozali | X         |
|                       | Apricot                        | Shalakh, Krasnoshekiy, Abutalibi, White tabarza                           | Y         |
|                       |                                | Krasniy partizan  | X         |



|      |                              |                                     |   |
|------|------------------------------|-------------------------------------|---|
|      | Peach                        | Red jubiley, Elberta                | X |
|      | Edible grape                 | Round white raisins , White Khalili | Y |
|      | Technical grape              | Rkatsiteli, Aliqote, Kabane         | X |
| 1966 | Peach                        | Chempion                            | X |
| 1967 | Lucerne                      | ASXI 1                              | Y |
| 1968 | Peach                        | Fidan                               | Y |
| 1969 | Onion                        | Luqanskiy                           | X |
| 1971 | Sweet pepper                 | Novoqoqoshari                       | X |
| 1972 | Autumn whiteheaded cabbage   | Improved local Darband              | X |
| 1973 | Corn                         | Azarbaijan 3 (hybrid)               | Y |
|      | Peach                        | Malik                               | Y |
|      | Strawberry                   | Festivalnaya                        | X |
| 1974 | Almond                       | Nikitski 62                         | X |
|      | Plum                         | Sovetski                            | X |
|      |                              | Radjabli                            | Y |
| 1976 | Cotton                       | 3038                                | Y |
|      | Sweet pepper                 | Podarok Moldavi                     |   |
|      | Cauliflower                  | Movir 74                            | X |
| 1977 | Water grass                  | Shirokolistnaya 2                   | X |
| 1980 | East date                    | Xiakume                             | X |
|      | Tomatoes for closed area     | Mosk. Osen. F 1                     | X |
|      | Mangel-wurzel                | Lvovskaya joltaya                   | X |
|      | Edibl carot (spring)         | Yubileynaya 60                      | Y |
|      | Edibl carot (summer)         | Absheronkaya winter                 | Y |
| 1981 | Bean                         | Krasnoqradskaya 5                   | X |
|      | Silo for sorgo               | Stravropol fodder hybrid            | X |
|      | Whiteheaded cabbage (spring) | Azerbaijan                          | Y |
|      | Whiteheaded cabbage (summer) | Azerbaijan                          | Y |
|      | Garlic                       | Djalilabad                          | Y |
| 1982 | Whiteheaded cabbage (autumn) | Absheron winter                     | Y |
| 1983 | Cotton                       | Aghdash 3                           | Y |
|      | Sorrel                       | Shirokolistniy                      | X |
| 1984 | Aubergine                    | Almaz                               | Y |
| 1985 | Soybean                      | Plamya                              | X |
| 1986 | Cucumber for closed area     | Mosk. Tepl. F 1                     | X |
|      | Peach                        | Salami                              | Y |
| 1987 | Lettuce                      | Krupnokochanniy                     | X |
| 1988 | Autumun hard wheat           | Mirbashir 50                        | Y |
|      | Autumn barley                | Qarabagh 7                          | Y |
|      | Oats                         | Azerbaijan 60                       | Y |
| 1989 | Autumn raps                  | Tsimenitskiy                        | X |
|      | Lucerne                      | Absheron                            | Y |
|      | Cotton                       | Az.NIXI 33, Mughan 305              | Y |

|      |                              |   |   |
|------|------------------------------|---|---|
|      | Sweet pepper                 | Topolin   | X |
|      | Tomatoes                     | Titan   | X |
|      | Cucumber for open area       | Konkurent, Parad  | X |
|      | Onion                        | Dusti   | X |
|      | Melons                       | Yantarnaya, Tavriya   | X |
|      | Mulberry tree                | Beauty mulberry   | Y |
| 1990 | Autumn hard wheat            | Qaraqilchiq   | Y |
|      | Soybean                      | Umanskaya 1   | X |
|      | Whiteheaded cabbage (spring) | Local Absheron  | Y |
|      | Tomatoes                     | Ultro, Novichok, volqograd 323  | X |
|      | Dill                         | Xarkovskiy 85   | X |
| 1991 | Tomatoes for closed area     | Rusich F1   | X |
|      | Pea                          | AzNIIZ 303  | Y |
|      | Pomegranate                  | Oleq  | Y |
|      | Tea thorn                    | Shefa   | Y |
| 1992 | Cauliflower                  | Qarantiya   | X |
| 1993 | Autumun barley               | Seltik  | X |
|      | Tomatoes                     | Elim, Ilkin   | Y |
|      | Sweet pepper                 | Murad   | Y |
|      | Pepper                       | Goy-gol   | Y |
|      | Tea thorn                    | Torlayan  | Y |
| 1994 | Cucumber                     | Feniks 640  | X |
|      | Pomegranate                  | Iri gila  | Y |
|      | Tea thorn                    | Zafarani  | Y |
| 1995 | Cotton                       | AP 317  | Y |
|      | Tomatoes                     | Astol   | X |
|      | Tomatoes for closed area     | Banovsha  | Y |
|      | Anise                        | Aghjebedi   | Y |
|      | Vegetable bean               | Zulal   | Y |
|      | Vegetable pea                | Fidan   | Y |
|      |                              |   |   |
| 1996 | Autumn mild wheat            | Mirbashir 128   | Y |
|      | Tomatoes                     | Vatan 1   | Y |
|      | Dill                         | Otello  | X |
|      | Watermelon                   | Mardjan   | Y |
| 1997 | Autumn triticales            | Samur   | Y |
|      | Autumn barley                | Qarabagh 21   | Y |
| 1998 | Cucumber for open area       | Azeri   | Y |
| 2000 | Bean                         | Az.NIIZ 352   | Y |
| 2002 | Tomatoes for closed area     | Shahin, Shalala   | Y |
|      | Pea                          | Nail  | Y |
| 2003 | Cotton                       | Gandja 2, Gandja 8  | Y |
| 2005 | Autumn mild wheat            | Nurlu 99  | Y |
|      | Corn                         | Kapaz   | Y |
| 2006 | Soybean                      | Majesta   | X |
|      | Potatoes                     | Fiela, Solara, Nora, Aqriya, Laura, Marabel, MonaLiza, Spunta, Arinda, Impala | X |

|      |                          |                        |   |
|------|--------------------------|------------------------|---|
|      | Tomatoes for closed area | Opera F1               | X |
|      | Garlic                   | Qusarchay              | Y |
|      | Cucumber for closed area | Pasha F 1              | X |
|      | Edible grape             | Azeri, Nail            | Y |
| 2007 | Autumn mild wheat        | Qobustan               | Y |
|      | Cotton                   | Gandja 80              | Y |
|      |                          | White gold             | Y |
| 2008 | Cotton                   | Gandja 78              | Y |
|      | Mullberry tree           | Garden Mullberry       | Y |
| 2009 | Autumn barley            | Baharli                | Y |
|      | Cotton                   | Gandja 110, Gandja 103 | Y |
|      | Tomatoes of closed area  | Ralli F1               | X |
|      | Cucumber for closed area | Pikolina F1            | X |
| 2010 | Cotton                   | Flora                  | Y |
|      | Tomatoes                 | Yubiley 60             | Y |
|      | Technical grape          | Goy-gol                | Y |
| 2011 | Tomatoes for closed area | Bella F1, Monro F1     | X |

There were zoned 20 species of crops, 4 species of cereals of leguminous plants, 4 species of oil plants, 6 species of fodder plants, 3 species of technical plants, 12 species of root-crops, 60 species of vegetable plants, 5 species of melon plants, 85 species of fruit plants, 1 species of mulberry tree during 1961-2011 years in third region (south border of Aghsu and north part of Shamakhi) for the purpose of use in agriculture sphere (Table 12).

*Table 12: Information on 3<sup>rd</sup> zoned agriculture plants (south border of Aghsu district and north part of Shamakhi district)*

| Year                    | Plant                          | Species  | Origin |
|-------------------------|--------------------------------|--|--------|
| 1960                    | Tomatoes                       | Volqograd 5/95                                     | X      |
|                         | Melons                         | Kolxoznitsa 749/753                                | X      |
|                         | Quince                         | Cardam   | Y      |
|                         | Apricot                        | Haqverdi, Novrast                                  | Y      |
|                         | Grape                          | Agh muskat, Cahrayi muskat                         | X      |
| Bayanshira, SHirvanshah |                                | Y  |        |
| 1961                    | Pomegranate                    | Valas  | Y      |
|                         | Fig                            | Dalmatski  | X      |
|                         | East date                      | Sidles   | X      |
| 1962                    | Corn                           | Zaqatala yerli yax-sh                              | Y      |
|                         | Lucerne                        | AzNIXI 5   | Y      |
|                         | Cucumber for open area         | Kirovabad mest.                                    | Y      |
| 1963                    | Edible pumpkin                 | Palav kadu 268                                     | X      |
| 1965                    | Winter pea                     | Az.NIXI 1528                                       | Y      |
|                         | Maroon                         | Agh uclu – cahrayi qirmizi, Rubin, Dunqanskiy 12/8 | X      |
|                         | Turnip                         | Odesskaya  | X      |
|                         | Spinach                        | Ispolinskiy 10                                     | X      |
|                         | <i>Pastinaca (wild carrot)</i> | Gerneyskiy   | X      |

|      |                          |  |   |
|------|--------------------------|--|---|
|      | Celery                   | Delikates  | X |
|      | Parsley                  | Urojaynaya   | X |
|      | Apple                    | Qirmizi QraFshteyn, Landsberq Reneti, SHampan Reneti, Semerenko reneti, Qishliq qirmizi parmen | X |
|      | Pear                     | Vilyams, Bere Ardanpon, Kure, Dushes Angulem   | X |
|      |                          | Nar armudu   | Y |
|      | Quince                   | Sari heyva   | Y |
|      | Plum                     | Anna SHpet, Persikovaya, Yashil Renkold, Bon – de Bri  | X |
|      |                          | Sari Albuxara  | Y |
|      | Cherry                   | Iri SHpanka  | Y |
|      |                          | Rodelski, Ingiltara Farashi  | X |
|      | Cherry                   | Sari droqana, Farash Kaimi, Biqqaro Qroliya, Roman Oliva, Bianka Gozali                        | X |
|      | Apricot                  | SHalax, Krasnoshekiy, Abutalibi, Agh tabarza   | Y |
|      | Fruit mullberry          | Xar tut, Badana, SHah tut  | X |
|      | Peach                    | Qizil yubiley, Elberta   | X |
|      | Edible grape             | Yumru agh kishmish, Banoshayi tayFi  | X |
|      |                          | Agh Huseyni, Agh Xalili  | Y |
|      | Technical grape          | Rkatsiteli, Xindoqni   | X |
| 1966 | Pear                     | Chempion   | X |
| 1967 | Lucerne                  | ASXI 1   | Y |
| 1968 | Peach                    | Fidan  | Y |
|      | Fig                      | Sochinskiy   | X |
| 1969 | Onion                    | Luqanskiy  | X |
| 1971 | Sweet pepper             | Podarok Moldavii   | X |
| 1973 | Corn                     | Azarbaycan 3 (hibrid)  | Y |
|      | Peach                    | CHilachi   | Y |
|      | Strawberry               | Festivalnaya   | X |
|      | Technical grape          | Qara goz   | Y |
| 1974 | Almond                   | Nikitsi 62   | X |
|      |                          | Sovetski   | X |
|      | Plum                     | Racabli  | Y |
| 1977 | Water grass              | SHirokolistnaya  | X |
| 1978 | Zizipsus                 | Nasimi   | Y |
| 1979 | Mulberry tree            | Zakir tut  | Y |
| 1980 | East date                | Xiakume  | X |
|      | Tomatoes for closed area | Mosk. Osen. F 1  | X |
|      | Mangel-wurzel            | Lvovskaya joltaya  | X |
|      | Edible carrot (spring)   | Yubileynaya 60, Absheronkaya zimn.   | Y |
|      | Edible grape             | Qara kishmish  | X |
| 1981 | Bean                     | Krasnoqradskaya 5  | X |
|      | Sorqo for silo           | Stravropol yem hibridi   | X |

|      |                               |  |   |
|------|-------------------------------|--|---|
|      | White headed cabbage (spring) | Azarbaycan                               | Y |
|      | White headed cabbage (summer) | Azarbaycan                               | Y |
|      | Garlic                        | Calilabad                                | Y |
| 1982 | White headed cabbage (spring) | Absheron ozimaya                         | Y |
| 1983 | Sorrel                        | SHirokolistniy                           | X |
| 1984 | Aubergine                     | Almaz                                    | Y |
| 1985 | Soybean                       | Plamya                                   | X |
| 1986 | Cucumber for closed area      | Mosk. Tepl. F 1                          | X |
|      | White headed cabbage (autumn) | Araz                                     | Y |
|      | Peach                         | Salami                                   | Y |
| 1987 | Lettuce                       | Krupnokochaniy                           | X |
| 1988 | Autumn hard crop              | Mirbashir 50                             | Y |
|      | Autumn barley                 | Qarabagh 7                               | Y |
|      | Oats                          | Azarbaycan 60                            | Y |
| 1989 | Autumn raps                   | Tsimlirskiy                              | X |
|      | Lucerne                       | Absheron                                 | Y |
|      | Cauliflower                   | Qishliq Adler, Yazliq Adler, Sochinskaya | X |
|      | Sweet pepper                  | Topalin                                  | X |
|      | Potatoes                      | Radomishlskiy                            | X |
|      | Cucumber for open area        | Konkurent, Parad                         | X |
|      | Cucumber for closed area      | Stella F1                                | X |
|      | Onion                         | Dusti                                    | X |
|      | Melons                        | Yantarnaya, Tavriya                      | X |
| 1990 | Autumn hard crop              | Qaraqilchiq                              | Y |
|      | Tobacco                       | Laqodexi Tr.449                          | X |
|      | Potatoes                      | Nevski                                   | X |
|      | Tomatoes for open area        | Utro, Novichok, Volqoqrad 323            | X |
|      | Aubergine                     | Zahra                                    | Y |
|      | Dill                          | Xarkovskiy 85                            | X |
|      | Soybean                       | Umanskaya                                | X |
| 1991 | Tomatoes for closed area      | Rusich F1                                | X |
|      | Pomegranate                   | Oleq                                     | Y |
|      | Tea thorn                     | SHaFa                                    | Y |
| 1992 | Autumn hard wheat             | Tartar                                   | Y |
|      | Cauliflower                   | Qarantiya                                | X |
| 1993 | Autumn barley                 | Seltik                                   | X |
|      | Tomatoes                      | Elim, Ilkin                              | Y |
|      | Sweet pepper                  | Murad                                    | Y |
|      | Pepper                        | Goy-gol                                  | Y |
|      | Tea thorn                     | Torlayan                                 | Y |
| 1994 | Autumn hard wheat             | Vuqar                                    | Y |
|      | Cucumber                      | Feniks 640                               | X |
|      | Tomatoes                      | Dar Zaboliya                             | X |

|                          |                           |   |            |
|--------------------------|---------------------------|---|------------|
|                          | Pomegranate               | Iri gila  | Y          |
|                          | Tea thorn                 | ZaFarani  | Y          |
| 1995                     | Tobacco                   | Zaqatala iri yarpaqlisi   | Y          |
|                          | Tomatoes                  | Astol   | X          |
|                          | Vegetable bean            | Zulal   | Y          |
|                          | Vegetable pea             | Fidan   | Y          |
|                          | Anise                     | Aghcabadi   | Y          |
|                          | Pear                      | Dushes Anqulem  | X          |
|                          | 1996                      | Autumn hard wheat   | SHir aslan |
| Lucerne                  |                           | Aran  | Y          |
| Bean                     |                           | Sevinc  | Y          |
| Tomatoes                 |                           | Vatan 1   | Y          |
| Dill                     |                           | Otello  | X          |
| Water melon              |                           | Marcan  | y          |
| 1997                     | Autumn tritikale          | Samur   | Y          |
| 1998                     | Cucumber for open area    | Azari   | Y          |
| 1999                     | Autumn mild wheat         | Azari   | Y          |
|                          | Autumn hard wheat         | Turan   | Y          |
| 2000                     | Bean                      | AzNIIZ 352  | Y          |
| 2001                     | Autumn mild wheat         | Qiyatli 2/17  | Y          |
| 2002                     | Tomatoes                  | SHahin, SHalala   | Y          |
|                          | Pomegranate               | Qaragila  | Y          |
| 2005                     | Autumn mild wheat         | Nurlu 99  | Y          |
|                          | Corn                      | Kapaz   | Y          |
| 2006                     | Potatoes                  | Fiela, Solara, Nora, Aqriya, Laura, Marabel, MonaLiza, Spunta, Arinda, Impala | X          |
|                          | Tomatoes for closed area  | Opera   | X          |
|                          | Garlic                    | Qusarchay   | Y          |
|                          | Soybean                   | Majesta   | X          |
| 2007                     | Autumn mild wheat         | Qobustan  | Y          |
|                          | Tobacco                   | Trapezond   | X          |
| 2008                     | Autumn mild wheat         | Ughur   | Y          |
|                          | Autumn hard wheat         | Qarabagh  | Y          |
| 2009                     | Autumn mild wheat         | Pamyat, Krasnodar 99  | X          |
|                          | Autumn barley             | Baharli   | Y          |
|                          | Tomatoes for closed area  | Ralli F1, Elmida F1   | X          |
|                          |                           | Sultan F1   | Y          |
| Cucumber for closed area | Pikolina F1               | X   |            |
| 2010                     | Tomatoes                  | Yubiley 60  | Y          |
| 2011                     | Lucerne                   | AghstaFa 1  | Y          |
|                          | Tomatoes                  | Xazar   | Y          |
|                          | Tomatoes for closed area  | Berlurena F1, Monro F1, Elnida F1   | X          |
|                          | Aubergine                 | Turkan  | Y          |
|                          | Sweet pepper              | Novoqoqoshari   | Y          |
|                          | Cucumber for covered area | Jazzer F1   | X          |
|                          | Onion                     | Barakat   | Y          |

There were zoned 8 species of crops, 5 species of cereals of leguminous plants, 67 species of oil plants, 3 species of fodder plants, 10 species of root-crops, 65 species of vegetable plants, 1 species of melon plants during 1961-2011 years in fourth region (desert foothills part of Gobustan and south-east border of Shamakhi) for the purpose of use in agriculture sphere (Table 13).

