ALOVSAT GULIYEV

AZERBAIJAN QANAT'S

(*Kahrizes*)

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Monoqrafiyada qədim su mədəniyyəti irs abidələrimiz olan kəhrizlərdən, onların inşa tarixindən, tikilmə texnologiyasından, qazmada istifadə olunan alətlərdən, kəhrizlərin sərfindən, iş rejimindən, suyun kimyəvi tərkibindən, mövcud vəziyyətindən, coğrafi koordinatlarından, kəhrizlərin üzərində olan tarixi abidələrdən və dünyanın digər ölkələrində istifadə olunan kəhrizlərdən bəhs olunur. Azərbaycanın ayrı-ayrı bölgələrində (2020-ci ilə qədər erməni işğalı altında olan Qarabağ kəhrizlərindən başqa) aparılmış tədqiqat materialları əsasında mühüm əhəmiyyət kəsb edən kəhriz sistemlərinin quruluşu, qazılma tarixi, kəhrizlərin təsir zonasında olan sahələr, qidalanma mənbələri, suların keyfiyyəti və sərfləri haqqında məlumatlar kitabda öz əksini tapmışdır.

Kitab hidrogeoloqlar, ekoloqlar, mühəndis hidrotexniklər, təbii sərvətlərimizin mühafizəsi ilə məşğul olan mütəxəssislər, ali məktəb tələbələri, bakalavr, magistr və bu sahədə elmi tədqiqat aparanlar üçün nəzərdə tutulmuşdur.

Monoqrafiyanın ikinci dəfə nəşrində (ingilis dilində) bəzi dəyişikliklər edilmişdir. AMEA prezidentinin və Biologiya və Tibb Elmləri Bölməsinin (BTEB) razılığı əsasında Torpaqşünaslıq və Aqrokimya İnstitutunun Elmi Şurasının qərarı ilə nəşrə tövsiyə olunmuşdur.

Alovsat Guliyev. Azerbaijan Ganats. Baku, "Elm", 2021, – 256 p.

The monography covers multiple aspects of the ganats, which are our ancient water cultural monuments, in particular their construction history and technologies, historical monuments on them, current state, utilization and functioning regime, excavation tools, geographical coordinates, chemical composition of water, as well as the ganats in other countries.

This book contains information on structure and excavation history of the critical ganat systems based on the research materials in the separate regions of Azerbaijan, excluding Karabagh ganats, which were under Armenian occupation until 2020. Also, service areas of the ganats, supply sources, and water quality and usage are emphasized in the book.

The book was intended for the hydro geologists, ecologists, engineer hydro technicians, experts protecting our natural resources, undergraduate and graduate level university students and the scientific researchers on this area.

The second publication of the monography in English includes some adjustments. The publication was recommended by the decision of the Scientific Council of the Institute of Soil Science and Agro Chemistry per consent of the President and Biology and Medical Sciences Section of Azerbaijan National Academy of Science (ANAS).

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From Author

Ganats are ecologically the purest water source!

Dear reader! Immortalizing the fauna and flora world of the earth is water. The drinkable water sources are mainly springs, rivers and ganats. The book of "Azerbaijan ganats" is the first research work written in this sphere. The ethnographic materials, the onomastic units connected with their names have been contonously investigated by the historians and ethnographers and the consequences have been printed.

The ganat systems investigation demands generalization of the technical information beside engineering-hydrotechnician hydrologist, hydrogeologist, and other related professions.

Devoting years to the soil and water research in Azerbaijan I noticed that we inherited ancient agriculture and irrigation culture. . This ispired me to look through the ganats as an engineer, and investigate their structure and functions.

The researches of the first settlments and water sources around the Duzdagh in Nakhchivan indicated that men used the salt deposits for seven thousand years. The stone salt was carried to some countries by the caravans. The ganats, water wells and reservoirs were used along the caravan roads. The ancient ganats near the Duzdagh changed their form because of incidents occured during the last century, but their wells remained up to now. It was clear from the researches carried out on the wells that the building date of the ganats dated back before the written ones.

The research on the ganats has become an inseparable part of my life activity: I investigated the ganats in Nakhchivan AR and other regions of Azerbaijan from 1976 to 2018. I had the chance to participate as a consultant in ganats research spreading around ancient "Sauran"(Sharvan), "Otrar", "Mitrobe" urban towers near Turkustan city of South Kazakhistan by an official invitation of the Gazakhistan Academy of Sciences in 2010, in Yazd province of the Iran Republic, in Tabriz, in the Turkey Republic in 2006-2012. I had studied the ganats "a drop of water is equal to one gold" used in the desert regions, in Ashgabad city. During my trip based on the invitation from The Institute of Ethnography of the Uzbekistan Academy of Sciences invited me, the researches on "Beshpanja" ganat (water expense is 300

liter/sec) under the defense fortress which was built by Macedonian Alexander near the Nurata city of Navai province before 2000 years were performed. I was invited to Marakesh in 2013 and to Uzbekistan by Uzbekistan Academy of Sciences in 2014. I investigated the ganats, water wells, reservoirs, springs and others with a date of four thousand years in the zones on Great Silk Way. I got an opportunity to be acquainted with the materials about the development of the ancient water cultural history by acting as interstate board members on "an ancient hydraulic system-ganats" of UNESCO contacting with the World Water Association. The drilling technology of the ganats spreading near the Marrakech city of the Marakesh state in Africa was very interesting for me.

I have been cooperating with Andreas Angelaksis (Greece) a leader of the Wolrd Water Assossiation for a long time. The projects were carried out in this sphere of Azerbaijan after the acquaintance with Jeyranbatan Water Purifier Device. Andreas Angelaksis's participation in the International Scientific Conference (2017) dedicated to the "100th anniversary of Shollar Water Line" organized by "Azersu ASC" was highly appreciated.

My participation in the conferences concerning the ganats in some countries of the world (in Iran, Turkey, Oman, Marrakesh, Turkmenistan, Uzbekistan, Kazakhstan and etc), cooperation with the International Organisation joint activity with the well-known scientists had a great impact on the work performed in this sphere and caused preparation of my books, articles, films, and brochures about the ganats.

According to the UN experts humanity will face ecological disasters related to the water shortage at the end of the XXI century. The people living in the definite regions of the earth will have to fight for a solution for the drinkable water and soil degradation problems. . For partial solution of these problems the ganats as a drinkable water source existing in our country must be protected. We have to guard the soils from chemical pollution, secondary salinization and other effects. . CAN NOT BE JUSTIFIED IN TWO SENTENCES. . THE PURPOSE OF THE BOOK SHOULD COME HERE AND NEXT PARAGRAPH BUT IT IS NOT CLEAR.

The ganats inherited from the past generation and exploited for a long time must be handed over to the future generation in working state. If we dont drill new ganats then we shouldn't close destruction of the ganats constructed before us.

The future generation should be inherited with soils without salinization, irrigation erosion, chemical pollution.

Some actual problems have not been fully covered in the book "Azerbaijan ganats" presented to the dear readers. It isn't surely flawless because of the first edition I express my gratitude to readers in advance for valuable suggestions and critical notes.

INTRODUCTION

The climate change and increase in temperature in the last 50 years showed people that they must use ratiinally and more efficinetly the water resources including underground water. . Tendency of some scientists and authorities towards the ganat systems in the world shows that the ancient hydrotechnical installations-ganats- were in people's service and it will be a hopeful meliorative system in the future. The ganats are the most harmless artificial system of the nature and do not have negative affect on the ecosystems. They are considered the most reliable water source in the arid zones.

If we take into account that a great attention should be necessary for the restoration and guarding of the ganat systems which meet the populations need for drinkable and irrigation water, that is neat and pure, continous water supply, current repairs with little expense while warming, natural events on the planet call the humanity to be vigilant, to use from the nature rationally.

According to the National information on UNO climate changes on air temperature is 0, 41'C in the Azerbaijan Republic, but 0, 47'C in Nakchivan in 1991-2000.