*Table 13: Information on 4<sup>th</sup> zoned agriculture plants (foothills and plains of Gobustan district and south-east part of Shamakhi district)*

| Year            | Plant                          | Species  | Origin |
|-----------------|--------------------------------|--|--------|
| 1960            | Technical grape                | White muskat, pink Muskat                        | X      |
|                 |                                | Bayanshira                                       | Y      |
| 1963            | Edible pumpkin                 | Palav kadu 268                                   | X      |
| 1965            | Turnip                         | Odesskaya 5                                      | X      |
|                 | Maroon                         | Agh uclu-cahrayi qirmizi, rubin, Dunqanskiy 1218 | X      |
|                 | Spinach                        | Ispolinskiy 10                                   | X      |
|                 | <i>Pastinaca (wild carrot)</i> | Greyskiy   | X      |
|                 | Celery                         | Delikates  | X      |
|                 | Parsley                        | Urojaynaya                                       | X      |
|                 | Edible grape                   | Yumru agh kishmish                               | X      |
|                 |                                | Agh Xalili                                       | Y      |
| Technical grape | Rkatsiteli, Xindoqni           | X  |        |
| 1971            | Sweet pepper                   | Novoqoqoshari                                    | X      |
| 1976            | Sweet pepper                   | Podarok Moldavi                                  | X      |
| 1977            | Water grass                    | SHirokolistnaya                                  | X      |
| 1980            | Tomatoes for closed area       | Moskva. Osen. F1                                 | X      |
|                 | Edible carrot (spring)         | Nantskaya 4                                      | X      |
|                 | Edible carrot (summer)         | Yubileynaya 60, Absheronskaya zim                | Y      |
|                 | Mangel-wurzel                  | Lvovskaya joltaya                                | X      |
| 1981            | Autumn barley                  | Donetsk 8  | X      |
|                 | Sorgo for silo                 | Stravropol fodd hybrid                           | X      |
|                 | White headed cabbage (spring)  | AzarbAycAn                                       | Y      |
|                 | White headed cabbage (summer)  | AzarbAycAn                                       | Y      |
|                 | Garlic                         | CalilAbAd  | Y      |
| 1982            | White headed cabbage (spring)  | AbsheronskAyA oz.                                | Y      |
| 1983            | Sorrel                         | Shirokolistniy                                   | Y      |
| 1984            | Cucumber for open area         | Konkurent  | X      |
|                 | Aubergine                      | AlmAz  | Y      |
| 1985            | Soybean                        | PIAmyA   | X      |
| 1987            | Lettuce                        | KrupnokochAniy                                   | X      |
| 1988            | Autumn hard wheat              | Mirbashir 50                                     | Y      |
|                 | Oats                           | AzarbAycAn 60                                    | Y      |
| 1989            | Autumn rAps                    | Tsimlirskiy                                      | X      |
|                 | Sweet pepper                   | TopAlin  | X      |

|                          |                          |   |   |
|--------------------------|--------------------------|---|---|
|                          | Cucumber for open area   | PArAd   | X |
| 1990                     | Autumn hard wheat        | QArAqilchiq   | Y |
|                          | Tomatoes for open area   | Utro, Novichok, VolqoqrAd 323   | X |
|                          | Dill                     | XArkovskiyy 85  | X |
|                          | Soybean                  | UmAnskAyA   | X |
| 1991                     | Pea                      | AzNIIZ 303  | Y |
|                          | Tomatoes for closed area | Rusich F1   | X |
|                          | Tea thorn                | SHaFA   | Y |
| 1992                     | Cauliflower              | QArAntiyA   | X |
| 1993                     | Tomatoes for open area   | Elim, Ilkin   | Y |
|                          | Sweet pepper             | MurAd   | Y |
|                          | Pepper                   | Goy-gol   | Y |
|                          | Tea thorn                | TorlAyAn  | Y |
|                          | Cucumber for open area   | Feniks 640  | X |
| 1994                     | Tea thorn                | ZaFarAn   | Y |
|                          | Cucumber                 | Feniks 640  | X |
| 1995                     | Tomatoes for open area   | Astol   | X |
|                          | Tomatoes for closed area | Banovsha  | Y |
|                          | Vegetable bean           | ZulAl, FidAn  | Y |
|                          | Anise                    | AghcAbadi   | Y |
| 1996                     | Tomatoes for open area   | Vatan 1   | Y |
|                          | Dill                     | Otello  | X |
|                          | Watermelon               | MarcAn  | Y |
| 1998                     | Cucumber for open area   | Azari   | Y |
| 1999                     | Autumn hard wheat        | Barakatli 95  | Y |
| 2002                     | Pea                      | NAil  | Y |
|                          | Tomatoes for closed area | SHAhin, SHAlAla   | Y |
| 2004                     | lentil                   | Arzu  | Y |
| 2005                     | Autumn mild wheat        | Nurlu 99  | Y |
| 2006                     | Pea                      | Narmin  | Y |
|                          | Potatoes                 | FielA, SolArA, NorA, AqriyA, LAurA, MArAbel, MonALiza, SpuntA, ArindA, ImpAlA | X |
|                          | Tomatoes for closed area | OperA F1  | X |
|                          | Garlic                   | QusArchAy   | Y |
|                          | Soybean                  | MAjestA   | X |
|                          | Cucumber for closed area | PAshA F1  | X |
| 2007                     | Autumn mild wheat        | QobustAn  | Y |
| 2008                     | Sainfoin - (onobrychis)  | AzNIIKL va P495   | Y |
| 2009                     | Autumn barley            | BAhArli   | Y |
|                          | Tomatoes                 | Belle F1, RAlli F1, ElnidA F1   | X |
|                          |                          | SultAn F1   | Y |
| Cucumber for closed area | PikolinA F1              | X   |   |
| 2010                     | Tomatoes for closed area | Yubiley 60  | Y |
| 2011                     | Tomatoes                 | Xazar   | Y |
|                          | Tomatoes for closed area | BerlurenA F1, Monro F1  | X |
|                          | Aubergine                | TurkAn  | Y |



|  |                          |           |   |
|--|--------------------------|-----------|---|
|  | Cucumber for closed area | JAZzer F1 | X |
|--|--------------------------|-----------|---|

There were zoned 8 species of crops, 8 species of cereals of leguminous plants, 6 species of oil plants, 6 species of fodder plants, 17 species of root-crops, 52 species of vegetable plants, 11 of them hybrid, 3 species of melon plants during 1961-2011 years in fifth region (mid mountain part of Shamakhi) for the purpose of use in agriculture sphere (Table 14).

*Table 14: Information on 5<sup>th</sup> zoned agriculture plants (midlands of Shamakhi district)*

| Year | Plant                         | Species  | Origin |
|------|-------------------------------|--|--------|
| 1963 | Autumn mild wheat             | BezostAyA 1                                      | X      |
|      | Sunflower                     | QiqAnt 549                                       | X      |
|      | Edible pumpkin                | PAIAv κAdu 268                                   | X      |
| 1965 | Turnip                        | OdesskAyA 5                                      | X      |
|      | Maroon                        | Agh uclu-cahrAyı qirmizi, rubin, DunqAnskiy 12/8 | X      |
|      | Spinach                       | Ispolinskiy 10                                   | X      |
|      | Pastinica                     | Gerneyskiy                                       | X      |
|      | Celery                        | DelikAtes  | X      |
|      | Parsley                       | UrojAynAyA                                       | X      |
| 1971 | Sweet pepper                  | NovoqoqoshAri                                    | X      |
| 1976 | Tall rAyqrAs                  | Qurinskiy  | X      |
|      | Sweet pepper                  | PodArok MoldAvi                                  | X      |
| 1980 | Tomatoes for closed area      | MoskvA. Osen. F1                                 | X      |
|      | Edible carrot (spring)        | NANtskAyA 4                                      | X      |
|      | Mangel-wurzel                 | LvovskAyA joltAyA                                | X      |
| 1981 | Autumn barley                 | Donetsk 8  | X      |
|      | Bean                          | KrAsnoqrAdskAyA 5                                | X      |
|      | White headed cabbage (spring) | AzarbAycAn                                       | Y      |
|      | White headed cabbage (summer) | AzarbAycAn                                       | Y      |
|      | Garlic                        | CalilAbAd  | Y      |
| 1982 | White headed cabbage (spring) | AbsheronskAyA oz.                                | Y      |
|      | Potatoes                      | Oqonyok  | X      |
| 1983 | Sorrel                        | SHirokolistniy                                   | Y      |
|      | Sunflower                     | VNIIMK 8883 yAx-sh                               | X      |
| 1984 | Autumn mild wheat             | AS-29  | X      |
|      | Aubergine                     | AlmAz  | Y      |
| 1985 | Soybean                       | PIAmyA   | X      |
| 1987 | Letucce                       | KrupnokochAniy                                   | X      |
| 1988 | Spring rye                    | Mirbashir 46                                     | Y      |
|      | Oats                          | AzarbAycAn 60                                    | Y      |
| 1989 | Autumn mild wheat             | Birlik   | Y      |
|      | Sweet pepper                  | TopAlin  | X      |
|      | Autumn rAps                   | Tismenitskiy                                     | X      |
|      | Potatoes                      | Rodomishlinskiy                                  | X      |

|      |                                   |   |   |
|------|-----------------------------------|---|---|
|      | Cucumber for open area            | Konkurent, PArAd  | X |
|      | Watermelon                        | YAntArnAyA, TAvriyA   | X |
| 1990 | Tomatoes for open area            | Utro, Novichok, VolqoqrAd 323   | X |
|      | Dill                              | XArkovskiyy 85  | X |
|      | Soybean                           | UmAnskAyA   | X |
|      | Potatoes                          | Nevski  | X |
|      |                                   | Sevinc  | Y |
| 1991 | Autumn barley                     | RosAyA  | X |
|      | Potatoes                          | LAymtdotA   | X |
|      | Tomatoes for covered area         | Rusich F1   | X |
| 1992 | Cauliflower                       | QArAntiyA   | X |
|      | Buckwheat                         | KrupinkA  | X |
| 1993 | Tomatoes for open area            | Elim, Ilkin   | Y |
|      | Sweet pepper                      | MurAd   | Y |
|      | Pepper                            | Goy-gol   | Y |
|      | Potatoes                          | UkrAynA – rorobiy   | X |
| 1994 | Cucumber for open area            | Feniks 640  | X |
| 1995 | Tomatoes for open area            | Astol   | X |
|      | Tomatoes for open area            | Banovsha  | Y |
|      | Vegetable bean                    | ZulAI, FidAn  | Y |
|      | Vegetable pea                     | FidAn   | Y |
|      | Anise                             | AghcAbadi   | Y |
| 1996 | cocksfoot - (dactylis L)          | AzNIIKL va P495   | Y |
|      | Tomatoes for open area            | Vatan 1   | Y |
|      | Dill                              | Otello  | X |
|      | Watermelon                        | MarcAn  | Y |
| 1997 | summer cypres - (bassia scoparia) | QobustAn  | Y |
|      | Potatoes                          | Amiri 600   | Y |
| 1998 | Cucumber for open area            | Azari   | Y |
| 2000 | Autumn mild wheat                 | Akinchi 84  | Y |
|      | Bean                              | AzNIIZ 352  | Y |
| 2002 | Bean                              | NAil  | Y |
|      | Sunflower                         | KAzino  | X |
|      | Tomatoes for closed area          | SHAhin, SHAlAla   | Y |
| 2006 | Bean                              | Narmin  | Y |
|      | Potatoes                          | FielA, SolArA, NorA, AqriyA, LAurA, MArAbel, MonALizA, SpuntA, ArindA, ImpAIA | X |
|      | Tomatoes for closed area          | OperA F1  | X |
|      | Garlic                            | QusArchAy   | Y |
|      | Soybean                           | MAjestA   | X |
|      | Cucumber for open area            | PAshA F1  | X |
| 2008 | Sainfoin - (onobrychis)           | AzNIIKL va P495   | Y |
| 2009 | Tomatoes for closed area          | RAlli F1, ElmidA F1   | X |
|      |                                   | SultAn F1   | Y |
|      | Cucumber for closed area          | PikolinA F1   | X |
| 2010 | Tomatoes for closed area          | Yubiley 60  | Y |

|      |                          |                        |   |
|------|--------------------------|------------------------|---|
| 2011 | Tomatoes                 | Xazar                  | Y |
|      | Tomatoes for closed area | BerlurenA F1, Monro F1 | X |
|      | Aubergine                | TurkAn                 | Y |
|      | Sweet pepper             | NovoqoqoshAri          | Y |
|      | Cucumber for closed area | JAzzer F1              | X |

### Crops:

#### - ***Aghsu district:***

**Lowland species (autumn mild wheat)** - middle-sized (96-102 sm), durable for falling down. It ripens slowly. Vegetation duration is 208-221 days, it ripens for 3-5 days later than Mirbashir species. The species is high productive, potential productivity is 70-80 quintal from 1 ha area. Its productivity is more from Mirbashir species for 13,1 quintal. This species is resistant for drought and fungus disease.

**Azamatli 95 (autumn mild wheat)** – low sized (92-96 sm), has strong trunk, durable for falling down. It ripens fast, vegetation period is 216 days. Due to quickly ripening, it doesn't expose to drought. Potential productivity is 80-90 quintal/ha. There wasn't observed infection of yellow pas.

**Barakatli 95 (autumn hard wheat)**- low sized (95-98 sm), semi-winter. Vegetation period is 210-219 days. Potential productivity is 70-80 quintal/ha. This species is resistant for drought, frost, has never been infected with yellow pas, flour dew. Optimal period of sowing is second half of October till first half of November.

**Bezostaya 1 (autumn mild wheat)** – middle sized (90-105 sm), is durable for falling down. The vegetation period is 220-224 days. Potential productivity is 40-70 quintal/ha. This species is resistant for pas, flour dew disease. Optimal period of sowing is second and third decade of November.

**Garabagh 21 (autumn barley)** – height is 88-100 sm, is resistant for falling down. Vegetation period is 169-206 days. Potential productivity is 57-68 quintal/ha. Optimal period of sowing is from second half of October till first half of November.

**Djalilabad 19 (autumn barley)** – height is 90-100 sm, is resistant for falling down and drought. Vegetation period is 177-184 days. Potential productivity is 60-72 quintal/ha. Optimal period for sowing is third half of October and first decade of November.

#### - ***Shamakhi district:***

The following species are cultivated in Shamakhi district: Garabagh 21 and Djalilabad 19 species of barley and Bezostaya 1 and Gobustan species of grain. Bezostaya 1, Azamatli 95 and Gobustan grain species are cultivated in farm areas in Gobustan district.

## **Cereals of leguminous plants:**

### **Pea –**

**Narmin species** – as was observed in farms, productivity is 20,1 quintal/ha, vegetation period is 192 days.

**AzNIIZ species** productivity is 15 quintal/ha, vegetation period is 190 days.

Based on observations on peas, it has been known that due to low temperature of air and soil during winter, ripening of the seeds was delayed till spring (usually last decade of December and first decade of January). As a result of relatively hot weather at early spring and enough humidity in lands all samples have comparatively early growth, and this helps them to avoid summer drought. Thus, vegetation period of peas in Gobustan district is 118-125 days.

## **Technical plants:**

### **Cotton:**

**AzNIXI 33** – productivity is 36 quintal/ha.

**3038** – productivity is 33,8 quintal/ha.

**Aghdash 3** – productivity is 38 quintal/ha.

**AP – 317** – productivity is 36,1 quintal/ha.

Aghdash 3 and AP-317 differs from other cotton species by fast ripening.

## **Fruit plants**

### **Apple**

The required average temperature for apple growth is 18<sup>0</sup>C-20<sup>0</sup>C. If the temperature will be higher or lower the assimilation of tree leaves will be destroyed. It is resistant to frost. Sometimes it's resistant to frost with temperature of -15<sup>0</sup>C -30<sup>0</sup>C and -35<sup>0</sup>C -40<sup>0</sup>C. Small poxes of tree can be spoiled in -1<sup>0</sup>C -3<sup>0</sup>C temperature.

### **Species:**

**Graphshteyn** – is summer species with tall height. The crown of the tree is round form, the branches are divided from the large branch. The fruits of the tree are big, yellow, pink-red with stripes. The tree ripens in middle of August.

**Winter gold parmen** – is middle sized, crown is pyramid form and wide, the branches are middle thicketed. The fruits are middle sized, conical and smooth. Peel of fruit is golden-yellow, sometimes orange, with red spots and pink stripes. Pulp is yellow, juicy, tastes as sweet wine. It is resistant to transportation.

**Yellow sour** – the trees are tall, the corona is round form. The species is long-lasting, strong and forbearing. It is resistant for diseases and drought. The tree has high productivity. The fruits are middle sized, oval with sort stem. Peel is thick, oil, smooth, light-yellow and red. Pulp is white, sour-sweet, juicy, aromatic. The tree is harvested in beginning of October.

**Wild Hadji** – trees as tall with round corona. It has high productivity. The fruits are smooth-round and small (100-150gr). Peel is thick and hard. The color is strong yellow with red strips. Pulp is white, juicy, aromatic and hard. It is sweet, and is harvested in the middle of October and can be kept till August.

**Shampain reneti** – trees are middle sized with wide corona. Fruits are flat-round middle-sized. Peel is smooth, bright, whitish and yellow with red cheek. Pulp is white, hard, juicy with wine taste. The fruits remain at the tree for a long time. It ripens in November-December. It is resistant for transportation and preservation. It can be kept till new harvest.

**Shimirenko reneti** – trees are tall with tight branches and wide corona. The species ripens fast. The fruits are middle sized, peel is light green, then it becomes yellow. The form is round. Pulp is light green, hard juicy, light aromatic. The fruits ripen slowly till November-December. It can be kept till June.

**Golden delicious** – tree is tall, corona is oval. The tree is rare in young age and with tight branches in old age. The fruits are middle sized and conical form. Peel is green yellow, sometimes golden. Pulp is yellow, juicy, has specific good aroma with high glucose.

## **Pear**

In comparison with apple, pear is warm required tree. It is resistant for  $-25^{\circ}\text{C}$   $-30^{\circ}\text{C}$  frost. Sprouts are spoiled in  $-2^{\circ}\text{C}$   $-3^{\circ}\text{C}$  frost, fruits are spoiled in  $-5^{\circ}\text{C}$   $-6^{\circ}\text{C}$  frost. The plant is high-light demanding plant.

### ***Species:***

**Wild Nadiri** – tree is tall, (10 m) with wide corona. Tree has tight branches. It ripens and is harvested fast. Fruits are small sized (30-60 gr), form is oblong. Peel is smooth, green-yellow, light red. Pulp is white, sweet and little sour. It ripens in end of August and is resistant for diseases.

**Wilyams** – tree is middle sized, in young age is pyramid form, in old age has become round form. The species is resistant for winter in warm districts. It is harvested in 3 years after growing. Fruits are big and middle sized. Peel is green-yellow, after ripening is yellow. Pulp is white and light yellow. The fruit is juicy and delicious.

**Lyubitsayya Klara** – tree is middle sized with wide corona. It is harvested after 3 years and flowers fast. Fruits are wide, smooth with red, yellow and light red peel. Pulp is

light yellow, juicy, oil, sweet with delicious taste. The species is resistant for fungus disease and transportation.

**Pomegranate pear** – tree is tall, wide with sparse corona. Fruits are big (200-500gr) conical. Stem is thin and long. Peel is light green and white, juicy, sweet and little sour. The tree is harvested in October and fruits ripen in January. The tree can be kept till April.

**Bere Ardanpon** –tree is tall with tight corona wide pyramid form. It is resistant for pests and diseases. Fruits are big and short. Pulp is light yellow, mild, juicy with delicious taste. The tree is harvested in beginning of October and ripens in January and can be kept till April.

**Bere Bosk** – tree is middle sized with tall pyramid form. Fruits are big and middle sized, oblong, symmetric. Peel is thin, mild, not smooth, green and brown-yellow. Pulp is white, mild, and juicy with delicious taste. It ripens in middle of September and is resistant for diseases and transportation.

**Dushes Angelum** – tree is middle sized with pyramid form corona. Fruits are big (250gr), conical. Stem is short and thick. Peel is thick, bright, green. Fruit is red yellow after ripening. Pulp is yellow, juicy and little sour. The species is resistant for fungus diseases.

**Kure**– tree is tall with wide corona. Fruits are big (400gr and more), oblong. Peel is hard, smooth, light green with strips. Pulp is white, granular. The species is resistant for fungus diseases.

### **Quince**

Quince being South temperate zone plant is warm required plant. But this plant differs from other south plants by its resistance for frost. It is pretender of light and humidity. This plant is harvested fast in light soils, but the productivity level is low. Notwithstanding it is harvested slowly in fertile and heavy soils, the productivity level is high.

### ***Species:***

**Djardam** – tree is tall, leafs are big with bubbles. Fruits are very big (600gr), oblong round. Peel is light-cinnamon and pink. After ripening it becomes strong yellow colored. Pulp is white-yellow, juicy. This fruit is delicious, aromatic and mild. The species differs by its high productivity. The fruits ripen in the middle of October and can be kept till March.

**Yellow quince** – tree is middle sized and has high productivity. Leaves are oval with bubbles. Fruits are round. Weight of fruit is 360gr. Peel is strong-cinnamon and pink, smooth and yellow. Pulp is light yellow, mild, very juicy, aromatic and delicious. Fruits mature in September. This species is resistant for keeping.

## **Peach**

This plant is heat-loving and pretender for light. This species isn't resistant for frost and drought. This plant begets in light and enough fertile soils.

### ***Species:***

**Golden jubiley** –tree is tall with rare corona. Blossoms are big strong pink, fruits are oval. Peel is golden-yellow with red cheek. Peel is hard and can be divided from pulp easily. Pulp is orange-yellow, sour sweet, aromatic and easily divided from the stone. It ripens fast in the end of August and has high productivity.

**Elbert** –tree is tall with rare corona. Leaves are oval, strong green-orange. Blossoms are ring form, strong pink colored. Fruits are very big, round. Peel is green-yellow-pink with red cheek and bloom. Pulp is pink-yellow, fibre, hard, juicy, aromatic, sour-sweet. Pulp is divided from stone easily. This species ripens in the end of August.

**Salami** –tree is tall with wide pyramid form corona. Leaves are wide strong green. Blossoms are big of rose form, light pink colored and blows slowly. Fruits are big, wide-oval and round. Peel is hard, with thick bloom, light yellow-green with strips cheek. Pulp is orange, rough fibre, juicy and it isn't divided from stone. Pulp is red around stone. This species ripens in the middle of September.

## **Plum**

This plant is pretender for light, isn't resistant for frost (-35<sup>0</sup>C -36<sup>0</sup>C). Humidity attitude depends on its origin and sub-inoculation. Asian species in comparison with European species are resistant for drought. Generally it is humidity demanding plant. This plant is good developed in humid, fertile and lime soils.

### ***Species:***

**Green Renklod** –tree is middle sized and has high productivity. Fruits are big (30-40gr) and round form. Pulp is green-yellow, hard, very sweet, juicy and very delecious. It ripens in the middle of August.

**Yellow Albukhara** –tree is short sized, with round and tight corona. Fruits are oval, middle sized (35gr), light yellow colored. Surface of fruit is covered with white wax. Pulp is light yellow, hard, sweet and aromatic. Stone is divided from pulp easily. It ripens from July till September.

**Altan Renklod** –tree is middle sized. Fruits are big (60gr), round from, red-violet colored. Pulp is golden-yellow, hard, juicy, and sweet. It ripens in the end of August. This species has high productivity.

## **Apricot**

It is heat and light demanding plant. Short term frosts (-25<sup>0</sup>C -30<sup>0</sup>C) don't impact to this plant. It blossoms in February. In this period blossoms can be spoiled by frost -18<sup>0</sup>C - 20<sup>0</sup>C. Branches of tree are quickly dry up and corona becomes rare in shady place. This plant relatively is resistant for drought and is good developed in light soils.

### ***Species:***

**Shalakh** – tree is tall with wide corona. Trunk and skeleton branches are thick. Leaves are wide, big and egg form, strong green colored, stems are long. Blossoms are big light pink colored. Fruits are oblong, wide egg form. Peel is pink-yellow with red cheek. Pulp is juicy, mild, fiber, aromatic and sweet. Stone is sweet. This species is has high productivity and ripens in end of June.

**Red cheek (kranoshekiy)**– the tree is short sized with wide rare corona. Leaves are oval, middle sized, strong green, thin and with long stems. Blossoms are white middle sized. Fruits are middle sized (25-30 gram) egg form. Peel is thick, hard, orange colored with little red spots and with strong red cheek. Pulp is orange, juicy, fiber, sweet-sour. Stone is sweet. This species has high productivity. It ripens in end of June and in the beginning of July.

**Abu Talibi**– is local Ordubad species. Corona of the tree is wide round form corona. Cortex is grey, thick. Leaves are oblong and egg form, strong green colored. Fruits are oblong with bloom on surface, peel is strong and hard, green yellow with red cheek. Pulp is light yellow, juicy, sweet-sour. It ripens in the end of July.

**White Tabarza**– tree is middle sized with wide rare corona. Fruits are oval and wide. Peel is thick, hard and without bloom, bright, strong-white colored with red cheek. Pulp is mealy, white, juicy and very sweet. Stone is sweet. It ripens in the middle of July.

**Hagverdi**– tree is round with tight branches corona. Fruits are oblong egg form. Weight of one fruit is 60-70 gram. Peel is thin, mealy bloom and white with red cheek. Pulp is light yellow, juicy, aromatic and sour. It ripens in the beginning of July.

## **Berry**

It is heat and light demanding plant. But excessive heat has negative impact on development and grows of this plant. This plant is more resistant for winter between south plants. Excessive humidity and close location to ground waters have negative impact on berry. Tree is developed well in sandy place.



***Species:***

**Biggaro Grol** – tree is tall with rare corona. This species has high productivity. Fruits of the tree are big and heart form. Peel is light red and yellow. Pulp is light pink, juicy, sweet and little sour. It ripens in July.

**Ramon Oliva** –fruits are middle sized (5,4 gr), round and heart form. Peel is strong red and after ripening it becomes black. Pulp is light red, sweet. Juice of the fruit is sweet and pink. This species has high productivity and ripens in July.

**Pharash Kassini** – fruits are big, round and heart form. Peel is strong red. Pulp is middle hard, juicy, sweet and strong red colored. It ripens in second decade of June.

**Yellow Drogan** –tree is tall with round pyramid form corona. Tree is harvested in 3 years old. Fruits weight is 7,5gr. There are yellow, round. Pulp is light yellow, juicy. It ripens in the end of June.

**Cherry**

The plant is resistant for frost of  $-25^{\circ}\text{C}$   $-35^{\circ}\text{C}$ . This species doesn't demand so much light but in enough lighted areas this plant has high productivity. Demand on humidity differs by sub-inoculations and sorts.

***Species:***

**Anadolu** – tree has height of 7m, corona is pyramid form. Fruits are middle sized, round, strong red. Stem is thin and long. Pulp is mealy, juicy, sweet-sour. Juice is strong colored. It ripens in the end of July. Fruits of tree don't ripen in the same time and therefore its harvesting consists of several stages.

**Podbel** - tree is middle sized with round corona. Fruits are big and middle sized, round, strong red, bright, thick and hard. Stem is middle long. Pulp is strong red, mealy sweet-sour, delicious. It is harvested in 5-6 years old. Harvesting consists of several stages. Fruits are used for processing.

**Big Shpanka** – tree is middle sized with round corona. Shoot and branches are strong, leaves are big and strong green. Fruits are big, oval, strong red colored. Peel is bright, thick and hard. Pulp is mealy, juicy, red, sweet-sour, delicious. This species has average productivity. It is a new species.

**Hazel nut**

This plant is resistant for frost of  $-25^{\circ}\text{C}$   $-30^{\circ}\text{C}$ . Male branches are resistant for frost of  $-10^{\circ}\text{C}$   $-12^{\circ}\text{C}$ , female branches for frost of  $-5^{\circ}\text{C}$   $-6^{\circ}\text{C}$ . It is humidity demanding plant especially in summer. It is also fertile demanding plant and well developed in clay soils.

***Species:***

**Oil huzel nut** – tree is tall (12m). Fruits are oblong-round, bright and red. Peel is thin and hard. Fruit's weight is 3gr. Kernel is covered with cork. This plant is resistant for diseases and pests. This species has high productivity. 32kg can be harvested from one bush. It ripens in September.

**Pomegranate**

This plant is dry subtropical plant. Vegetation period demands high temperature. It is resistant for drought but it's necessary humidity to give good harvest. Normal heat (22<sup>0</sup>C - 25<sup>0</sup>C) and enough humidity of soil (75-80%) are the base of high and high productivity. This plant is resistant for -18<sup>0</sup>C -20<sup>0</sup>C frost.

***Species:***

**Azerbaijan guloysha** – tree is middle sized (3m) with tight branches. Fruits are 300-400gr. Peel is red-pink, thin and bright. Seeds are big, red and middle sized. Juice is sweet, red. It ripens in October. Each bush gives 45kg harvest.

**Pink guloysha** – tree is middle sized (3-4m). fruits are big, round form, 220-250gr. Peel is pink-red. Seeds are middle sized strong red. Juice is sour-sweet. It ripens in October. Each bush gives 35-45gr harvest.

**Thin peel** – fruits are strong red with thin peel. Seeds are strong red, sweet-sour. It ripens in October. Each bush gives 35-40 harvest.

**Calf mursal** – tree is middle sized (3m), trunk is with little barbs. Fruits are big (300gr) and sometimes very big. Peel is thick. Seeds are middle sized and big, strong red. Juice is sweet-sour, red. It ripens in October. Each bush gives 30-50 harvest.

**Fig**

It is heat demanding plant and resistant for -18<sup>0</sup>C frost. This plants demands humidity and is resistant for short term drought. It ripens normal in week humidity soils, in hard heavy soils the fruits are very little.

***Species:***

**Kadota** – tree is tall with rare round corona. Branches are grey. The tree is harvested two times. Fruits are middle sized (50-55gr), fertilized fruits are very big (100gr). Fertilized fruits are more sweet and delicious. Peel is green-yellow. The fruits are used in fresh and dried form.

## **East date**

This plant is more resistant for frost of  $-22^{\circ}\text{C}$   $-23^{\circ}\text{C}$  among the subtropical plants. Due to late beginning of vegetation period it is not exposed to spring frosts. Tree are resistant for high temperature, short term drought and demand light.

### ***Species:***

**Khiakume** – tree is tall (4-12m) with wide, tight branches corona. Leaves are oval round, egg form, strong green, 10-17sm height and 6-10sm width with bright surface. Fruits are big (300-500gr), round and spherical. Form and color depend on pollination. Stem is 1,5 sm. Fruits are covered with wax. Pollinated fruits are round and brow. Pollinated and fertilized fruits can be eaten in unripe form. Pulp if fruit depending on pollination is yellow-brown and strong brown. This plant has high productivity and one tree gives 120-180kg of harvest.

**Sidles** – tree is tall with wide rare corona. Cortex is tight and hard. Leaves are middle sized, oblong and egg form. Fruits are middle sized (150gr) and flat. Pulp is without seed and brown-orange, with seed red-brown. It ripens 20-25 days after harvesting. This plant is resistant for transportation. One tree gives 60-70kg of harvest.

## **Almond**

This plant is heat demanding and resistant for  $-30^{\circ}\text{C}$   $-35^{\circ}\text{C}$ . this plant demands light.

### ***Species:***

**Nikitskiy** – tree is tall with rare corona. Blossoms shoot is big. Stone is big, wide, strong brown, sweet.

## **Zizipsus**

This plant is resistant for drought, heat and frost  $-30^{\circ}\text{C}$ .

### ***Species:***

**Nasimi** – tree is tall 6m with pyramid form corona. Shoot is brown with weak burbs. Tree is harvested in 4-5 years. Frits are big, 9,5gr and cylindrical form. Peel is strong brown, sweet-sour. It ripens in third decade of October. Each tree gives 4kg of harvest.