The atmospheric rainfalls are 9, 9/ over the Azerbaijan zone, but 17, 1/ less than norm on Nakhchivan AR.

It is noted in the climate scenarios of 2021-2050 the air temperature increase on Azerbijan in the first half of the XXI century will be $0,3^0$ C on average. This situation will strongly show itself in Nakhchivan AR, so, the water resources should be used efficiently and rationally in Azerbaijan.

The ganats are assumed as water and life source in Azerbaijan. They are ancient examples of the irrigative –construction culture. The ganats are considred as a monument or spring-monument among the people. Traces of Azerbaijan history live in ganats. Thus, an investigation on the ganats can be

a great tool for exploring Azerbaijan history and culture. The ganats are one of the important research objects of Azerbaijan agriculture science. Study of the ganats possesses a great importance to investigate a region concretely, but a country broadly. The ganat factor can fulfil a key function in investigation of some historical truths. Therefore to immortalize the ganats and to teach the new generations can be a great chance for objective and substantial delivery of the development way of agriculture and learning of the education culture as patriots familiar with their history. . Just, the ganat research in Azerbaijan appeared from necessity of reasonably studing the country history , geography, economy, agriculture, construction culture, and etnography. .

Nowadays, the importance of the ecological problems continues to grow. . On one hand, storms and floods, on the other hand water shortage, aridity, irrigation and drinkable water deficiency, soil erosion and difficult ecological situation make men to leave their residence and search the best opportunites for development.

Unfortunately, the ganats were left alone, many of them lost their strength, and some were spilled and neglected. This was resulted in countrywide migration, causing difficulties in a sphere agriculture and water shortage.

People do not consider the ganats unfit and obsolete infrastructure. They are sure that the people will be supplied with the qualitative water by the ganats both at present and in future.

What is ganat?

Ganat is an hydrotechical system extracting underground water to the surface by the use of gravity. There is underground water supply in the zones of which river net is weakly developed. It is necessary to use of these waters only by the ganats in all the seasons of the year. In some areas where underground water recources are sufficient and the surface water is out of the reach, ganats could provide water in all the seasons.

The following advantages can be named for the ganat system:

-The ganat water is neat and pure;

-Continuous water is provided by less expenses;

-Meets the people’s need for drinkable and irrigative water.

-Mills can be used in some places

-Positively affects an ecological world by playing a natural drainage role.

-Is considered the most reliable water source;

-The ganats with their glorious memory confirm sedentary lifestyle;

-Is currently repaired with the negligible expenses;

When the attention to ganats fades away, they are spoiled and consequently the unpleasant processes occur.

So, the underground water regime changes, the subsoil water level reaches the surface and causes swamping and secondary salinization of the soils which are dangerous for the local condition. The ecological balance is broken up. The available animal and plant world perishes, the fauna and flora concering the swamp and salinity are formed in its place.

The ganats sinking in the settlements causes the rise of subsoil water till the level of houses basement. (1972-1980 yy. Ganja, Ordubad, Nakhchivan)

The sinking and catastrophic collapsing situations happen. Mineralization of the subsoil waters grows, pollution of subsoil waters occurs as a result of approaching the subsoil waters to the surface. Furthermore the repair and restoration of the ganats are extremely become difficult.

Information about the ganat

The information about availability of the ganat systems, their importance, some characters at the foothill of Iran plateau, Turkustan oasis and Great Karatay mountains was provided in the ancient and antique sources 2700 years ago.

According to the information up to now we can say that there are enough fabrications, legends, tales about development history and spreading of the ganats: Sacrifice for the water increase, purifying with the ganat water, kneading dough with the ganat water in holidays or saint days wishing for a good year, distribution of bread and other habits existed.

The men not strong enough before the river flood couldn't protect the irrigative systems from destructive streams and floods, the water loss was great at expense of filtration and evaporation in the water systems without a solid base. It was difficult to transport the water to the far distances because of

little slope. The manual labour and the animals power were used in the water-raising systems. .

The water civilization significantly developed during the sassanid period in 224-602 and in 550-331. The ganats which are considered the most progressive system were created in Iran and Mesopotomy during these periods. The new system was invented with its positive characters. Its water was ecologically considered purer. The water loss during transportation is almost reduced to nothing, any slope can be achived because it is situated under the ground.

The underground drainage-irrigative systems of which nutrition source is considered flood source in Egypt upwards of the Nil river were formed before V millenium.

The drainages used for irrigation look like the ganats with some pecularities though they were built in a different way.

During the second centenary before our era the irrigation policy is considered a main development direction of the country in the period of Han dynasty in China. This policy straightened itself, the material abundance influenced the demographic situation and the population of the country reached 50 million.

The wheeled pumps were used in irrigation beginning from VII century during the Tang dynasty. At the same time the most complicated systems of the ganats were developed in Sintzyan Uygurstan.

The primitive irrigation measures appeared till Maya tsarism in central America in the second millennium before our era, after the political power of the tsarism became stronger, the irrigative systems were improved and during the III centenary the perfect irrigation devices were constructed along the ocean possessing an arid climate of Peru.

As a result of the water provision improvement, settling develops in the desert landscape around Mexico and people gradually immigrated to the mountainous plateau, they took irrigation culture too. Unquestionably the increase in need for water made men search for alternative sources for the surface water.