## **Strawberry**

This plant isn't resistant for frost and it is spoiled in temperature  $15^{\circ}\text{C}$ - $18^{\circ}\text{C}$  if it isn't snowing, but under snow the plant can be kept in the temperature  $-25^{\circ}\text{C}$   $-30^{\circ}\text{C}$  even in  $-40^{\circ}\text{C}$ . This plant demands light, in the condition of high light and shady place does not develop well. The plant is planted in south regions in shady places and demands humidity.

### **Species:**

**Madam Muto** – fruits are big (18gr) and red. Pulp is light red, sweet-sour, delicious. The plant has high productivity and is resistant for winter.

**Festivalplant** - is tall and rare. Leaves are big, light green. Fruits are big, initial fruits are 46gr, following harvest's fruits is 8-10gr. Fruits are oblong, egg plant. Pulp is pink; middle hard, juicy, sweet-sour. This plant has high productivity. Shortcoming of this plant is not being resistant for *Trichothecium rozeum* disease and tick disease.

### **Grape**

#### **Species:**

**White muscat** – it is French origin technical grape species appropriated for this zone. Muscat species as well as Shasla species are planted in most of world grape regions. White Muscat's bush is tall, blossoms are pollinated themselves. It is harvested fast. Seeds are amber colored, size is 13-18mm. cluster is middle sized 10-18sm, cylindrical and conical form. Cluster's weight is 103-150gr. Productivity of grape in Shamakhi region is 50-70 quintal. Ripening period is 130-135 days. There is planted the best wine species in 800 m above sea level in Mountain Shirvan region.

**White Shasla** – it is zoned Egyptian species. Seeds are white, size is 13-18mm. Cluster is cylindrical conical, height s 10-18sm and tight. The plant ripens fast and ripening period is 115-120 days.

**Aligote** – it is zoned French technical grape species. Grape bushes are middle sized, blossoms are pollinated themselves. Seeds are light green, size is 13-18mm. Peel is thin and elastic, pulp is white and juicy. Cluster is cylindrical, size is 10-18sm and tight. The plant is middle ripened. Ripening period is 115-120 days. This species is used for wine making.

**Bayanshira** – is local Azerbaijan edible species and is planted in midland region. Grape bushes grow fast. Seeds are strong red, size is 13-18mm. Cluster is middle sized 180-190gr. Ripening period is 130-135 days. He plant has high productivity. Based on dates on 1950 year, the harvest amount was 1065 quintal, 1980 the amount was 800-1000 quintal. Wine from this species is light, mild and aromatic. Cognac alcohol from this species ripens fast, but champagne ripens slowly.

**Pink muscat** – it is zoned French technical grape species. Bushes grow fast. Seeds are amber colored, 13-18mm. Cluster is cylindrical and conical, size is 13-18sm and tight. Leaves are with little bloom. Ripening period is 130-135 days. The harvest amount in Shamakhi region is 80 quintal, glucose is 25%. The species is used in region to make port vine sort of wine.

**Hamashara** – it is local technical grape species. This species was pollinated at the cost of Hamashara river of Djalilabad district and after it was cultivated by local population. Blossoms are pollinated themselves, bushes grow fast. Cluster's stem is short. Seeds are black, size is 23mm. Peel is thick, not hard, pulp is hard white. Cluster is wide conical, size is 18-26sm and tight. Leaves have little bloom. It is fast ripening species. Ripening period is 115-125 days. Seeds ripen in the end of August and in the beginning of September. This species is used to make red wine and *Cahors* sort of wine.

**Khindogni** – it is local technical grape species. It was created by selection way. This species is pollinated itself. Bushes are strong. Seeds are black; size is 13-18mm. Pulp is sweet and smooth. Cluster is conical; size is 18-26sm. Cluster's stem is very thick. Ripening period is 10-135 days. This species is used only for wine making. Productivity depends on the regions. In Garabagh region the harvest amount is 200quintal, in Ganja 100 quintal, in Mil the amount is 75 quintal. Glucose is 19,8%.

**Kabarne sovinyon** – it is zoned French technical grape species. Bushes grow not fast. Seeds are black, size is 13-18mm. Peel is thick, pulp is juicy. Cluster is cylindrical-conical, size is 10-18sm and tight. Ripening period is 135-140 days. These species current time are planted in Aghstafa and Ganja wine plants. The grape ripens in the end of September. This species adapts easily to various conditions. In warm regions, the amount of sour decreases and becomes mild and it is profitable for wine making.

**Madrasa** – it is Azerbaijan local technical grape species. It was spread in top Shirvan region. Bushes are middle sized and grow not fast. The species is pollinated itself, seeds are black, size is 13-18mm. pulp is very juicy. Cluster is conical, size is 10-18sm and tight. Ripening period is 130-135 days. It ripens completely in the beginning of September. This plant has middle productivity.

**Rkasiteli** – it is zoned Georgian technical grape species. It is pollinated itself. Seeds are oval, white, size is 13-18mm. Pulp is juicy, cluster is cylindrical-conical, size is 10-18sm. Ripening period is 130-135 days. The species has high amount of glucose. The species is sensitive for drought and resistant for phylactery.

**Sapevari** – it is zoned Georgian technical grape species. Bushes don't grow fast. The species is pollinated by itself. Seeds are oval, black, size is 13-18mm. Cluster is conical. Ripening period is 130-135 days. The species is typical wine species. Glucose amount is 25-28%.

**Kabarne** – it is zoned French technical grape species. Seeds are black, size is 13-18m. Cluster is cylindrical, size is 10-18sm and tight. Ripening period is 135-140 days.

**Risling** – it is zoned German technical grape species. Bushes don't grow fast and it is pollinated itself. Seeds are round, white, size is 13-18mm. Peel is thick and limpid. Pulp is juicy, cluster us cylindrical, size is 10sm and tight. Ripening period is 130-135 days. The species is used for making of high quality wine and champaign.

**White Khalili** – it is local meal grape species. Bushes are very strong and pollinated itself. Seeds are light green, size is 13-18mm. peel is thick, pulp is sweet. Cluster is oblong, size is 10-18sm and tight. Ripening period is 105-115 days. Harvesting is conducted in July. It is eatable.

**White currants** – it is local grape species in order to drain. Seeds are oval, amber colored, size is 13mm. Cluster is conical, size is 10sm. Ripening period is 130-135 days.

**Black currants** – it is widely spread in Central Asia grape species. It is mostly planted in warm regions. Bushes are strong and are pollinated themselves. Cluster is middle sized, oblong-conical and rare. Seeds are small, oval, strong blue and covered with wax layer. Peel is middle thick. The species has high glucose and is sweet.

**Shirvanshahi** – this species is very valuable in Low Shirvan region. Bushes are middle sized, blossoms are pollinated themselves. Clusters are middle sized, conical and rare. Cluster stem is thick. Seeds are middle sized, round and egg form, they are covered with wax layer, is strong blue. Peel is thick and hard. Pulp is fleshy, pulp is divided from stone difficult. This species has high amount of glucose. This species is sued for making *Cahors* wine. The most famous wine is “Kurdamir”.

**Huseyni** – homeland of this species is Central Asia. This species is widely spread in Uzbekistan, several countries, Azerbaijan especially in Shamkir district. The species has number of types. They are White Huseyni, Huseyni Lyunda and Galinbarmaghi. Huseyni Lyunda is more spread than other. Bushes are strong and grow fast. Stem is very long, conical. This species is rare and brakes easily. Seeds are big, oblong, cylindrical, limpid green. Peel is thick, elastic. Pulp is fleshy, juicy. The taste is sweet-sour, after completely ripening the taste is more sour. Huseyni is the most beautiful species with its cluster and seeds. Huseyni take second place in Uzbekistan after white currant. Huseyni is typical meal species. This plant demands a lot of heat.

### **Vegetable plants**

#### **White-headed cabbage**

This plant doesn't demand so much heat and is resistant for frost. Seeds grow in the temperature of 18-20C during 7-12 days. The optimal temperature for plant growth is 15-17C. Well planted seedlings are resistant for -3C -5C frost. Late ripened species is resistant for -10C -12C frost.

#### ***Species:***

#### **White-headed cabbage for summer planting:**

**Azerbaijan-** it is middle planting species. Mass of the plant is 1,3-3,4kg and it is hard. It is harvested at the same time. It is resistant for transportation and keeping. The plant is used in canning form.

**Yujanka 31** - it is middle ripened species. Ripening period is 105-120 days. Productivity is 250-260 quintal from 1 ha. Mass is 1,6-1,8kg, the color is white-yellow. This species relatively is resistant for diseases and warm. The plant is used for marinade and fresh form.

### **White-headed cabbage for autumn planting:**

**Autumn Absheron**- it is fast ripened species. Ripening period is 214-226 days. Productivity is 430-480 quintal from 1 ha. Mass is 1,5-2,5kg and middle hard. The plant is resistant for transportation and diseases. It is used in fresh form.

**Araz**- it is fast ripened species. Ripening period is 203-220 days. Productivity is 430-500 quintal from 1 ha. Mass is 1,8-1,9kg. It is resistant for transportation and diseases. The plant is used in fresh and marinade form.

### **Cauliflower for summer planting:**

**Movir 74**- it is fast ripened species. Ripening period is 102-105 days. Mass of the plant is 0,4-0,8kg and is harvested I spring-summer and summer-autumn. The plant is used in fresh and marinade form. This species is widely spread in Azerbaijan. The cabbage is big, round and has high productivity. Diameter of the plant is 10-12sm, productivity is 100-120 quintal/ha. The plant is resistant for diseases.

**Garantiya**- it is fast ripened species. Ripening period is 115-125 days. Mass of the plant is 0,5-0,8 kg, it is round, light yellow with small granular. Productivity is 90-150quintal/ha. The plant is resistant for diseases.

### **Cauliflower for autumn planting:**

**Winter Adler 679**- it is middle ripened species. Ripening period is 210-240 days. Diameter is 12-15sm, the plant is white. Weight of the species is 2,6kg. Productivity is 140-160quintal/ha. The plant is resistant for diseases.

**Sochinskaya**- it is middle ripened species, ripening period is 194-237 days. The plant is big, white, hard. Weight is 0,44-0,93kg, productivity is 100-170quinal/ha. The species is resistant for diseases.

**Autumn Adler**- it is middle ripened species. Vegetation period is 145-240 days. The species is round and smooth, hard, white and yellow. Weight is 0,2-0,6kg. Productivity is 100-120 quintal/ha. The plant is resistant for diseases.

### **Tomatoes**

The species is planted in open and closed areas, it is heat and light demanding plant. The normal temperature for plant's growing is 22<sup>0</sup>C -24<sup>0</sup>C. In the temperature of 15<sup>0</sup>C blossoms are destroyed, in the temperature of 10C the growing process is stopped. High temperature 35<sup>0</sup>C also negatively affects to plant's growing. The optimal humidity for the plant is 75-80%.

#### **Species:**

#### **Tomatoes for open area:**

**Elim**- it is middle ripened species. Vegetation period is 109-110 days. Productivity in various regions is 648-772 quintal/ha. The plants are round, red. Mass of one plant is 135-140gr. Biochemical indicators are high. The species is resistant for abiotic factors, diseases and viruses.

**Ilkin**- it is middle ripened species. Vegetation period is 112-115 days. Productivity in various regions is 480-650 quintal/ha. The plants are oval-oblong, middle mass is 90-110 gr. Biochemical indicators are high and it is resistant for fuzarioza diseases and transportation.

**Vatan 1**- it is middle ripened species. Vegetation period is 109-115 days. Productivity is 629-824 quintal/ha. The plants are round, middle mass is 112-135gr. Biochemical indicators are high, it is resistant for diseases and transportation.

**Peremoga 165**- it is middle ripened species. Vegetation period is 107-115 days. Productivity level is high – 400-670 quintal/ha. Plants are round, red and with smooth surface. Mass of one plant is 70-130gr. The species is used in fresh form. The plant is resistant for transportation, diseases and conservation.

**Volgograd 5/95**- it is middle ripened species. Ripening period is 116-130 days. The plants are round form, flat, bright red with smooth surface. Productivity is 350-600 quintal/ha. Mass of one plant is 90-150 gr. The species is used in fresh form and to product tomato paste. The plant is resistant for transportation, diseases and conservation.

**Titan** – it is middle ripened species. Ripening period is 118-135 days. The plants are round, big, hard with smooth surface. Productivity is 500-600 quintal/ha. Mass of one plant is 77-141gr. The species is used in fresh form, it is resistant for transportation, conservation and Fusariose diseases.

**Utro** – it s middle ripened species. Ripening period is 105-112 days. The plants are round, flat, red with smooth surface. Productivity is 400-800 quintal/ha. Mass of the plant is 58-108gr. The species is used in fresh form and canning, it is resistant for transportation, conservation and diseases. It is not resistant to transformation and diseases.

**Novichok**- it is middle ripened species. Vegetation period is 99-109 days. The plants are oval oblong, middle sized, red with smooth surface. Productivity is 500-600 quintal/ha. Mass of one plant is 76-83gr. The species is used for canning, it is resistant for conservation and diseases.

**Volgograd 323**- it is fast ripened species. Vegetation period is 103-110 days. The plants are round, flat, red. Productivity is 490 quintal/ha. Mass of one plant is 60-96gr. The species is used in fresh and canning form. The plant is resistant for transportation, conservation and diseases.

#### **Tomatoes for closed area:**

**Banovsha**- it is indeterminate type. Productivity from one square meter in not heating green house is 9,6-10,2kg, in heating greenhouses the productivity from one square meter is 12,3-14,1kg. The species is middle ripened plant. Ripening period is 170 days. The plants are round, flat, red. Mass of one plant is 84-99gr. Biochemical indicators are high. The species is relatively resistant for diseases.

**Shalala**- it is indeterminate type. Productivity from one square meter in not heating green house is 9,8-10,0kg, in heating greenhouses the productivity from one square meter is 11-13kg. The species is middle ripened plant. Ripening period is 167 days. The plants are round, big, red. Mass of one plant is 121gr. Quality indicators are high. The species is relatively resistant for diseases and *Trichothecium rozeum* in greenhouse conditions. The species is used in fresh and canning form.

**Shahin**- it is indeterminate type. In heating greenhouses the productivity from one square meter is 6,5-7,0kg. The species is middle ripened plant. Vegetation period is 142 days. The plants are round, big, red and hard. Mass of one plant is 120-140gr. Quality indicators are high. The species is relatively resistant for diseases and *Trichothecium rozeum* in greenhouse conditions. The species is used in fresh and canning form.

**Moskovskiy osenniy**- it is indeterminate type. Productivity from one square meter in not heating green house is 5-6kg, in heating greenhouses the productivity from one square meter is 10-12kg. The species is middle ripened plant. Vegetation period is 173 days. The plants are round, big, red. Mass of one plant is 60-65gr. Quality indicators are



satisfactory. The species is relatively resistant for diseases and *Trichothecium rozeum* in greenhouse conditions. The species is used in fresh and canning form.

**Rusich F1**- it is indeterminate type and heterosis hybrid. Productivity from one square meter in not heating green house is 7-9kg, in heating greenhouses the productivity from one square meter is 13-15kg. The hybrid is middle ripened plant. Vegetation period is 170-171 days. The plants are round, big, red with smooth surface. Mass of one plant is 80-90gr. The species is planted in winter-spring seasons. Quality indicators are good. The species is relatively resistant for diseases and *Trichothecium rozeum* in greenhouse conditions. The species is used in fresh form.

### **Egg-plant**

The plant is heat, light and soil demanding species. The optimal temperature for plant's growing is 23<sup>0</sup>C -30<sup>0</sup>C. The species is resistant for drought. But in case of irrigation lack during the fruiting, the fruits will be smaller and bitter.

#### **Species:**

**Zahra**- it is middle ripened species. Vegetation period is 121-124 days. The fruits are long cylindrical, smooth surface, pulp is white. The color of the plant during technical ripening is violet color, during the biological ripening the color becomes yellow-brown. Total productivity during the year is 450-500 quintal/ha. Mass of one plant is 125-155gr. The species is resistant for transportation, conservation, abiotic factors and Fusariose disease.

**Almaz**- it is middle ripened species. Vegetation period is 180-120 days. The fruits are shot cylindrical, black. Average productivity is 450-500 quintal/ha. Mass of one plant is 120-125 days. The species has a lot of seeds; it is resistant for abiotic factors and Fusariose disease.

### **Pepper**

The species is heat and light demanding plant. The productivity of the plant is high in the soil with humidity PH 6,0-6,6 and air humidity 60-70%.

#### **Species:**

##### **Sweet pepper:**

**Novogogoshari**- it is middle ripened species. Ripening period is 120-130 days. Productivity level is high – 450-500quintal/ha. The fruits are flat and round, tomato form, big with little bulging, not bitter. Mass of one plant is 115-120gr. Color of the plant is in technical ripening is strong green, during the biological ripening the color becomes strong red. Quality indicators are high. The species is resistant for conservation and transportation, diseases.

**Podarok Moldavi**- it is middle ripened species. Vegetation period is 150-155 days. Productivity level is high – 500quintal/ha. The fruits are conical, middle sized, smooth surface. Mass of one plant is 75-100gr. Color of the plant is in technical ripening is light green, during the biological ripening the color becomes red. Quality and biochemical indicators are high. The species is resistant for conservation and transportation, diseases. The plant is used in fresh and canning form.

**Murad**- it is fast ripened species. Vegetation period is 150-155 days. Productivity level is high – 480-500 quintal/ha. The fruits are conical, middle sized, smooth surface. Mass of one plant is 85-95gr. Color of the plant is in technical ripening is light green, during the biological ripening the color becomes red. Quality and biochemical indicators are high.

The species is resistant for conservation and transportation, diseases. The plant is used in fresh and canning form.

**Bitter pepper:**

**Goy-Gol-** it is fast ripened species. Technical ripening period is 105-109 days, biological ripening period is 121-133 days. Productivity level is high – 400quintal/ha. The fruits are long-13-17sm, diameter is 2-3sm. Mass of one plant is 29-31gr. Color of the plant is in technical ripening is light green, and during the biological ripening the color becomes red. Taste of the plant is little bitter, aromatic. Quality and biochemical indicators are high. The species is resistant for conservation and transportation, diseases. The plant is used in fresh and canning form.

**Cucumber**

The plant is heat, social and air humidity demanding, the optimal temperature for plant's growing is 22<sup>0</sup>C-28<sup>0</sup>C. In comparison with tomato, cucumber doesn't demand so much light, demands soil with humus.

***Species:***

**Cucumber for open are:**

**Kirovobadskiy mestniy-** it is middle ripened species. Ripening period is 47-55 days. The plant has long arch, fruits are cylindrical (12-18sm), mass is 200-250gr, the color is strong green, smooth surface and without bloom. Productivity is 250-300 quintal/ha. The species is meal species and is used in fresh form. Fruits are very delicious, they are resistant for conservation and transportation, number of diseases.

**Azeri-** it is middle ripened species. Ripening period is 72-76 days. Fruits are cylindrical (8-11sm), mass is 180-200gr, the color is strong green, smooth surface and without bloom. Productivity is 260-270 quintal/ha. The species is meal species and is used in fresh and canning form. Fruits are very delicious, they are resistant for conservation and transportation, number of diseases.

**PArAd-** it is fast ripened species. Vegetation period is 32-54 days. The main arch is middle sized. Fruits are cylindrical and oval (8-11sm), mass is 180-200gr, the color is strong green, with bumped surface. Productivity is 180-190 quintal/ha. The species is meal species and is used in fresh and canning form. Fruits are very delicious, they are resistant for conservation and transportation, number of diseases. The plant is summer planting species.

**Konkurent-** it is fast ripened species. Vegetation period is 36-55 days. The main arch is middle sized. Fruits are cylindrical and oval (9-12sm), mass is 180-200gr, the color is green, with bumped surface. Mass of one plant is 70-103gr. Productivity is 129-243 quintal/ha. The species is meal species and is used in fresh and canning form. Fruits are very delicious, they are resistant for conservation and transportation, it is sensitive for diseases.

**Cucumber for closed area:**

**Stella-** it is middle ripened species, partenokarpic type. The trunk is long. Vegetation period is 67 days. The trunk is long. Fruits are cylindrical, mass is 270-274gr, with bumped surface. Productivity in 1<sup>st</sup> stage is 14,8 kg from 1 m<sup>2</sup>, in 2<sup>nd</sup> stage 7,6kg from 1 m<sup>2</sup>. The species is meal species and is used in fresh form. The species is middle sensitive for diseases.

**Moskovskiy teplichniy-** it is middle ripened species, partenocarpical type. The arch of the plant is long. Vegetation period is 76-96 days. Fruits are cylindrical, situates on arch in tenuous case. The length of the fruit is 30-40sm. Mass of one plant is 360-400gr. Productivity is 27,3-29,8 kg from 1 m<sup>2</sup>. The species is middle sensitive for diseases.

## **Onion**

Onion is planted in moderate and warm regions. The plant demands light and humidity. The species is resistant for  $-2^{\circ}\text{C}$   $-4^{\circ}\text{C}$  frost. The plant gives high productivity in light soils.

### **Species:**

**Luganskiy**- it is late ripened species, vegetation period in different regions is 98-140 days. An onion is round, flat and oval. The peel is drain, yellow and yellow-brown, pulp is green, it is hard, mass is 71-146gr. Productivity is 200-410 quintal/ha. Biochemical and taste indicators are high. Onion is used in fresh, canning form. The species is resistant for diseases.

**Dusti**- it is middle ripened species. Vegetation period is 134-139 days. An onion is round and oval. The color is white and middle sized. Mass of onion is 125-160gr. Productivity is 437 quintal/ha. Biochemical indicator are high, the taste is middle bitter. The species is middle resistant for diseases.

## **Garlic**

The plant demands light and heat and is more resistant for frost than onion.

### **Species:**

**Djalilabad**- it is fast ripened species. Vegetation period is 240-250 days. It is autumn high productive species. Big onion has 8-12 parts. Mass of one plant is 40-50gr. The productivity is 140-179 quintal/ha. Biochemical indicators are high. The plant is used in fresh and canning form.

**Gusarchay**- it is fast ripened species. Vegetation period is 240 days. Mass of one onion is 66gr, number of part of one garlic is 8-12. Productivity is 124 quintal/ha. Quality indicators are high, the species is resistant for diseases and pests.

## **Beetroot**

The plant demand light, the blossoms begin to grow in the temperature of  $4^{\circ}\text{C}$  -  $6^{\circ}\text{C}$ . In the temperature 15-18C during 5-6 days the plant totally begin to blossom. Optimal temperature for vegetation is  $15^{\circ}\text{C}$  -  $18^{\circ}\text{C}$ , for blossom and seeding the temperature is  $18^{\circ}\text{C}$  -  $25^{\circ}\text{C}$ , the optimal humidity of soil is 60-70%.

**Bordo 237**- it is middle ripened species. Vegetation period is 62-116 days. Root fruit is round, pulp is strong red, burgundy colored, juicy and sugared. Mass of one plant is 300-650gr. Productivity is 350-700 quintal/ha. Biochemical indicators are high and it is suitable for long term conservation. The species is used for juice making, in salads, meals and canning. The plant is relatively resistant for diseases.

## **Carrot**

The plant is resistant for frost, seeds begin to grow in the temperature of  $2^{\circ}\text{C}$  -  $6^{\circ}\text{C}$ , seeds are resistant for frost  $-2^{\circ}\text{C}$  -  $-6^{\circ}\text{C}$ . The optimal temperature for normal growing and development is 16-20C. High temperature negatively impacts to growing process and mass. The species is very resistant for humidity.

### **Species:**

**Absheronskaya zimnaya**- it is middle ripened species. Vegetation period is 105-113 days. Scattering is recommended in summer. Root crop is conical, orange and yellow. Productivity is 348-387quintal/ha. Amount of carotene in the fruits is 8-10%. The species is used in fresh form and for commodity. The plant is relatively resistant for diseases.

**Yubileynaya**- it is middle ripened species. Vegetation period is 110-121 days. Scattering is recommended in spring root crop is cylindrical, orange, core is small. Productivity is 367-405 quintal/ha. Amount of carotene is 9-14%. The species is used in fresh form and for commodity. The plant is relatively resistant for diseases.

**Nantskaya 4**- it is middle ripened species. Vegetation period is 78-110 days. Root crop is cylindrical, orange, core is small, mass of plant is 92-152gr. Productivity is 423-432 quintal/ha. Quality indicators are high. The species is used in fresh form and for commodity. The plant is relatively resistant for diseases.

## **Leguminous vegetables**

### **Vegetable bean**

The plant is light demanding, is not resistant for drought, demands normal humidity during blossom phase. Optimal temperature is 25<sup>0</sup>C -30<sup>0</sup>C.

#### ***Species:***

**Zulal**- it is middle ripened species. Vegetation period is 68-73 days. Number of beans in one plant is 18-35. Productivity is 198-230 quintal/ha. The plant is used in preparation of national meals and canning industry. The species is relatively resistant for diseases.

### **Vegetable pea**

The plant is less heat and humidity demanding plant. seeds begin to grow in the temperature of 2<sup>0</sup>C -4<sup>0</sup>C. Seeds are resistant for -4<sup>0</sup>C -6<sup>0</sup>C frost. Optimal temperature for growing is 12-17C, high temperature negatively impacts to the plant.

#### ***Species:***

**Fidan**- it is fast ripened species. Vegetation period is 144 days. Plant is bush form; number of peas in one bush is 28. Number of seeds in one bean is 3-9. Mass of 1000 seeds is 160-190gr. Productivity is 27-73 quintal/ha. The plant is used in meal and canning industry. The species is resistant for diseases.

## **Melon plants**

### **Watermelon**

The plant is light demanding. The productivity is especially high in light, sandy and fertilized soils. Optimal humidity of soil is 50-60%, humidity if air 45-60%.

#### ***Species:***

**Mardjan**- it is middle ripened species. Ripening period is 90-100 days. Fruit is round, strong green with smooth surface. Taste quality is 4,5-5 points. Mass of the fruit is 5-20kg. The plant has high productivity. Productivity is 270-240 quintal/ha. The plant is resistant for diseases and conservation. The fruits can be conserved during 50-60 days. The plant is used in fresh form; peel is used in confectionery industry.

### **Melons**

The plant develops rapidly in the temperature 20-30<sup>0</sup>C.

#### ***Species:***

**Yantarnaya**- it is middle ripened species. Vegetation period is 71-86 days. Fruits are oval and smooth. After ripening the fruit is yellow, mass is 0,9-2,4g. Pulp is white, thick, very sweet and juicy. The plant is resistant for transportation, diseases and drought.

**Tavriya**- it is late ripened species. Vegetation period is 89-106 days. Fruit is round, smooth. Mass of fruit is 1,1-2,6kg. Peel is thin, pulp is thin, sweet, juicy and aromatic. The plan is resistant for conservation and transportation, drought.

**Kolkhoznitsa 749/753**- it is middle ripened species, has high productivity. Fruit is round, smooth. Fruit's color is strong green or yellow-orange, pulp is thin white, hard, juicy and sweet. The species is resistant for transportation, diseases and viruses.

### **Pumpkin**

The plant is resistant for drought, humidity, it demands heat. Optimal temperature for the plant is 22-27°C.

### **Species:**

**Palov Kodu 268**- it is middle ripened species. Fruits are strong, arch is long. Ripening period is 110-120 days. Mass of the plant is 5-6kg. Peel is thin, pulp is orange, thin, sweet (3-8%). Productivity is 400-450 quintal/ha. Ripened plant can be conserved for 7-8 months. The plant is resistant for drought and diseases.

### **Dill**

The plants are resistant for cold and demand heat. In the beginning of vegetation the plant demands humidity.

### **Species:**

**Otello**- it is one-year grass plant. The plant demands heat, ripening period is 40-45 days. It has high productivity, 3-4kg from one 1 square meter. The plant is used in fresh form.

### **Potato**

It is moderate plant. Temperature lower 7°C -8°C, 30°C -35°C negatively impacts to the plant. Optimal temperature for the plant is 15-16°C. Shoot of the potatoe is destroyed in the frost -3°C. Potato is water demanding plant.

### **Species:**

**Ogonyok**- it is middle ripened species, bush is middle sized. Leaves are strong green. Blossoms are white and short term. Pulp is white and oval. Potential productivity is 350-380 quintal/ha.

**Amiri 600**- it is middle ripened species. Pulp is white, round-flat. Blossoms are white. The potato is harvested 2 times in 1 year, it is resistant for *Phytophthora infestans* disease. Potential productivity is 300-400 quintal/ha.

## **4.2 Results of the inventory of the wild relatives of agricultural species and the analysis of the tendency of changes for the last 50 years**

Diversity of wild crop relatives and wild plants is gradually decreasing. Wild relatives of wheat have spread in plain, foothill and mountainous regions of Azerbaijan. Three wild wheat species threatened to extinction grow in mountain and foothill zones. These are single-grained wheat (*T. boeoticum* Boiss.), spelt (*T. araraticum* Yakubs) etc. It was found that various species of *T. boeoticum* Boiss. have spread in Bastichay valley in Zangilan district (600-800 m above sea level), in Sharur and Ordubad districts of Nakhchivan AR, and in the territory of Jabrayil district.

*T. urartu* species was also found in Azerbaijan. The species of *T. monococcum* – divergence of the species of *T. boeoticum* Boiss. was found spreading in Mountain Garabagh region. *T. araraticum* was found in Shamakhi (at elevation of 800 m) and in Agsu pass (at elevation of 350-700 m). This species is also found in Nakhchivan. 9 species belonging to *Aegilops* genus are widespread in Azerbaijan. During survey, some species of this genus were observed in some sites above 2000m. Eight species of wild barley have spread in the country, including wild barley (*Hordeum spontaneum* C.Koch.), blue barley (*H. glaucum* Steud.), bulbous barley (*H. bulbosum* L.), violet barley (*H. violaceum* Boiss. et Huet.), rye-shaped barley (*H. secalinum* Schreb.), hare barley (*H. leporinum* link.). Four wild rye species have spread here. These include *S. segetale* Roshev., *S. vavilovi* Grossh., *S. anatolicum* Boiss., and *S. sylvestre* Host. 17 species of vetch and 40 wild species of sweet pea (*Vicia* L.) have spread in Azerbaijan. In addition the flora of Azerbaijan still represents 2 wild species of sorghum and 3 species of millet (*Panicum capillare* L., *P. dichotomiflorum* M., *P. sumatrensis* Roth et Roem).

In Southern region species like *Medicago glutinosa* Bieb., *Eremurus spectabilis*, *Solanum ysimbrifolium* lose their natural area. *Physalis* L. (two wild species), *Allium* L. (6 out of 41 wild species are endemic), *Amarranthus* L. (6 wild species), *Rumex* L. (17 species), *Polygonum* L. (27 species), *Calligonum* L. (4 species), *Malva* L. (10 species), *Alcea* L. (8 species), *Mentha* L. (5 species are available in Azerbaijan 4 of which are wild) among wild ancestors and relatives of vegetable-melon crops are widespread in Azerbaijan.

The area of wild species of vegetable-melon crops was also found to be decreasing. Some plant species of food importance may be shown among widespread wild vegetable plant used by people. Mallow (*Malva neglecta* Wailler) belonging to *Mavaceae* family. Leaves and shoots of this plant is used making various meals. Marrow of cow-parsnip (*Heracleum asperum* Bieb. –an ethereal plant belonging to *celery* family) is peeled and eaten or pickled. The medicinal importance of knotweed (*Polygonum alpestre* C.A Mey.) is known to people. They use its young shoots and leaves in making various meals like porridge, kata (flat pie filled with leaf vegetable), plov (rice made meal) and dovga (sour milk made soup with leaf vegetable) or its shoots are dried and stored for late use. Young shoots and leaves of nettle (*Urtica dioica* L.) belonging to *Nettle* family is used in making various meals or they are crumbled by adding salt after which becomes edible. Dead nettle, Melissa (*Melissa officinalis* L.) is a perennial plant with aroma of a lemon. Its young shoots and leaves are picked and used as basil. It is also used in perfumery and medicine.

A number of wild plants growing naturally are widely used by people. These plants include fennel (*Foeniculum vulgare* Mill.), bulb onion (*Allium rotundum* L.), asparagus (*Asparagus officinalis* L.), sorrel (*Rumex asetosa* L.), dock sorrel (*Silene* L.), rhubarb (*Rheum undulatum* L.), ziziphora (*Saturea montana* L.), horse mint (pepper mint – *Menta piperitta* L.), coriander (*Anthriscus cerafolium* Hoffm.), hill coriander (*Bifora radians* L.), salsify (*Tragopogon* L.) & tens of other plants.

One can find 40 wild forms of apple (*Malus* L.) in large tracts of forest, in river valleys and other places. *P. eldarica* Grossh. and *P. vsevolodi* T.Heid. are endemic wild pear species. Wild forms of quince are found in coastal forest area of Caspian Sea. Decreasing area of these forests are leading to a decrease in diversity. These forests represent service tree (*Sorbus* L.) with 11 species (5 of them are endemic to the Caucasus); hawthorn (*Crataegus* L.) – 9 species; plum (*Prunus* Mill.) – 3 species, almond (*Amigdalus* L.) – 2 species, cherry (*Cerasus* Juss.) – 5 species, strawberry and raspberry (*Rubus* L.) – 14 species and currant (*Ribes* L.) with 2 species. Furthermore, one can find wild medlar (*Mespilus germanica* L.), sloe (*Prunus spinosa* L.), alycha (*Prunus divaricata* Lebed.), pomegranate (*Punica* L.), sweet cherry (*Cerasus avium* L.) (Moench.), dog-rose (*Rosa* sp.), sea-buckthorn (*Hippophae rhamnoides*), cornel (*Cornus mas* L.), grape (*Vitis silvestris* Gmel.), nuts and other fruit-berry crops in the forest and shrubberies, and in mountainous and foothill regions of the Republic.