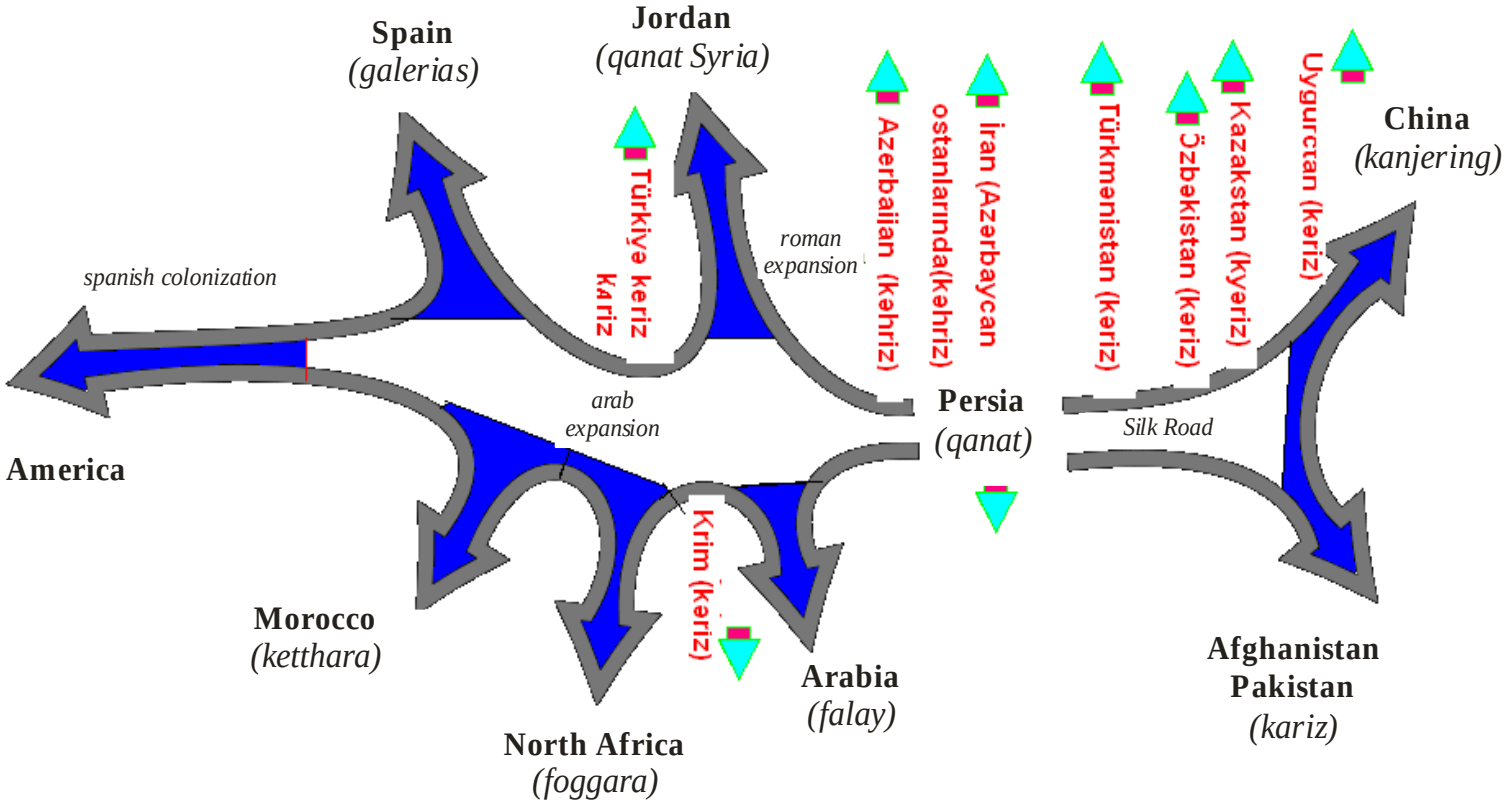

Figure 1. . Dissemination and naming of ganats in the world

Figure 2. Meeting of the 5th UNESCO Intergovernmental administrative personnel on ganats. Tehran, 2013

Figure 3. Moroccan old Kankan. Morocco, 2013

Figure 4. Meeting with the Moroccan Kankan. Morocco, 2013

Figure 5. Water Museum, established in Yazd, Islamic Republic of Iran

Figure 6. Research of Turkestan ganats (South Kazakhstan)

Figure 7. Wheel and dol at Yazd Water Museum

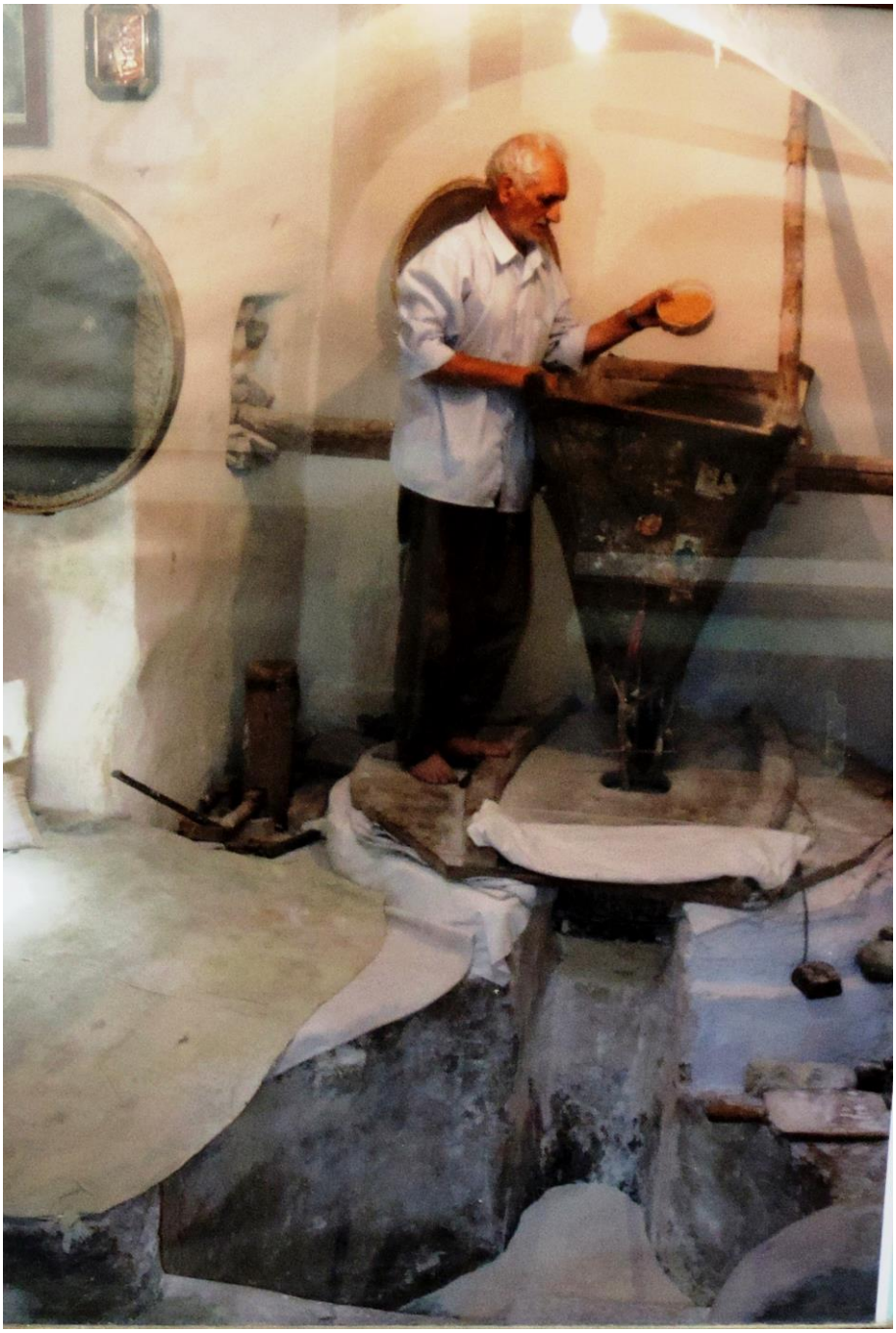

Figure 8. Ganat water-operated mill

Figure 9. The water wheel on the ganat. Yazd Water Museum

Figure 10. Outbreak of ganat in Oman

Figure 11. A pool at the exit of ganat (Oman)

Figure 12. Exit of the Beshpanja ganat in the city of Nurata, Uzbekistan

More drilled wells are deepened as time goes on and demand is increased. They were merged with each other. At the same time the new drilling rigs and devices were emerging.

Around 2500 B.C. the deep walls were built from the baked bricks to consolidate the wells of which the depth is 10 meters in the Indian River Basin, Tar desert of India. . The information about the existence of the wells with depth around 500 metres in China has come up until now since the Hun dynasty. It was very difficult to extract the water from such wells. However, qanat system was the only solution to take water from such wells.

The extraction of the subsoil waters by drainages during the fulfilment of the mining work in Urartian Crescent (B.C. VII-II) is mentioned in the information about the Alhu city collapse as a result of the earthquake during the Assysia King II Sargon in 714 BC. In this period the ganats of Tigris valley, Mid, Persipolis, Oman, Egypt sea sides had already possessed a large geographical zone and Herodotus, Polibus, Diodorus, Sikulus and others informed about geographical spreading of the ganats in their works.

According to the historical information more than 40% i.e. 15 million people lived as a result of the irrigative systems development during Sassanid period of North Irag. During the Arabs' occupation the ganats drilling began to spread father away quickly and reached Cyprus, Sicily, Morocco, Spain, Canary Islands. . This process past from East of Iran to Central Asia during the Abbasid Caliphate, afterwards from Spain to Peruvian and Mexico.

The local population used the ganat waters in Mexico plateau and the Pacific Ocean coasts while they hadn't any information about Iran, and the Eastern World. . Fifteen million hectares of soil are irrigated in the world at the expense of the ganat system. This system is called pakios or fagues in Peruvian, drainage in Great Britain, paralysis in Saudi Arabia, foggara in Tunisia, mammoth or alkavor in Mexico , ganat in Azerbaijan , ganat in Iran, ganat in Afghanistan, Karaz in China and Pakistan, ganat romani in Jordan and Syria Kettara in Morocco, galleria or inflammation in Spain, paralysis or aflat in Oman and United Arab Emirates, Kahn (coffee) in Belgium , Katakom in the Ukraine. . Almost Half of the ganats are in Iran and the rest are located in Afghanistan, Pakistan, Turkmenistan, Azerbaijan, China, Oman, Morocco and Mexico.