The survey of biodiversity in the territory of Nakchivan revealed that flora of this region represents valuable wild grain crops including *Avena ventricosa* Bal. Ex. Coss., *Hordeum spontaneum* C. Koch., *Secale anatolicum* Boiss., *Triticum araraticum* Yakubz., *Triticum monococcum* L., *Secale vavilovii* Grossh.; leguminous plants: *Onobrychis* sp.div., *O. transcaucasica* (both wild and cultivated forms are found), *Lens* sp.div., *Medicago* sp.div., *Trifolium* sp.div.; bulbous geophytes: *Allium leucanthum*, *Allium szovitsii*, *Allium acaca* Gmol. Ex Schult., *Allium mariae* Bordz., *Allium leonidii* Grossh etc. Many of these species are threatened to extinction. In the territory of Zuvand (Lerik region) the area of *Astragalus*, *Allium*, *Beta*, *Hordeum*, *Amygdalus*; in Mountain-Shirvan, Gabala-Oghuz and Lankaran-Astara regions the area of some genera like *Lactuca* and *Triticum* was observed to be decreasing. Some valuable plants of natural pastures like *Ammi visnaga* (L.) Lam., *Achillea nobilis* L., *Inula helenium* L., *Digitalis nervosa* Steud. et Hochst. ex Benth also faces with the same danger. The survey carried out by research staff of the Institute of Botany at southern slopes of Major Caucasus and in the territory of Nakhchivan AR revealed that some aboriginal species like *Dorema glabrum* Fish.et C.A.Mey., *Ferula oopoda* Bois., *Ferula szowitsiana* D.C., *Smyrniopsis aucheri* Boiss., *Grammosciadium platycarpum* Boiss.et C.A.Mey., *Zeravchania pauciradiatum* (Tamamsch.)M. Pimen., *Ferula persica* Willd., *Stenotaenia macrocarpa* Willd., *Prongos acaulis* (DC.)Bornum are threatened to extinction. Some weedy plants like ambrosia (*Ambrosia artemisiifolia* L.), binding weed (*Cuscuta* L.), creeping stagger-bush (pink) (*Acroptilon repens* DC.), spiny nightshade (*Solanum rostratum* Dun.) have spread in the flora and replaced local species.

Furthermore, a number of wild plants of medicinal and industrial importance representing the flora of the Republic are removed and sent to foreign countries by different businessmen. These plants include *Glycyrrhiza glabra* L. (licorice), *Urtica dioica* L. (nettle), *Betula* sp. div. (species belonging to birch genus) etc. Regulation of harvest of these plants is necessary to ensure their conservation.

### 4.3 Results of the pastures plants inventory and analysis of the tendency of the changes for the last 50 year

The distribution of vegetation types of pastures of **Agsu** district are under the law of vertical zonation. The mountain zone is characterized by forest strips and patches, where grow oak (*Qeurus longipes*), Caucasian hornbeam (*Carpinus caucfsica*), maple (*Acer platanodes*), hawthorn (*Crataegus grex*), etc.

Multistage area topography is characterized by shrubs where grow: wild pomegranate (*Punica granatum*), blackberry (*Rubus caesius*), thistle (*Paliurus spina christi*), wild rose (*Rosa canina*), etc.

Foothills adjacent to the Shirvan plain vegetation are characterized by various grasses and shrubs - wild grains, mugwort, blackberries, wild pomegranates (*Punica granatum*), thistle (*Paliurus spina chrichti*), Loch (*Elegnus angustifolia*), etc.

The foothill pastures characterized by the following types of vegetation: Shrubs - wild pomegranate (*Punica granatum*), thistle (*Paliurus spina chrichti*), (*Rhamus pallasii*), currants (*Ribe va-crispa*); wild cereal grasses - Wormwood (*Artemisia*), (*Alhagi pstndalhagi*) and others.

In the flood plains and on the edges of old river beds there grow - tamarisk (*Tamarix ramossisina*) and red hawthorn (*Rubus anatolicus*).

There grow reeds (*Phramites australis*), (*Cares melanstachya*), (*Cynodon dastylon*), liquorice (*Glycyrrisa glabra*), etc. on the flood plains and lower reaches of the river Agsuchay.

The plains are rich with ephemerals and plants characteristic of saline soils.

Livestock forage on low-lying areas is based on forage crops. The base of sheep breeding, is mainly pastures near village, located in the hilly terrain. At these sites the main types of vegetation are: *Medicago coerulea*, *Festuca sulcata*, *Stipa szovitsiana*, *Stipa lessingiana*, *Medicago minima*, *Artemisia fragrans*, *Pao bulbosa*, *Cynodon dactulon*, *Artemisia scoparia*, *Artemisia meyeriana*, *Astragalus kentrophyta*.

Pastures, located in the lowlands region are characterized by vegetation of arid and semiarid zones, dominated by sagebrush and ephemeral - *Salsola dendireiode*, *Petrosimonia brachiata*, *Alhagi psendalhag*, *Medicago minima*, *Glycyrrhisa glabra*, *Capparis spinosa*.

Analysis of the state of pastures showed that as a result of indiscriminate grazing and climate change, significantly reduced their productivity and grassy area, which led to the development of erosion processes.



Habitat of some species of plants has been narrowed. Thus, wild grain plants that have a weak root system, practically disappear. Significantly there have been narrowed the range of sagebrush (*Artemisia fragrans*) - valuable forage crop.

These territories are used under *Salsola dendroideodes*, *Petrosimonia brachiata*, *Alhagi psendalhagi*, *Limonium meyeri* and some other characteristic of saline soils, plants. These processes have reduced the productivity of pastures. There is observing increase of harmful and poisonous plants instead of valuable forage crop.

Similar processes occur in the foothills and piedmont areas where valuable forage crops are replaced by shrubs.

In **Shamakhi** district there is observed vertical zonation in plant cover. There are spread feather grass, grass and mugwort in foothill proluvial-deluvial sloping plains. Differentiation of plant cover here is observed in two directions – from west to east and from south to north.

The flora in lowlands is represented which is inherent for arid areas (semiarid and drought steppe), salt-tolerant one-year plants- *Salsola erassa*, *Petrosimonia brachiata*, in highlands of the same area - *Kalidium caspicum*.

Species composition is represented by plants with a short growing season, especially with ephemera (*Senecio vernalis*, *Avena eriantha*, *Medicago minima*, *Anisantha rubens*, *Bromus japonicus*, *Lolium rigidum*, *Eremorutum orientale* et al.) and ephemeroids (*Taraxacum officinale*, *Poa bulbosa*, *Allium rubellum*, *Gagea chanae* et al.). Also, there are growing bushes, shrubs and half-shrub (some kinds of *Artemisia*, *Kalidium*, *Salsola*, *Tamarix*, etc.)

Wormwood is one of the most common desert types in Shamakhi. It occurs mainly in the gray and slightly saline soils. Very often wormwood growing with perennial plants creates mixed semiarid formation. In all variants of wormwood grows 30 - 35, sometimes up to 50 - 55 ephemera and ephemeroids: *Poa bulbosa*, Japanese fire - *Bromus japonicus*, tough weeds - *Lolium rigidum*, Mortuk Eastern - *Eremopyrum orientale*, geranium - *Erodium cicutarium*, alfalfa, fine - *Medicago minima*, the blue alfalfa - *Medicago coerulea* and others

The area of winter pastures is 25,226 ha, which according to standards calculated for grazing 58,600 head of cattle.

The territory of summer pastures is 15,000 ha, with is calculated for grazing 60,500 head of cattle. Currently, however, the district has nearly 180 thousand small cattle, which shows the overgrazing of cattle from 2.5 to 5 times (3-3.5 times). The area also has about 37 thousand head of cattle, which must graze only on the pastures near the villages, but as already noted, because of their low productivity there is the fact of grazing cattle in summer and winter pastures, which are only for a small head cattle.

As a result there is observed significant excess of allowable loads on pastures, which ultimately leads to erosion, landslides. Currently, the productivity of pastures, especially summer pastures lost more than 55-60%. In addition to this, there was an increase of the range of harmful and poisonous plants.

It is important to note that there are not carried out practical measures to restore pastures.

Thus, it should be noted that as a result of the increased negative impacts of anthropogenic and natural factors, the state of pastures of Shamakhi district is noticeably deteriorated.

There is decreased grassy area, expanded the range of harmful and poisonous plants. As a result, the productivity of pastures decreased by 55-60%.

In **Gobustan** district, a diversity of vegetation of winter pasture is divided into four types:

- arid - *Petrosimonia brachiata*, *Poa bulbosa*, *Eremopyrum orientale*, *Eremopyrum triticium*, *Salsola cracca*, *Salsola ercoides*, *Salsola dendroides*, *Salsola nodulosa*, *Sveda dendroides*
- semiarid - *Artemisia fragrans*, *Poa bulbosa*, *Salsola ercoides*, *Koshia prostrata*, *Medicago minima*, *Eremopyrum orientale*, *Sveda dendroides*, *Lolium rigidum*.
- Piedmont semisteppe - *Agropyrum cristatum*, *Festuca sulcata*, *Stipa szovitsiana*, *Bromus japonicus*, *Lolium rigidum*, *Medicago minima*.
- steppe vegetation - *Festuca sulcata*, *Stipa szovitsiana*, *Festuca ovina*, *Stipa Lessica*, *Agropyrum cristatum*

In Gobustan, as in the previously discussed areas, as a result of increasing negative impact of anthropogenic and natural factors, the condition of pastures has deteriorated:

- arid climate change has led to perennial forage crops to annual plant of saline areas;
- there is observed intensification of erosion, compaction, salinisation and desertification of land;
- reduction of humus soil, replacement of valuable forage crop pests and poisonous plants, as a result of non-normalized grazing and plowing land it has led to a decrease in pasture productivity and overall land degradation.

#### **4.4 Major risks of the influence on agro-biodiversity and local species, including those facing the elimination risk.**

Evaluation of genetic erosion has been carried out to ensure the information needed to support strategic planning by identifying the precise character, scale and source of threats

to biodiversity. It was found that genetic erosion is caused by a combination of factors including frequent replacement of crop varieties, population grow, urbanization and expansion of anthropogenic landscape, intensive and inefficient utilization of genetic resources, high pressure to forests and pastures, inadequate storage facilities of ex situ collections, growing impact of abiotic (draught, salinity, cold, high temperature) and biotic (diseases, pests, accession of wild species to flora) stress factors, intensive contamination of soil, water and air and climate changes. This region has not had expeditions or surveys of target plants in 16 years.

Forest and shrubs cutting as firewood or for construction purposes in northern slopes of Minor Caucasus (Khanlar, Shamkir, Tovuz etc), in mountain and foothill zones of Major Caucasus (Guba, Gabala, Zagatala and other districts), in Nakhchivan AR, in Talysh mountains, in the bank of river Kur, soil salinity in plain areas, irrigation of land with contaminated river water, intensive expansion of agriculture and livestock production cause to serious constraints that results in day by day decrease of diversity of wild flora. Lack of control over grazing in plain areas has spoiled some part of these soils. For example, intensive cattle grazing in semi-desert pastures of Absheron and Gobustan accelerated erosion process and caused to formation of ravines. In general, intensive utilization of pastures in Azerbaijan results in disappearance of natural plant cover and accelerates desertification process.

About 3,6 million hectare lands suitable for agriculture are subjected to erosion. 1,3 million hectare of this soils are weakly eroded soils, 1,15 million hectare moderate eroded soils and 1,14 million hectare severe eroded soils. Soil salinization also causes disturbance of plant communities. More than 1, 5 million hectare of land has become saline soils. Combination of factors including inadequate production technologies applied in agriculture, unsystematic woodcutting, inappropriate soil tillage, unsystematic and soil irrigation beyond irrigation rate, inadequate construction of drainage-collector and irrigation networks and construction of water reservoirs in sensible relief accelerate erosion and salinization process.

Impact of anthropogenic factors on forests has increased due to intensive expansion of crop area and unsystematic cattle grazing. Flood, stream, landslide and other natural disasters have become intensive as soil protection in woodlands is decreased. Soil erosion in forest bordering zones has increased. Over-utilization of forest genetic resources causes to significant damage first on *Tugay* and plain forests since the area of these forests is very small. Woodcutting, road-building and oil-gas pipeline building in biodiversity rich areas causes landscape fragmentation, and accelerates desertification that expose the ecosystem to heavy danger.

Letting sewage and industrial waste run into water basin without purification, including the Caspian Sea leads to creation of biodiversity related problems and causes to desertification of coastal zones. According to calculations, on average annually 350 million m<sup>3</sup> polluted water runs to basin of the river Kur (main source of irrigation) from the territory

of Armenia, 330 million m<sup>3</sup> from Georgia and 25 million m<sup>3</sup> from Azerbaijan. All these cause heavy contamination of the river Kur with heavy metals, phenols, oil products and other noxious substances. One can imagine the scope of danger to which the whole ecological system is exposed, considering that polluted water of the river Kur is main source which is used in irrigation. In Absheron the peninsula 10 thousand hectare land is contaminated with oil and exposes plant cover of the territory to danger. Furthermore, construction activities, new quarries established here and new summer cottage plots cause a sharp decrease of natural landscape.

Special danger is caused by mass utilization of fertilizers, herbicides and pesticides in agriculture without any control. Last years a large amount of chemicals were imported in the country. These chemicals are not tested in most cases. It should be noted that sometimes farmers don't follow application rate of these chemicals due to lack of knowledge on production technologies.

A number of measures have been taken by the government related to factors influencing the state of genetic diversity to improve both ex situ and in situ conservation of genetic resources, which include adopted laws, expansion of protected areas, etc. Positive tendencies in provision rural population with electricity and gas and intensified control over woodlands and shrubbery have stopped partially cutting forests and shrubs for firewood.

Though the state of ex situ conservation is not satisfactory in general, but improved gene bank facilities for medium-term storage at RIA, establishment of Genetic Resources Institute (2003) on the basis of the Institute of Genetics and Selection of NASA, and putting National Gene Bank with medium and long-term storage facilities into operation (at GRI) and actions taken to introduce proper order in field collections are of positive factors to improve conservation activities and creates firm belief in further development of conservation activities in near future. All these actions should be noted as important measures, but the sector still faces with serious constraints.

Based on provided assessment the experts have selected 2 crops as indicator: grape and wheat which are agricultural crops and generally applied in all region.

## V. Current climate change and climate change scenario

### 5.1 Assessing current change in climate elements

#### **Agsu:**

Mountain slopes directed to South and plains with inclination receive a great deal of light and heat. The amount of sunshine hours hesitates between 2100-2200. Annual total tension of radiation in foothills low of horizon for 500m is 128-130ccal/sm. The amount of tension of radiation in area up of the horizon is less for several calories, the calorie increases in middle mountain areas. Mountain blocs detected to South, especially South-East slopes of Lengebiz Mountain range due to high radiation tension are exposed to long term drought by reason of less amount of precipitation. 75% of mentioned radiation amount is received in April-September.

Thus some part of radiation in lowland of district and plain with inclination in Kura-Araz lowland can be used as cheap energy source. The problem solution in district level is impossible at current time. This solution requires some technical equipment. But there are a lot of opportunities to use biological mass received from solar radiation that is more than solar heat. The other problem is efficiency use of heat resources, decreasing of short term vegetation plants for the purpose of increasing of long term vegetation, extend the works on taking two harvests during one year. Plain part of the district with inclination creates an opportunity for it. This opportunity is increased by plain with inclination located between Pirhasanli-Aghsu city and Budja-Langadbiz villages that have tight irrigation system. This area is one of the most irrigation provided areas.

Average daily temperature higher than 10 °C reaches to 4500 °C-5600 °C. This amount in Agsu region is 4472 °C. The temperature in grain planting areas is 2300-2400 °C that is higher 10 °C. The area harvesting of grain plants and other fast ripened plants can be used for harvesting of corn, bean, potatoes, pea and etc. This approach is especially used by leading farms, but most of farms get one harvest in a year.

Lack of irrigation water is observed during most years. In these cases the drought problems become more serious. Annual precipitation amount in Agsu district is 460 mm. The amount of the precipitation in Sagiyan village is 555 mm, Ganob village 742 mm. Then, low and middle part of Agsu district is well provided by humidity. Thus, middle mountainous part of Agsu district is reach by plant cover.