In ancient times, there were 38000 ganats with 160 000 km length in Tehran, Gum (Qom), Nishapur, Yazd, and Kirman zones and 7 million hectares of fields and fruity .

Figure 13. . UNESCO Meeting at the International ganat center (Yazd, Iran)

Figure 14. . Speech at the international conference in Ashgabat

Figure 15. . "Girkhpilla" on the ganat in Yazd city, Iran.

Figure 16. . International conference at the Kyrgyz-Turkish Manas University

Figure 17. . UNESCO Conference on ganats in Yazd city, Iran

Gardens were irrigated with these waters, the ganat systems are still considered only water supply source in some provinces, for ex in Yazd and Kirman.

The ganats were also victims of political conflicts from time to time. . The ganats which were more than 400 years old in Turkestan, Mesopotomy had been destroyed during Mongolian military march.

Mongolians broke down the Isfahan city in 1237, afterwards Emir Teymur who also attacked here in 1387, commanded to destroy the ganats which formed the basis of the population's water provision. . But Teymur's heir Shahrukh was busy with the ganats construction correcting father's fault in the initial years of his empire.

Use of the ganat systems in the Ukraine was known from the XVI century. . The ganats were built in Evpatoria, Bagchasaray, the pottery pipes were inserted in inter well tunnels and protected the tunnel from collapsing. . "Khan bath" and "Khan mosque" ganats of which inter well distance was 50 meters, but the head well depth was 8-9 meters.

There is millennium history of ganats in Kazakhistan and Central Asia with semiarid climate. . The close net of the ganat systems are available in Murg river delta, Fergana valley, at the northern foolhills of the Karatau mountains, in Tufan depression, Pamir, Tyanshan and Kopet-Mountain foothills. . The ganats are only water sources in Izperzen, Ishan, Khankarez, Kopet-Dagh of Turkmenistan . The water consumption of ganats of which mean length is 200 meters, but inter well distance is 50 meters changes by 20-150 litres in seconds. . The ganats in Turkestan oasis are closely situated in Sauran, Chernak, Babayikorgan and other regions.

The ganats were unequally distributed in both world and countries. . So, the ganats are close in Gandahar, Uruzgan, Nimror and Hilmand of Pakistan, in Karnataka of India, Uygur autonomy of China, in the east of United Arab Emirates, on a line of Hababa-Zebla-AL Janad in the north of Yemen, in Hadramat, at the Aktar mountain foothill in the north of Oman, in the eastern of Tuvayk mountains of Saudi Arabia and in Jeddah-Mecca region, in Nil valley of Egypt, in the north of Libya, at the foothill of Atlas mountains in Tunisia, in the Mediterrian Sea of Algeria, in Andalus of Spain in Fujin lake of Italy, in Helmsang of south Luxembourg, in Crimea, in Yazrd Province of Iran .

Figure 18. . Ordubad City. . Entrance of Haji Tagi spring
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Figure 19. . Sarshahar spring in Ordubad city

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Figure 23. . Vanand village ganat in Ordubad district

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Figure 26. . Exit of the "Yukhari cheshma"ganat on the Alinjaqala slope

Figure 27. . A water-keeping pool in Alinjagala rock

Figure 28. . Exit of the "Yukhari cheshma"ganat on the Alinjaqala slope

Figure 29. . Pir ganat in the village of Gal of Gulfa district

Figure 30. . Ganat on the way in the village of Shurut of Gulfa district

Figure 31. . Galandar khan ganat in Nakhchevan city

Figure 32. Ancient ganat wells around Duzdag

Figure 33. To come down a hill to the ancient ganat well around Duzdag

THE STUDY METHODS OF THE GANAT SYSTEMS

There is a great scientific practical importance in definition of the use date in ganat systems. Especially establishment dates of ganats, the use dates by the initial civilizations, definition of the ganats by ancient human civilizations possesses both scientific and political importance.

In order to determine the ganats age the following methods that could be mentioned as indirect ways were applied:

- Ceramic products discovered in the ganat bed;
- The building technics of the ganats;
- Comparison between the material through archaeological excavations.
- The excavation technologies of the ganats;
- Definition of the paleo-geographical condition in ganat structure and for paleonthological residues encountered in the wells;

One of the strong water- problematic regions of Azerbaijan is Nakchivan. Drying of the surface water, rivers, and springs happens in some places of the zone in summer. Therefore the use of water wells and ganats are extremely crucial in this region.

They are considered only hopeful water source. The ganats are able to meet the people's need by removing the water at a depth of 4-5 m to 30-40 m above ground surface.

Selection, drilling and getting water is very responsible work . They are realized as a result of the different methods and experiments. Although the drilling of ganat sewer and wells are principally subject to the relevant laws, none of them repeats the other. Each ganat possesses individual feature.

The ganats nourishment is at the expense of the subsoil waters. The waterproof layer can both be in horizontal and sloping condition in their flow. Besides the thickness of the underchannel flows and hydraulic slope play a key role in the ganats nourishing from river-beds.

While calculating a plane flow of the subsoil water the Darsi law is used. In this case, the value of the hydraulic gradient is fixed

by the horizontal plane of the waterproof layer. The mirror level of the subsoil

Figure 34. There is a rich groundwater reserve under the soil with cracks. (A view of the nature of Nakhchivan).

water (free surface) is characterized by the depression curve. The flow thickness in any cut doesn't remain constant along Y flow. The hydraulic gradient is equal to the tangent drawn for the depression curve. Tangent of this angle is characterized by the compiled derivative according to X from Y in the selected coordinate system. This derivate gets a negative mark according to Y reducing while X distance rises. Then the hydraulic gradient is:

$$J = dy : dx$$

If we write marks of the hydraulic gradient and width-section area in a place in Darsi law, then the following expression can be got for the special expense of the plane flow.

$$q = \upsilon y = kJy$$

$$q = -ky\frac{dy}{dx}$$

If this expression is simplified.

$$qdx = -kydy$$

The both sides of the last equation are integrated, we can got;

$$\int qdx = \int -kydy$$

$$qx = -k\frac{y^2}{2} + c$$

Here the following boundary conditions are used to find C integral constant:

While $x=0$, then $y=h$

C constant is found while these terms are written in its place of the last equation;

$$c = k\frac{h_1^2}{2} \text{ və } \qquad q = k\frac{h_1^2 - y^2}{2}$$

While X=L in the last expression gets $J=h2 \quad y=h2$ marks and get Dyupi formula for a special expense in the plane flow of the subsoil water.

$$q = \frac{k(h_1^2 - h_2^2)}{2l}$$

This expression can be used as a depression curve equation about plane flow of the subsoil water in waterproof horizontal layer. Therefore h1 depth of subsoil waters can be calculated in the ganat sphere in L distance of the flow direction while h2 and q are known.

$$2lq = \left(h_1^2 - h_2^2\right)k$$

$$h_1 = \sqrt{\frac{2ql}{k} + h_2^2}$$

If the waterproof layer lies down then the pressures in the I and II sections can't be fixed for the waterproof stratum. In this case 0-0 plane is additionally past to fix the hydraulic gradient.

The hydraulic gradient according to designation in the picture:

$$J = \frac{H_1 - H_2}{l}$$

A mean height of the flow can be received as an equal to half of h1 and h2 heights difference.

$$h_0 = \frac{h_1 - h_2}{2}$$

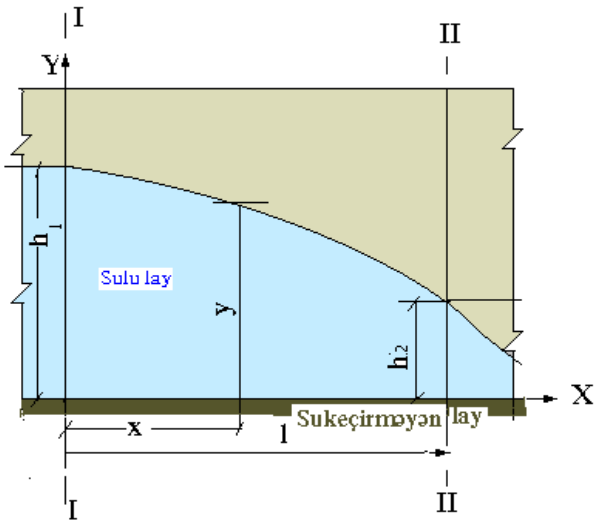


Figure 35. Movement scheme of the underground water on waterproof horizon layer.