Amount of precipitation in low plain with inclination in Agsu district is 400-450 mm. Amount of evaporation in October is 800-900 mm. Taking into account amount of precipitation in the same year, irrigation norm for vegetation period is 650-750 mm. Irrigation canal network during drought period can't provide relevant humidity amount. Of course there is an opportunity for humidity providing regulation in Agsu district and the opportunity should be used. Waters of Agsu collector, Navahi dumb and Up Shirvan canal can't provide 20% demand on humidity and it in turn causes great loses in agriculture. The only way of solution is construction of dumb on Agsu river or its tributary Sulutun.

The following problem related with climate is combating against hails. Hails are observed 3-5 times a year in Agsu river basin and it damages cultivated areas and especially fruit farms. In our opinion, there should be built regular and mobile group in Shamakhi and Aghsu districts. Local population implement combating against frost by self smoking, heating and etc.

The other problem related to climate is periodic flood. Best efficiency way of combating against flood is implementation of forest and forest-ameliorative measures and construction of flood river holders. These folders can implement 3 functions at the same time: 1) decreasing of flood power by gathering of flood water; 2) use of flood material in construction works; 3) use of gathered waters for irrigation purposes. The main measures of combating against flood are providing of the settlement with gas pipeline and thus conservation of forest cover in mountain slopes. There is an opportunity of relevant amount of humidity for natural forest cover restoration in height of 700-800m.

Snow cover in plain region is not continuous. Snow cover forms along Agsu river basin related to height, continuous snow cover begins at the height of 1200-1300m. Maximal thickness of snow cover here is 40-60sm.

Extremal climate indicators of the region are the following:

1. The hottest area of the district is south part and border with Kurdamir district nearby Udjarli village, it is semiarid plain. Based on information received from Kurdamir meteorology station the temperature in summer during July and August is 42-43<sup>0</sup>C. Maximal temperature in January is 20<sup>0</sup>C.
2. The coldest area is middle part of Agsu river Qalaybukurt and Avakhil villages. Absolute minimal temperature here is -20<sup>0</sup>C -22<sup>0</sup>C. Average minimal temperature in January is -3<sup>0</sup>C -42<sup>0</sup>C.
3. The rainiest area of the district is North part in Agsu river valley 800-850m.
4. The most drought area is border with Kurdamir district. Amount of annual precipitation here is 400mm.
5. The heaviest rainfall was observed during August in Kurdamir district in 1928, it was 133mm, during October in 1951, and the amount was 134mm.

### ***Shamakhi:***

There are mainly 4 climatic types in the Shamakhi region. From the South to the North of the district territory has semi-desert with drought winter and drought plain climate type, mild-hot climate with drought winter, mild-hot climate with equal distribution of rainfalls and cold climate type with equal distribution of rainfalls during all seasons. The average temperature is -5+2 <sup>0</sup>C in January , and is 15-25 <sup>0</sup>C in July. The precipitation is increased from South to mountains, from 300 mm to 110 mm. The most of annual precipitation takes place in autumn and spring months. The snowy days amount hesitates between 15-20 days in South, 100-110 days in North, the snow cover the thickness of the average annual is from 12-15 sm to 210sm.

There is hot, mild, cold climate in the region. There is the dry summer climate which has the less precipitation. The summer is dry because the precipitation fall is little. The annual amount is 450-700 mm. Cold climate with humidly winter is formed in highly mountain areas, mildly hot climate with dry winter is in the low mountains areas, mild climate with dry summer is in the East part. Thus, it is observed the creation of plain landscape in the East and forest –meadow landscape in the West part.

The average annual temperature is 2;6;10;14<sup>0</sup>C .The absolute minimum temperature of North-West is -30<sup>0</sup>, but South-east of temperature is -18<sup>0</sup>. Absolutely maximum temperature is 16-37<sup>0</sup>. It is created in compliance with horizontal and vertical zones. Pirsaat, Chigilchay, Gozluchay, upper tributaries of Agsu rivers are the largest rivers of the region. There are a lot of mineral springs (Chagan, Galeybugurd, Avaxil and etc.) Kakilnohur, Gızılnohur and mountainous lake. Zoogalava could be mentioned as an example for the artificial water reservoir.

The total amount of radiation is 122-132 kkal/sm<sup>2</sup>, the annual amount of radiation balance is 38-45 kkal/sm<sup>2</sup>.

The annual amount of temperature from 5<sup>0</sup> highly is 2000-5000<sup>0</sup>,the annual amount of temperature from 10<sup>0</sup> highly is 1000-4400<sup>0</sup>. The first autumnal is observed during second decade of November. The last of spring frost is observed during first decade of April.

The average annual relative humidity of whether is 70-75%, it changes between 50-86 % during the year. The annual amount of precipitation is 300-800 mm. accordingly the precipitation falls down during the spring and autumn season. The evaporation takes place 600-1100 mm in land cover during the year.

### ***Gobustan:***

The amount of sunny hours hesitates between 2100-2200. Its maximum quantity in the region is observed of the South-East part. The annual total amount of radiation is not more than 126-130 kkal/sm<sup>2</sup>. But this amount is considered as a large quantity and it is created the opportunity to widely use of solar radiation at the foothill area.

There are distinguishing features of atmospheric circulation in neighbouring territories. It is explained that first of all the region is far from the influence of air masses of the Western part, secondly there is not the severe conditions of convergence of air masses during the intervention from the East. Cold air masses from the East of intervention is created the condition for the strengthening effect of fyon in the part of foothills and increasing the drought in some days.

The most important problem of region is drought. The genetic basis is the maximum of the Middle East. A long term anticyclone creates desert in the center (Central Asia), the semi-desert and draught plain conditions in the peripheries. Absheron-Gobustan region is situated in this periphery border. Thus, the considerable part of the administrative region is exposed to the difficulties of the water.

The heating resources is not used too much under this condition. Accordingly the humidly resource of season of Gobustan territory used as the winter pastures is not enough to establish cultural pasture.

Farming activities carried out in the small areas well supplied with irrigation water it is possible to increase the productivity of agriculture in the region at least 2-3 times. For example, sloping plain where the Lengebiz chain close the Alat bloc of total active temperatures (more than  $10C^0$ ) is 4000-43000<sup>0</sup>. When height increases, this number decrease, but it still remains high around Maraza. (3350<sup>0</sup>). This reserve is created the condition for accumulating autumnal grain and other crops of short vegetation period after breeding the product of the second part. The soil and climate condition with rightly using of any farmers must not be agreed with these resources to go vain in their area. Dry subtropical zone in the Northern border of region area is divided into two parts. Approximately 600-650 m a part of below from the height line has the dry subtropical climate. Though the physical-geographical territory of Gobustan as well as considerable part of the administrative region suitable for olive cultivation. There must be sufficient resources to irrigation for to plant the olive at the first time.

Annual amount of precipitation analyses show that about half of annual precipitation (157 m) of Maraza 322 mm falls in February-June. This annual can be also providing the ephemeral grass and brush for dry condition. Thus, during the spring and winter the uselessly flowing water can be use with to create the water reservoirs. The underground water is needed for this cause.

#### ***Natural disasters:***

Natural disasters are subject to Gobustan, Shamakhi and Agsu districts as well. So as, observed drought in those regions in July month in 2000 year have continued in August month as well. In general, there was no rainfall in the region. The summer season of 2011 has passed with long-term drought.

In April month of 1966 year, heavy showers in Shamakhi district have resulted with strong flood in Sumgait and Ceyrankechmez rivers leading to big distractions and losses in agriculture. Floods and streams in Agsuchay River passing the Agsu district in April-May months of 1988 have resulted with destroy for districts infrastructure and losses in agricultural sector. In 1993, due to flood in Agsuchay and Pirsaat have destroyed the neighbourhood areas. In December of 1996, the maximum speed of wind has reached to 33 mm/s in Maraza. In April month of 1997, it was hail fall with diameter of 8 mm in Shamakhi and other neighbour districts. April month of 1998 is remembered as abnormal hot weather. On 08 May 2001, in Shamakhi it was case of hail with diameter of 1 sm. In May 2002, in Shamakhi district was a case of hail fall. In April month of 2005, it was observed speed of North-West wind of 35 meters in Maraza, in August month the speed of the same type of wind was 40 meters in Shamakhi district. In February 2006, the speed of North-West wind in Shamakhi district was 32 m/s. In July month of 2008, there was a strong flood in Pirsaat River as a result of heavy shower. It resulted with big damage of bridges, houses and



losses for households. The flood has resulted with bid losses in Agsu district in April month of 2010.

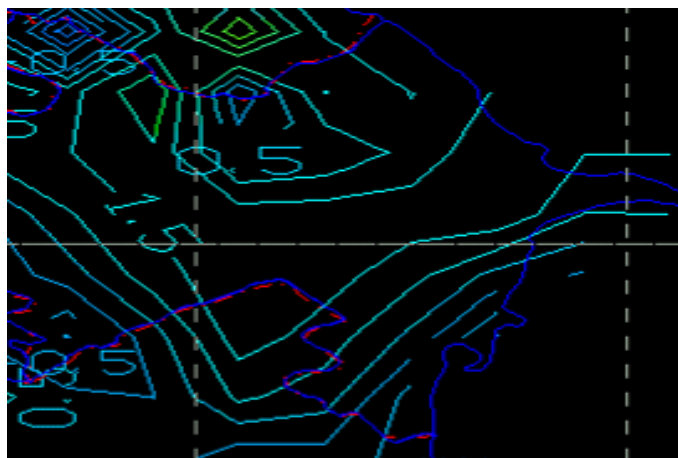
## 5.2 Future Climate Projections for 2020-2050.

Climate scenario has prepared based on the “PRECIS 1.4” ((Providing Regional Climate for Impact Studies) model developed by the Center of Climate Prognosis and Research of the Great Britain Meteorological Organization.

It was identified a version of calculation based on PRECIS model by differing border conditions and emission scenarios. Due to this version, ECHAM4 border conditions and A2 emission scenario was elected. Calculations have been provided for 3 periods:

- I period: plays role of basis covering the period of 1960-1990
- II period: is the period of scenarios for 2020-2050

*Figure 4. Map of differences between average annual temperatures and climate data for 1961-1990 .*



As it is clear from the picture, the difference in our region is  $+0,5^{\circ}$  to  $+1,5^{\circ}$ . This is to say that, PRECIS model increases temperatures within our borders in compare with current observations. This difference is  $1,5^{\circ}$  in Agsu and Gobustan, and  $0,5^{\circ}$  in Shamakhi district. This numbers have taken into account in PRECIS model.

*Figure 5. Difference between amounts of rainfall norms (mm/day) calculated by PRECIS model and CRU climate data*



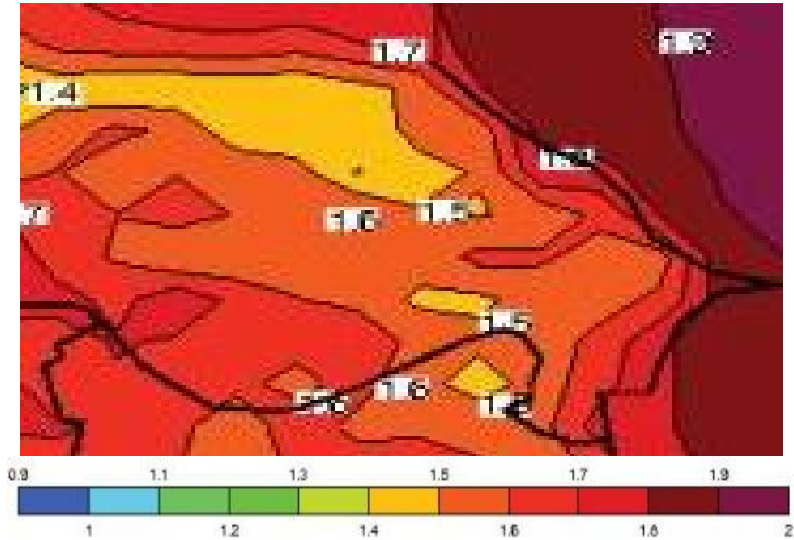
As it clear from the picture, in most regions the difference is zero. But, in Gobustan, Shamakhi and Agsu districts the difference between model and climate data is observed. By increase of altitude in the region difference is bigger. This is because of that, in CRU data is not taken into account high level of rainfalls in the region. .

**5.2.1. Temperature change in 2020-2050 years**

Due to border conditions of PRECIS model and emission scenario in 2020-2050 years the average yearly temperature increase will be 1,6-1,7 C<sup>0</sup> (figure 6). When in Agsu and Shamakhi districts this increase will be 1,6<sup>0</sup>C, in Gobustan it will be 1,7<sup>0</sup>C. The temperature increase in 1991-2010 years was approximately 0,8<sup>0</sup>C. This proves the accuracy of climate change information of the model.

*Table 15. Temperature change in 2020-2050 years*

| District | Period         |
|----------|----------------|
|          | 2020-2050 (°C) |
| Gobustan | 1.7            |
| Shamakhi | 1.6            |
| Agsu     | 1.6            |



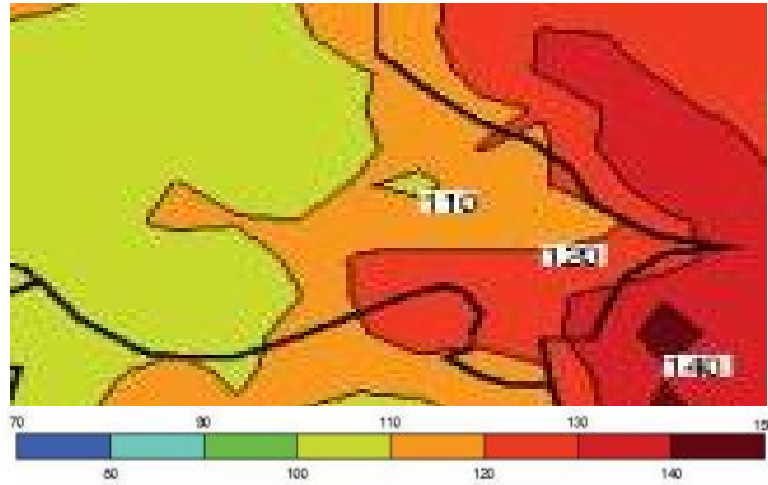
*Figure 6. Increase of average annual temperature in the region (difference between data of 1961-1990 and 2020-2050 period)*

**5.2.2. Change in rainfalls in 2020-2050 years**

Rainfalls will increase by 15% in 2020-2050 years in compare with 1961-1990. That is to say that, the decrease of rainfalls is not expected. Despite of increase of rainfalls, evaporation also increases. And this will increase demand for irrigation water.

*Table 16. Change of rainfalls in 2020-2050 year, in percentage*

| Districts | Period        |
|-----------|---------------|
|           | 2020-2050 (%) |
| Gobustan  | 15            |
| Shamakhi  | 15            |
| Agsu      | 15            |



*Figure 7. Change of rainfall in the region (comparison of data 2020-2050 years with data of 1961-1990), %*

## VI. Assessment of Ecosystems and agro-biodiversity vulnerability to climate change

### 6.1 Selection of indicators for assessment of vulnerability and detailed description

Methodology for selection of vulnerability indicators has been proposed by international expert. In accordance with widely accepted approach on vulnerability it has been chosen to use the three major vulnerability components:

1. Adaptive capacity of communities to climate change
2. Exposure of communities to climate–hazards
3. Sensitivity of communities to climate–hazard exposures

Each of these three vulnerability components is further divided on sub-components. For each vulnerability sub-components, a set of vulnerability indicators has been assigned.

Based on the data provided by national experts, vulnerability indicators have been assessed for each vulnerability sub-component. This has been done separately for each of pre-selected region.

| Component         | Sub-component     |
|-------------------|-------------------|
| ADAPTIVE CAPACITY | Social capital    |
|                   | Human capital     |
|                   | Financial capital |
|                   | Physical capital  |
| Exposure          | Climate hazards   |
| Sensitivity       | Ecosystems        |
|                   | Communities       |
|                   | Agriculture       |

Then, it was identified indicators within each sub-component. Each indicator has been provided with relevant weight within the sub-components by project team based on the significance of appropriate indicator. The division of weights between indicators is given below:

#### For Adaptive Capacity:

|                             |             |
|-----------------------------|-------------|
| Social capital              |             |
| Farm organisations          | 0,80        |
| Female work                 | 0,20        |
| <b>Total social capital</b> | <b>0,25</b> |

|                                |             |
|--------------------------------|-------------|
| Human capital                  |             |
| Literacy                       | 0,40        |
| Education                      | 0,40        |
| Agricultural education         | 0,20        |
| <b>Total human capital</b>     | <b>0,25</b> |
|                                |             |
| Financial capital              |             |
| Livestock density              | 0,30        |
| Average salary                 | 0,70        |
| <b>Total financial capital</b> | <b>0,25</b> |
|                                |             |
| Physical capital               |             |
| Infrastructure                 | 0,65        |
| Access to market               | 0,35        |
| <b>Total physical capital</b>  | <b>0,25</b> |

## 6.2 Assessment of ongoing climate change and possible influence on forecast climate change (2020-2050) to agro-biodiversity

The potential of region as a whole should be considered in the process of selection of most vulnerable region to climate change where it is necessary to lay a foundation of adaptive measures.