Figure 3. Schematic indication of subsoil waters (ground) level on the waterproof inclined layer: - 0-0 level plane or absolute height: h1 and H2 – absolute heights of the mirror surface in subsoil waters on the I an II cuts which are situated at L distance from one another; h1 and h2 are thickness of subsoil waters on the same sections.

A specific watering of the plane flow in underground waters can be calculated as following for the reviewed case:

$$q = k\frac{(H_1 - H_2)(h_1 - h_2)}{2l}$$

Here the Dupi for calculation of the subsoil waters flowing into horizontal water intake device (ganat) drilled till waterproof layer. So, their watering can be calculated by means of hydrogeological methods according to the nourishment condition of the ganat systems.

The special Kankan group is attracted to work for drilling or restoration of the ganat. This group consists of 4-5 people, an accurate

duty distribution is performed among them. Every employee must exactly know job responsibility and safety rules, should be ready for it must not lose himself during an unpleasant incident.

Kankan is called occupational owners who drill a well and ganat or restore them. The Kankan group, a chief master consists of – kankanbashi ("evil favor" "sharkheyir" is said) "master" (Kankan) grinder, assistant of Master, -"Sewer" and "Sack".

The kankanbashi is a main worker in ganat drilling and restoration work and he is appealed in this work.

"Kankanbashi" comes to the place of ganat drilling with the applications, exactly learns a state on the basis of the order and make terms with the applications.A capacity of water will be extracted from the ganat, length of the ganat, restoration problems and others are reflected. "Kankanbashi" leads all the works.

The master (Kanakan)- plays a main role in drilling of spheres and wells, executes "kankanbashi's" instructions.

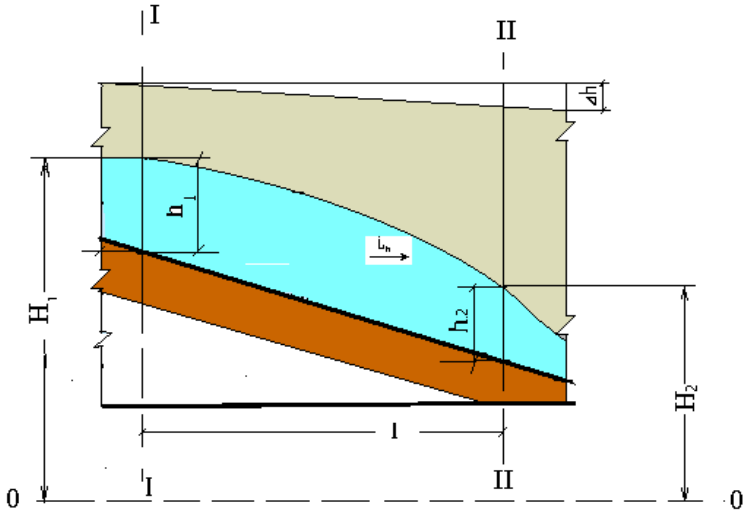


Figure 36. . Schematic representation of the level of groundwater on waterproof horizon layer: - 0-0 level flatness and absolute height; H1 and H2

The grinder- works in the grinding wheel on the wells outfall. The main responsibility falls on grinder (pistachio) in lifting-downloading of the workers and loads. While rising the work capacity and well depth two men work in the grinding wheel. The second worker helps the main grinder.

Laghimbar (sewer) is main person in well drilling and in cleaning works during restoration. Dolchu (dolkesh) is a person who executes ganat drilling or restoration, removal of ground from springs and wells. “Dolchu” collects drilled or cleaned ground, water drags into the well bottom and this load is drawn out by the grinding wheel. While the distance increases between the wells an additional “dolchu” is connected.

Picture 37. . Kankan wheel and the Kankan working in it.
(Iran Islamic Republic, Yazd Water Museum).

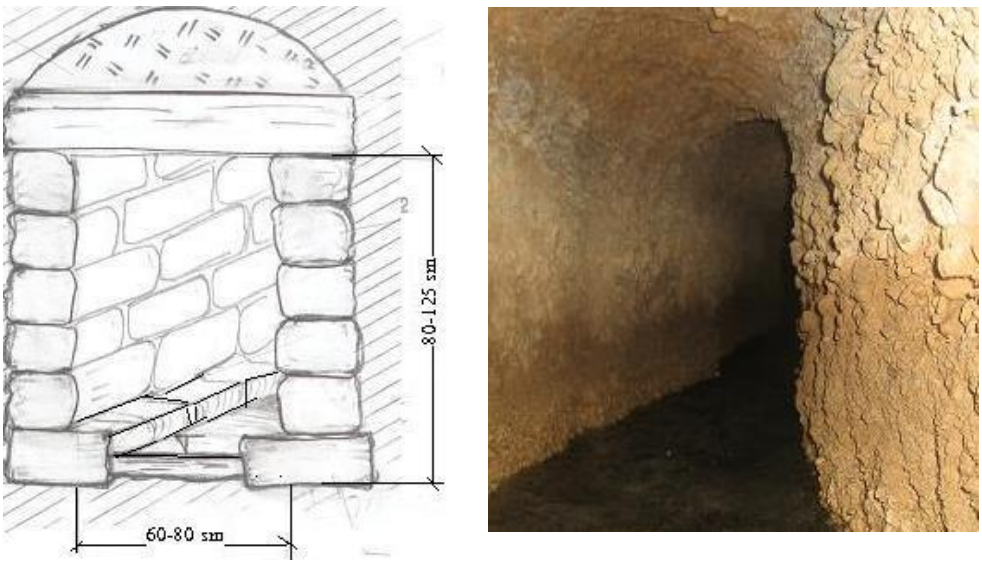
Besides them a supplemental worker is invited while work volume is more. These workers execute special work which is given by the master.

At present the groups are partly used in ganat restoration. . But the duties as “evilfavor” “sharkheyir” or “ kankanbashi” are full-filled by the ganats office.

Structure and measures of the ganats

The width cut measures of the ganat sphere are selected depending on drilling features, water- physical peculiarities and mechanical structure of the ground waters. A width of the ganat sphere on the hard rocks is b=0, 65-0, 70 m, height h=0, 75-1, 20m, sometimes h =1, 40-1, 70m (Fig. 48)

For example, the morphometric measures of the ganats in the Nakchivan Autonomous Republic are different. The longest one of them is 2, 3 km, a length of the least one is 20-50.



A) “Saiband” ganat *A) B)”Monochrome” ganat*

Picture 38. . An appearance of the width cut in the ganat.

The ganat wells are built with the stone in relatively cone-like form (relatively narrowing upward), at 3-5 metric height beginning from a

hard rock for not- destruction of the ganat wells, it is called “chalagarden” (pic. 39). As there is no destruction danger they work by saving their form and width cut measures in one dimension.

Picture 39. . “Chalagarden” in the ancient ganat wells

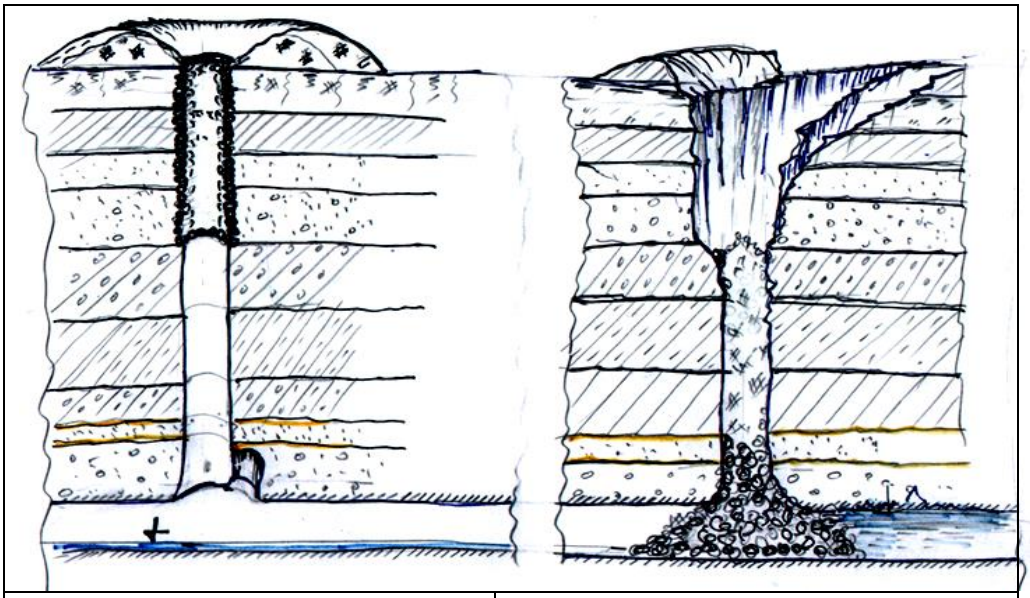
The ganats are “monochrome” or “saiband” by the structure. . The sphere is saved in the natural drilling state in the monochrome ganats. . (Pic. 5. b). That is, the side walls and ceiling are natural ground . Being “monochrome” the sphere is connected with the elevation of structure, hardness and durability of ground in the drilling tunnel.

In the ganats with “ saiband”, i. e the side walls of the tunnel are built with the stone or baked brick at 120-130 cm height, but the ceiling is covered with the flagstone, 60-65 cm distance is kept between the side walls, and this is intended for the kankan’s movement in the sphere (Pic. 5. a).

“Saiband” and “ Chalagarden” – are building kinds which are used in sphere and wells building in the ganats. . The vertical wells drilling on the sphere are lifted from the bloomery to the earth surface with building by the “ chalagardan” method and the wells outfall is covered with the flagstones. (pic. 40).

The ganat systems are repaired and restored according to the traditional Kankan experiment and work method. At present they are restored by the progressive method and the new ones are drilled. Here the most important problem is to use from the new technologies in the work process. An application of the new technologies hasn’t found its place in

ganat restoration works. Therefore there is a need for formation of the local constructor- project group which will be able to provide an application of the new tools and technologies in ganats restoration.



A) In the ordinary state. .	***B) In the collapsing state.***

Pic. 40. . Schematic cut of the ancient "chalagardan" ganat.

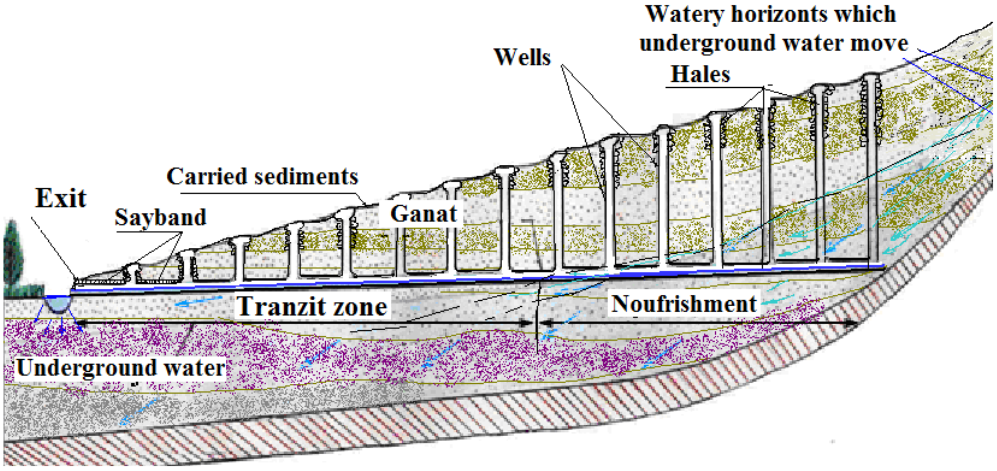
Division of the ganat sphere into zones

The ganats pass a long way (depending on place inclination) for removal of the waters on the different layers of the land. One part of this way concerns the nourishment zone, but one part concerns the water transport zone.

The ganats nourishment (this is called "fermentation" among the people) depends on an area of the subsoil water collector canal, water-physical features, lithological characters, sediments origin and their water-storage ability . Besides it, the ganats action depends on physico-mechanical characters of the ground of which sphere is drilled, rocks slope , hydro-dinamical inclination of the subsoil waters. The water-penetration ability of the ground waters which are found in the nourishment zone of the ganats changes by 0, 4-30 m/day. The ganat is divided into two zones for its length according to the ganat systems structure and passing of the flowing water from what stages. (Pic. 41)

1. Nourishment zone. This zone consists of the drilled spheres collection in the zones serving the ganat nourishment. The underground waters enter the ganat sphere and nourish it in this zone.

Here, the ganat nourishment is provided depending piezo-metric slope, water degree of the rocks. In some drought years the lowering works of the ganat bottom are realized by “abandoned tattoo” operation because of the water regime change . It is possible to increase partially ganats expense by this method. The minimal expense *(Qmin =Qconst)* which comes from the nourishment zone is taken as the basis during the ganats surrender. The months which influence very little on nourishment zone of the surface flows and rainfalls are concerned the minimal water expense of the ganat.



Pic. 41. . *Schematic description of the nourishment and transit zones in the ganats.*

2. Transit zone. The length from the end of the ganat nourishment zone to the ganat exit (sphere) is called a transit zone. In this zone the random streams (thief currents) can influence the ganat flow. It can be positive and negative effect. In most cases these waters cause unpleasant disturbances.

The water losses affecting the increase of the ganats expense are found in this zone. That is, the ganat water passing on different rocks along the transit soaks into porous rocks and causes “stealing” of the water from the ganat sphere, therefore the water flow of the ganat decreases.

The kankans prevent the water percolation (filtration) by realizing of fastening, replacement of the surface layer by the waterproof rock, filling of the rock porosity with the silty water and other operations. The kankans control the water flowing from the "Gumana" well till exit. At first the length of the water loss in the transit zone is fixed by the Kankan. The area of the bloomery in which the water moves is drilled at 5-10 cm thickness and taken. Then a thick cover from the waterproof clay is put on it and fastened. So, the percolation is prevented.

Some kankans prepare clay solution and add to the water from the percolation zone to prevent from percolation in the ganat. As a result, the silt particles fill in the rock porosities in the percolation zone and prevent the water percolation. Today the "Lilajar" word in the professional kankans' language is connected to the work name directed to prevention from losses in the transit zone.

At present some contemporary measures are fulfilled to prevent from filtration in the ganat systems in the Iran Islamic Republic. The concrete rings, plastic pipes, placement of the sheets on the wet perimeter and etc. can be mentioned.

Classification of the ganats for nourishment sources

There is a need for the ganats nourishment classification. Because the ganat systems nourish from the higher mountainous zones, rainfalls in the rocky fissures, karst systems in connection with the structure and hydrogeological condition, river-bed waters, debris cone sediments for their nourishment sources. Such nourishment is met in the other regions of the world. The ganat systems are classified for their nourishment sources in Azerbaijan as a result of the carried out researches:

1. The ganats nourishing from the underground flows which are formed the atmospheric precipitations soaking into soil ground waters in the foothill zones.

Such ganats spread in the foothill zones of the Boyuk Duz sloping plains of Nakchivan. Their length changes among different sizes depending on the landscape, nourishment zone area , the earth surface inclination.

2. The ganats nourishing from the river-bed waters.

Such ganats are also active at the expense of underground flows in summer when the rivers partly dry . But the ganat flow can often change depending on water degree of the year, seasonal floods and drought. Such ganats in Nakchivan AR are met in Nakchivanchay, Jahrichay, Alinchay river-beds.