So, Shamakhi district has been recently developing as one of the most important tourist centers. Therefore, there is doing a great work in this district and there are formed prerequisites for the conservation of forests and vegetation in general, and for the new activities (tourism).

However, there are no prerequisites for the development of tourism and other alternative activities on the border with Gobustan area in the floodplain Pirsaat river in semi-arid zone. Basically there is developed extensive breeding with all the attendant negative effects (erosion, salinization, reduced agrobiocenosis, land degradation).

The most urgent issue is climate change adaptation in the Gobustan region as, the negative factors climate change affecting the environment in the area may get even worse.

The area is located in the arid zone, there is an acute problem of water shortage, and the existing brackish underground sources are brackish, there is observed a significant over-grazing, with corresponding negative consequences.

There have been considered scenarios of climate change calculated from models recommended by the IPCC GCM GISS, GFDL-3 and an expert scenario proposed by the Department of Climatology, Institute of Geography of ANAS (I), and PRECIS 1.4 (II) in the framework of I and II National Communication on

Climate Change of the Azerbaijan Republic. The analysis of climate change scenarios shows scenario calculated by the model PRECIS 1.4 for the period 2021-2050 gg that is the most realistic. In accordance with the scenario, there is expected increasing of average annual temperature for 1,6<sup>0</sup>C with a simultaneous increase in annual precipitation amounts compared with the base (1961-1990gg) standards by an average of 15%. As a result, there will be observed changes in agro-climatic resources the borders of thermal boundaries and zones of moisture, which directly affect the agricultural production. Preliminary results showed that as a result of climate change on the territory should be expected:

- increase amounts of active temperatures above 10<sup>0</sup>C for about 300-400<sup>0</sup>C;
- increase the duration of a possible vegetation of plans for 15-25 days;
- reduction of the duration of the actual vegetation for 8-10 days (due to greater heat supply);
- increase evaporability for 15% or 120-150mm in the plains and the 60-80mm in the lowlands and midlands (Gobustan district);
- Climatic norm of irrigation will be 725-800 mm in the plain area, and in the middle mountain area of Gobustan it will remain around current levels;
- Thermal boundaries will mix at height of 200 - 300m above sea level in the mountains, which take place around at 650-900m above sea level;
- Boundaries of moisture zones will be shifted to the direction of mountain for 50-100m above sea level, in general, there will be arid area by expanding the areas of semi-deserts and dry steppes.

Expected climate change can have both positive and negative consequences. Expected climate change can have the following results on base agricultures of the district:

- there is expected increase the period of possible vegetation as with the simultaneous reduction of the actual 10-15 days that would allow the cultivation of more demanding to the warmth of winter wheat;
- after harvesting in case of irrigation water it is possible plant of other crops- forage, grain and getting two or even three harvests a year;
- thermal boundaries of industry viticulture will increase;
- increase of the quantity and quality of grapes is also possible.

However, the fully implementation of these possibilities seem unlikely, as the region now suffers from a lack of moisture, which will increase in future. The situation is aggravated by the fact that in the most arid areas, the possibilities of irrigation are limited or don't exist. This primarily relates to the plain - foothill areas of Gobustan district and Shamakhi district in most parts of which are spread semiarids and dry steppes. Based on this adaptation activities should be aimed primarily at:

- providing agricultural with irrigation water;
- application of water-saving irrigation technologies (sprinkler, drip, etc.);
- carrying out, where it is possible, measures of wash of salinized soils;
- introduction of drought-resistant varieties of crops;

The vulnerability of water resources to climate change is defined on the basis of models GISS, GFDL-3, GFDL-T, and the artificial scenario. The resulting estimates, calculated as the difference between the total water demand and available water resources without regard to adaptation, suggest that in all scenarios of climate change the situation is tense, while GFDL-T scenario, the situation becomes most difficult, i.e. water resources could be reduced till about 40%. Thus, the most vulnerable sectors for climate change of the economy are energy, agriculture and the provision of drinking water.

Climate change will affect the amount and rate of irrigation norm of crops - for some it may be reduced by reducing the growing season, but for others, such as perennial forage plants increase. Such a scenario would adversely affect the environmental situation of all 3 districts, but it can be disastrous for Gobustan region, as the most arid, i.e. up to the formation of deserts and complete degradation.

### 6.3 Calculation of vulnerability indices and selection of pilot regions

The vulnerability index of an indicator is calculated by multiplying its weight factors by its coefficient. In Table 17, it is provided weight factors, coefficients and indices for vulnerability sub-components and indicators for the three proposed pilot regions:

*Table 17: Vulnerability indices, weights and coefficients*

| Vulnerability category   | Weights     | Values   |        |          | Coefficients |      |          |
|--------------------------|-------------|----------|--------|----------|--------------|------|----------|
|                          |             | Shamakhi | Agsu   | Gobustan | Shamakhi     | Agsu | Gobustan |
| <b>Adaptive capacity</b> |             |          |        |          |              |      |          |
| <b>Social capital</b>    | <b>0.25</b> |          |        |          |              |      |          |
| Farm organizations       | 0.8         | 0.38     | 0.42   | 0.80     | 1.00         | 0.91 | 0.47     |
| Female work              | 0.2         | 30.00    | 30.00  | 30.00    | 1.00         | 1.00 | 1.00     |
| <b>Human capital</b>     | <b>0.25</b> |          |        |          |              |      |          |
| Literacy                 | 0.8         | 99.20    | 99.10  | 99.10    | 1.00         | 1.00 | 1.00     |
| Education                | 0.2         | 83.30    | 83.20  | 83.20    | 1.00         | 1.00 | 1.00     |
| Agri workers             |             | 0.10     | 0.10   | 0.10     | 1.00         | 1.00 | 1.00     |
| <b>Financial capital</b> | <b>0.25</b> |          |        |          |              |      |          |
| Livestock density        | 0.2         | 0.66     | 0.64   | 0.63     | 0.96         | 0.98 | 1.00     |
| Average salary           | 0.8         | 150.00   | 165.00 | 180.00   | 1.00         | 0.91 | 0.83     |
| <b>Physical capital</b>  | <b>0.25</b> |          |        |          |              |      |          |
| Infrastructure           | 0.65        | 153483   | 108642 | 82785    | 0.54         | 0.76 | 1.00     |
| Access to market         | 0.35        | 994      | 1272   | 936      | 0.78         | 1.00 | 0.74     |

## Exposure

### Climate hazards

|             |     |        |        |        |      |      |      |
|-------------|-----|--------|--------|--------|------|------|------|
| Rainfall    | 0.4 | 535.50 | 390.20 | 379.20 | 0.71 | 0.97 | 1.00 |
| Temperature | 0.4 | 0.40   | 0.90   | 1.00   | 0.40 | 0.90 | 1.00 |
| Droughts    | 0.2 | 106.30 | 70.70  | 58.40  | 0.55 | 0.83 | 1.00 |

## Sensitivity

### Ecosystems

**0.33**

|                     |     |        |        |       |      |      |      |
|---------------------|-----|--------|--------|-------|------|------|------|
| Plant cover         | 0.4 | 57.78  | 59.25  | 61.23 | 1.00 | 0.98 | 0.94 |
| Ground water        | 0.1 | 8.74   | 8.36   | 0.10  | 0.01 | 0.01 | 1.00 |
| Land use            | 0.4 | 14.76  | 3.80   | 0.31  | 0.02 | 0.08 | 1.00 |
| Number of varieties | 0.1 | 169.00 | 128.00 | 93.00 | 0.55 | 0.73 | 1.00 |

### Communities

**0.33**

|                   |      |       |       |       |      |      |      |
|-------------------|------|-------|-------|-------|------|------|------|
| Women             | 0.15 | 51.00 | 51.00 | 50.00 | 1.00 | 1.00 | 0.98 |
| Children          | 0.15 | 5.83  | 11.00 | 10.60 | 0.53 | 1.00 | 0.96 |
| Below poverty     | 0.4  | 6.17  | 6.07  | 6.39  | 0.97 | 0.95 | 1.00 |
| Population growth | 0.3  | 2.30  | 2.10  | 2.50  | 0.92 | 0.84 | 1.00 |

### Agriculture

**0.33**

|                      |      |       |        |        |      |      |      |
|----------------------|------|-------|--------|--------|------|------|------|
| Small-scale farming  | 0.15 | 17.05 | 20.94  | 29.96  | 0.57 | 0.70 | 1.00 |
| Rural population     | 0.15 | 53.00 | 72.00  | 80.00  | 0.66 | 0.90 | 1.00 |
| Land degradation     | 0.1  | 80.55 | 75.42  | 100.00 | 0.81 | 0.75 | 1.00 |
| Production           | 0.2  | 75.72 | 181.50 | 202.88 | 1.00 | 0.42 | 0.37 |
| Crop diversification | 0.2  | 2.24  | 2.15   | 6.67   | 0.96 | 1.00 | 0.32 |
| Irrigation           | 0.1  | 8.74  | 8.36   | 0.10   | 0.01 | 0.01 | 1.00 |
| Agri workers         | 0.1  | 60.00 | 60.00  | 71.00  | 0.85 | 0.85 | 1.00 |

First of all, it was provided calculation for each vulnerability component: adaptive capacity, exposure and sensitivity. Calculations have been provided for each pre-selected region. The results is provided in table 18:

*Table 18: Results of calculations of vulnerability indices for each component*

| # | Components               | Shamakhi | Agsu | Gobustan |
|---|--------------------------|----------|------|----------|
| 1 | <b>Exposure</b>          | 0.55     | 0.91 | 1.00     |
| 2 | <b>Sensitivity</b>       | 0.69     | 0.70 | 0.89     |
| 3 | <b>Adaptive capacity</b> | 0.90     | 0.92 | 0.84     |

Then, to have final value of calculation of vulnerability indices the following formula has been applied:

$$VI = (I_{\text{exposure}}^{1/3} \times I_{\text{sensitivity}}^{1/3} \times I_{\text{adaptiv capacity}}^{1/3})$$



As a result of provided calculations, Gobustan district has got the highest vulnerability indices value – 0.91. Then, it is followed by Agsu district 0.81 and Shamakhi – 0.70.

Thus, based on the results of vulnerability assessment and visual observations provided during several field visits and according to experts judgements, project team has finally come decision and 2 communities of Gobustan district (Tesi and Yekexanay) located along Pirsaat river in arid zone and 1 community of Shamakhi region in semi-arid zone (Sabir settlement) have been selected as pilot communities.

## VII. Conclusions and Recommendations

The following conclusions can be made after provided analyzes:

### *Agriculture and agro-biodiversity:*

There had been formed 3 types of land property after conducted land agro reforms: state, municipal and private. There had been formed a lot of private farms. All this took place against in the background of economic transition. As a result, the lack of sufficient funds of most landowners did not give them the opportunity to purchase modern equipment, the necessary chemicals (fertilizers, pesticides, etc.), lack of knowledge in agronomy, agricultural engineering and agricultural chemistry didn't allow to combine cost-effective economic management with rational use of land and nature as a whole.

Available irrigation and drainage system during Soviet Union was of poor quality, and for the past 20 years they almost became unsuitable for use. Practice of application of modern water-saving irrigation systems is completely absent (drip, sprinkler, etc.). There is also no current collector-drainage system.

The area of high-tech cultures had been significantly reduced, previously occupying an important place in agriculture. Thus, the plantation of grapes had been significantly reduced, and Gobustan district this culture had been reduced to nothing.

The rapid development of extensive (nomadic) livestock had more exacerbated the condition of ecosystems.

There is completely lack of cultural pastures and forage base for livestock is weak, as well the practice of application modern technologies for livestock. In addition, along with it cattle is grazed in summer pastures, which is impermissible by law (summer and winter pastures are considered only for sheep and goats).

As is well known, the summer pastures are located in the mountains that characterized by a sensitive ecosystem. Grazing and multiple shotgun overgrazing has led to increased erosion, degradation of soil, debris processes landslides. Unsystematic grazing and multiple overgrazing had led to increased erosion, land degradation, mudflow processes and landslides.

A similar situation exists in winter pastures, which are mostly located in arid and semi-arid zones. In these areas have been developed erosion, salinization, land degradation processes.

Grazing of cattle, planting crops, planting of vegetables and etc. lead to land use not in relevant direction. This practice leads to decrease in productive value of pasture, as well as the spread of noxious plants and weeds.

In addition, areas of plants of forage value had been significantly reduced, and they had been replaced by harmful and toxic plants for cattle. Taking into account that pastures are not only agricultural value, but they are the habitat of wild flora and fauna, it is clear that this negatively impacts on all wildlife in the region. All these problems are inherent for all 3 districts under consideration.

*Institutional gaps:*

After gaining an independence, Azerbaijan has established a solid, focused on developed countries, legislative base aimed at economic development, conservation and rational use of natural resources, further development of democratic institutions and strengthening of local self-government.

However, the normative base of implementing the law requires a review and there is a need to create effective mechanisms for the practical application of environmental management.

There is no national strategy (concept) of land management.

Number of environmental project has been implementing in the country related to improving the condition of pastures, reforestation, water management, as well as there have been implementing projects in the sphere of agriculture. However, the lack of consistency of these projects and activities reduces their effectiveness, and sometimes only partially fulfilled.

It should be noted that the environmental issues in development plans of the regions are not priorities, as well as the problem of taking the necessary measures to adapt to climate change.

Local authorities have not implemented any practical work to improve the condition of pastures, land use and land management in general.

*Environmental knowledge and access to environmental information:*

As already mentioned, the level of knowledge on proper management of agricultural production is also not high.

In general, there is no practice of agricultural production, taking into account the management of land, water and nature in general.

There is also no on-site agro-consulting, as well agro-environmental consulting.

Surveys and interviews with local population showed that even the simple farmers and rural intelligentsia have no knowledge for the proper land use. Besides the problem of the correct and environmentally sound agricultural practices are outside of the scope of interest. As, they are basically interested in solving problems of their economic problems.

There is required quite a lot of funds in the first phase to solve problems related to sustainable land management, biodiversity conservation, creation of favorable environmental conditions. It is also necessary to conduct purposeful, periodic work with rural communities to raise awareness not only in the proper use of land, but also on climate change, its impacts on communities and adaptation measures with regard to these problems in the future.

As a result of provided vulnerability indices calculations based on proposed methodology, Gobustan district has got the highest vulnerability indices value – 0.91. Then, it is followed by Agsu district 0.81 and Shamakhi – 0.70.

Thus, based on the results of vulnerability assessment and visual observations provided during several field visits and according to experts judgments, project team has finally come decision and 2 communities of Gobustan district (Tesi and Yekexana) located along Pirsaat river in arid zone and 1 community of Shamakhi region in semi-arid zone (Sabir settlement) have been selected as pilot communities.

## VIII. List of references

1. Museyibov M.A, Physical Geography of Azerbaijan, 1998
2. Климат Азербайджана, Баку, Издательство Академии Наук Азербайджанской ССР,1968. 342с.
3. Шихлинский Э.М. Атмосферные осадки, Климат Азербайджана, Баку 1968, 152-185с.
4. S.H.Xalilov, S.H.Safarov, Monthly and yearly norms of atmospheric precipitation in Azerbaijan Republic. Scientific-practical climate survey book, Baku, 2001.
5. Installing and using the Hadley Centre regional climate modeling system, PRECIS. UKMO, 155p.
6. "Social and economic geography of Azerbaijan", academician A.A.Nadirov, academician G.S.Mammadov, prof. V.A. Efendiyev, prof. M.A.Museyibov, prof. T.G.Hasanov, prof. N.A.Babaxanov, prof. Ch.N.İsmayılov and others, "Baku University" publication, 2010
7. "Climate characteristics of administrative districts of Azerbaijan SSR, G.A. Hacıyev, V.A. Rahimov, Baku, 1997.
8. [www.az.wikipedia.org](http://www.az.wikipedia.org)
9. [www.meqdis.org](http://www.meqdis.org)
10. [www.az-stat.org](http://www.az-stat.org)
11. Second National Communication to the United Nations Framework Convention on Climate Change. 2010, Baku. Ministry of Ecology and Natural Resources, Republic of Azerbaijan
12. United Nations (UN). 2011. Regional Climate Change Impacts Study for the South Caucasus Region. Tbilisi, Georgia.
13. Assessment of Biodiversity in Azerbaijan, First National Report to Biodiversity Convention, Baku, 2004
14. "Biodiversity", Aliyev C.A., Akparov Z.I., Mammadov A.T, Baku, "Elm" publication house, 2008, p. 232.
15. Second National report on food and agricultural plant genetic resources situation, Baku, 2006, (<http://pgrfa.org/gpa/aze/azerbaijan2az.pdf>)