3. The ganats nourishing from the narrowing width cuts of the river valleys.

Such ganats nourish from river-bed underground flows restricting the movement at the expense of the water-proof rocks from the narrowing width cuts of the river valleys. Such ganats are found above the Payiz village of the Jahrichay, in the Nakchivan bed and other places.

4. The ganats nourishing from the river debris cone.

These ganats nourish from the underground waters created at the thickness by replacing each other of the various sediments in the river valleys. The ganats which nourish from the river-bed waters of the rivers drying during summer at the foothill can be concerned this type. The ganats acting in the debris cone of the Sirab, Gahab and other small rivers can be concerned this type. In some places the underground waters are used by the ganats for sometimes. Such ganats are continuation of each-other on inclination and are situated as if graded cascade form. That is, nourishment zone of one ganat is situated under other ganat exit. Such ganats widely spread in the debris cone sediments of the Aylis and Ordubad rivers of Nakchivan AR.

5. The ganats nourishing from Triassic aged layers speared under the foothill zones of the sloping plain.

The underground waters in such layers are situated at 15 m depth. They are used as springs in many places, but they are used by the ganats in some places. The karst caves and emptiness are coincided in the water layers formed from the calcareous rocks by a chemical composition. The mineral waters possessing a different mineralization degree participate in some ganats nourishment. They create stoning in the ganat sphere and cause decrease of its water. . Such springs are a reason for decrease of its water. Such springs are called “saltpeter spring” amongst the people. Their water flow are less than other ganats.

There is “Salty spring” of which mineralization degree is 2, 45 g/l near the Jahri village of the Babak district.

6. The ganats nourishing from the waters which percolate into the fissures in the ancient towers and down to the rocks. As as example, in ancient fortresses people forcibly built rocky furrows and flows and filled the water into the basins on the rocks in order to stay in enemy’s blockade in the defense fortress for a long time .

The water system on the ancient Alinjagala situating in the Julfa region concerns such type of the devices. Here, all the water collector furrows possessing quadrangle width cut drilled on the rocks are connected with the drilled basins on the rocks. Both the snow and rain waters flow into these furrows and fill in the basins.

The basin measures change depending on water collector area; length-23m, width-6m, depth-2-4m depending on slopes.

The waters not being collected in the basins of the tower fill in the rock fissures and nourish the ganat that has been drilled at the foothill. The same ganat is met in the ancient settlement on the upper part of the present Khanagah village, on the south-east slope of Alinjagala.

8m fall of the well under the angle of 45 degrees and 10m descent by recycling were determined while looking at three wells of the ganat called “Upper spring” amongst people. There is void in which 3-4 people will be settled down. The top of the void was covered with the huge rock piece. ”The God” word was engraved on the visible side of the rock. The rock piece was cleaved and depth was shaped into 0, 6 m hole form. The ganat nourishment is provided by the water collecting in this hole. The ground waters with water movement of the sphere have great filtration. The water is extracted on the surface by the pottery chutes for prevention of water loss.

Installations and historical monuments built on the ganat systems

The installations on the ganat are historical monuments. Possessing an ancient town-building culture Azerbaijan is famous with the urban-type accommodations, defense fortifications, towers, religious and civilian

buildings, sepulchers. One of these monuments are ganats acting as if "alive" monument and "forty-steps" on them. (Pic. 9, 10)

A role of the ganat systems in town- building culture is indispensable. In some places the population used the ganat waters as the only water source both in the welfare and yard area and fields irrigation since the ancient time. These water systems were built by the separate communities, rich people, beys, khans, shahs. The ganats which remained up to now are famous by the name of men who invest money on them. For example, Shah Abbas in Julfa, Haji Taghi in Ordubad, Haji Fattah, Abbas bey, Janan bey in Nakhchivan, Mahmud agha, Kalba Musa and other ganats can be shown. Besides it the "people's ganats" built at the expense of the people's joint effort are available.

In the Middle Ages the ganats were used as a fortress defense system, food store warehouse and refrigerator.

There are three ganat systems under the towers having an ancient history and famous with the name of "old tower" in Nakchivan. As the tower walls and remnants weren't protected during Soviet times, its zone was destroyed and the ganat wells were filled in by the different "researchers, gold seekers".

The "Mahmud agha" ganat passing under the tower waits its research as an interesting historical monument assuming historical importance for today. The two-storoyed underground system was constructed on the ganat sphere, it was determined during the research works in 2005. There are ganat line covered with the slab in ganat building, food storehouse in the emptiness on it, niches and lamp places.

The top of the sphere under the tower of the ganat was expanded. The void with 2x3 m and 2m height was created in the expanded place, the niches were constructed, the well was connected with the earth surface.

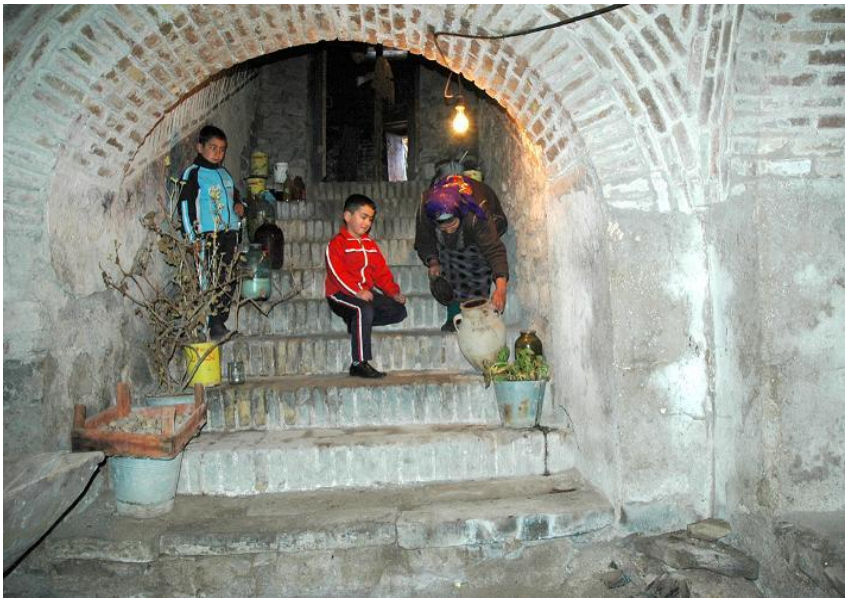


Figure 42. The interior view of "Girkhpilla"

Figure 43. A view of the estates "Girkhpilla" on the ganat Kahriz (Ordubad city).

During the tower defense or in the hot summer the population preserved food stock in the same void made in the ganat sphere. The temperature in the ganat sphere ($+5+10^0C^0$) gives opportunity for long-term quality of the food. At present some of these monuments were wholly destroyed, some wait for their restoration.

The researches indicate that many “girkhayag”(forthy-foot) or “girkhpilla” (forty-stage) on the ganats in the settlements as “Shahtakhti”, ”Khok” “Garabaghlar” “Lula”, ”Khan”, ”Kalba Musa” spring till the beginning of the last century but “dolgayit” wells were in some places. Unfortunately, desolation of the later periods caused their uselessness.

Some of the installations met in different forms on the ganat systems are called main, but some are auxiliary devices.

“Gumana” well “Bash well” ganat sphere and other wells concern the first one. These are called main devices of the ganat. There were auxiliary devices as “girkhpilla”,”girkhayag”, basins and food preserving places constructed on it besides the main devices not depending on ganat activity. (pic. 42) Each device has its function that they are fulfilled by ganat driller or customer. According to the customer’s financial situation “girkhpilla” or spring-monument is constructed in architectural style depending on depth on the ganat.

But “girkpillalar” had been built using local materials in the estates. (Pic. 43).

DRILLING TECHNOLOGY OF THE GANATS

Engineering-measuring works in drilling and restoration of the ganats

The ganats drilling is performed by the professional kankans. They perform the ganat drilling as the following rule: At first the Kankan observes the zone, the landscape, he approximately believes that there will be underground water there, then fixes a place of the first well and drills it . This is called “Gumana” well. The Kankan who is sure that the water will be extracted from the “Gumana” well determines a place of the wells which will be drilled towards bottom.

Sometimes they drill 2-3 additional wells as a “Gumana” well (according to the triangle system and fix a movement direction of the underground water by pouring coloured liquid into the same wells. After it the best of the wells is (plenty of water) deepened and drilled till the water-resistant layer . To gather the water on the water-carrier stratum all the waters is collected into somewhere by depending the sewer on the waterproof layer.

So the two kankans begin to drill the well in the direction of the water flow. After the well is drilled for 2-3 m the wheel is put on its outfall (this place is called “work outfall). When it is drilled and reached the definite depth (it is called “tark” (leave) or (divorce) (farsh) then a sewer (sphere) is begun to be opened. . For correct drilling of the sewer one wood is stretched to the well outfall and the master is directed to the well. . While throwing the sewer , the master always looks back, to the well bottom i. e. . lightning side not to make mistake. If there is no light, the lamp is put on the outfall. When the sewer length is more then they begin to drill front to front from two sides. The masters go out to each other with the sound of the picker under the earth.

The masters say that the sound of the picker is easily heard from 10-15 m. This sound is called “tagga”.

The Kankan working in the well helps the other Kankan on the earth by the “tagga” (by hitting two stones to each other) in fixing the direction of other well. That’s why the Kankan leans his ear on the land and specifies where the sound comes from. Then he proves that the sound is on the sphere. The circle is scratched at 0, 5 m radis in the same point and a new well is begun to be drilled.

While the well divorce (farsh) climb up from the sewer, it is drilled. The initial water extracted from here is omitted into the second well. After the water is drown in this well, the sewer is thrown here from the third well. So the water is taken to the end by “sulukar”-“sujar” (sujar” is a place of the water flow of the sewer).

The sphere is drilled at the same measure and level. That’s why the master puts glass with the water in the “gurujar” on the smooth wood

(gurujar is called a dry floor of the sewer) the air in the emptiness of the glass confirms durability of the “gurajar” level at the same point.

The master put sheepskin hood on his head and protects his shoulder and back from water and random rock pieces while dripping water from the sewer walls (it is called “thief water”).

The outfall part (upper) of the ganat wells is built with the stone in a cone-like from beginning from hard rock at 3-5 m area not to be dispersed. As it is noted before that it is called “chalagardan”. Then the well outfall is covered with the flat stone.

The soil which is drilled from sewer by the Kankan is brought into the bottom of the well (dragging with the hand) by the “dolkesh”. Then ”dol” is lifted by the wheel and unloaded some metres aside from the well outfall.

Pic. . 44. . Restoration of the ancient ganat in Nakchivan.

When the wells are drilled and they are ready and after extracting of the water to “yarma” (“yarma” is a place where the water comes to the surface, it is called a spring in Nakchivan), the wells outfall is closed. The well outfall is opened only during their repair. Keeping the well

covered sanitary rules are strictly adhered to and the danger of collapse is eliminated.

Some kankans drill the wells from bottom to top in Azerbaijan. Though this operation is difficult the work is quickly going on. On the other hand the Kankan performing drilling operation with his feet doesn't prevent the following dolkesh. The work volume, measures based on geoderic motivation and hydrogeological condition of every ganat determine its value. The professional kankans possess traditional experiments and realize the solution of the problems in sequence. During the ganat drilling the kankans strike rocks, use rotation, siphon, slump methods and extract the water to the surface. Depending on work character and rock sort sometimes hard rocks are found that are forced to detract the sewer measures to achieve passing. These sizes are detracted so that the kankans can hardly move. Such ganats are met in Julfa and Ordubad.

The kankans calculate twice for well drilling in repair and restoration works which differs from drilling works for new ganats. Because the drilled well crosses from sunken one and is joined the old sphere not approaching the scattered place.

The restoration works are considered good from the first month of autumn till the second month of the spring. Because, the ganat water, the surface flows also decrease, irrigation isn't performed. In ancient times an owner of the ganat which will be restored measured the water flow of the ganat in December. This time the master used to solve all the disputable problems, list the complaint, give a job to other kankans and etc.

So, the master used to get 30 manats and a sugar instead of what he did. Without his permission the other kankans had no right to drill the ganat.

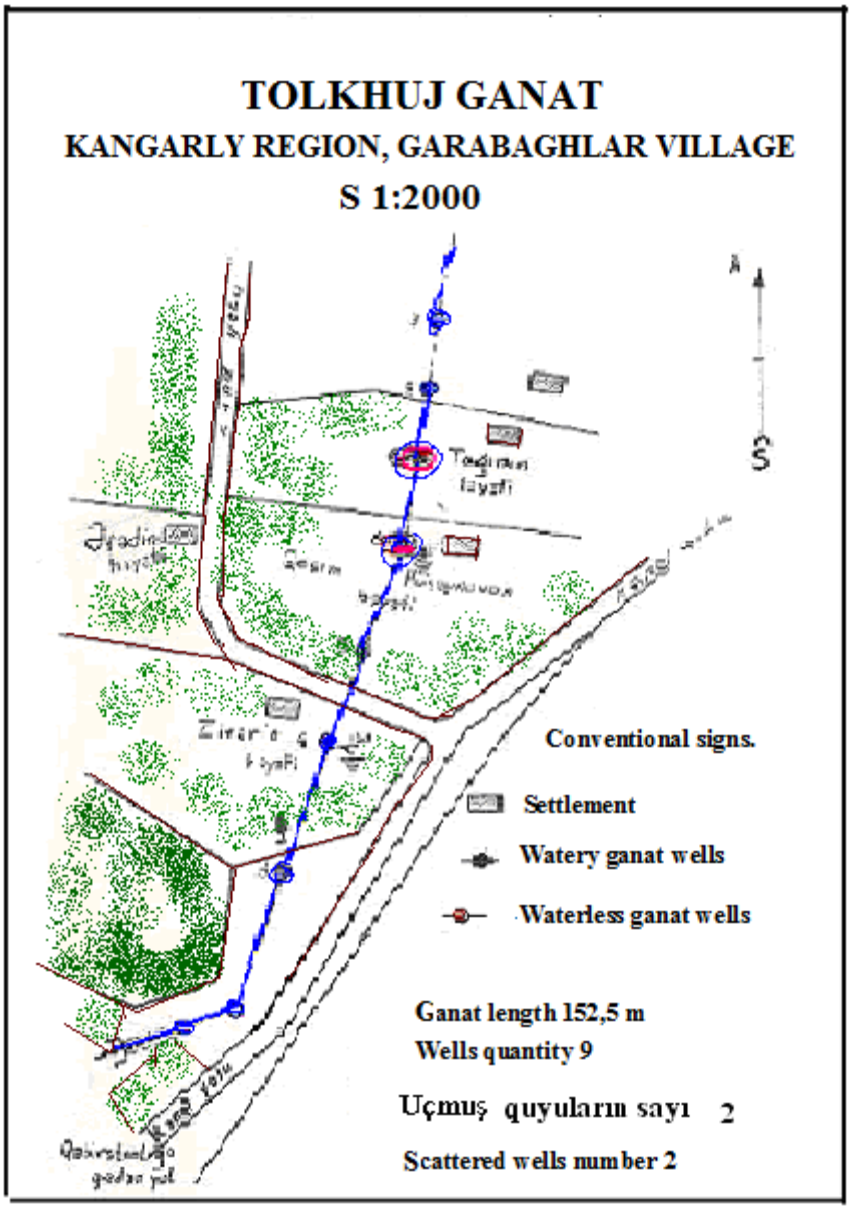
Evaluation in engineering-measurement works must be performed before and not beginning for the ganat restoration work. At first this work is begun with the reviewing all the ganat parts. The experienced kankans carry out inspections in the wells and furnaces of the ganat. The irrigation fulfilled (drilling, building works) on water-collector area,

furnace directions, ganat exit, wells, indications of the streams and the complications which are created from them are revealed.

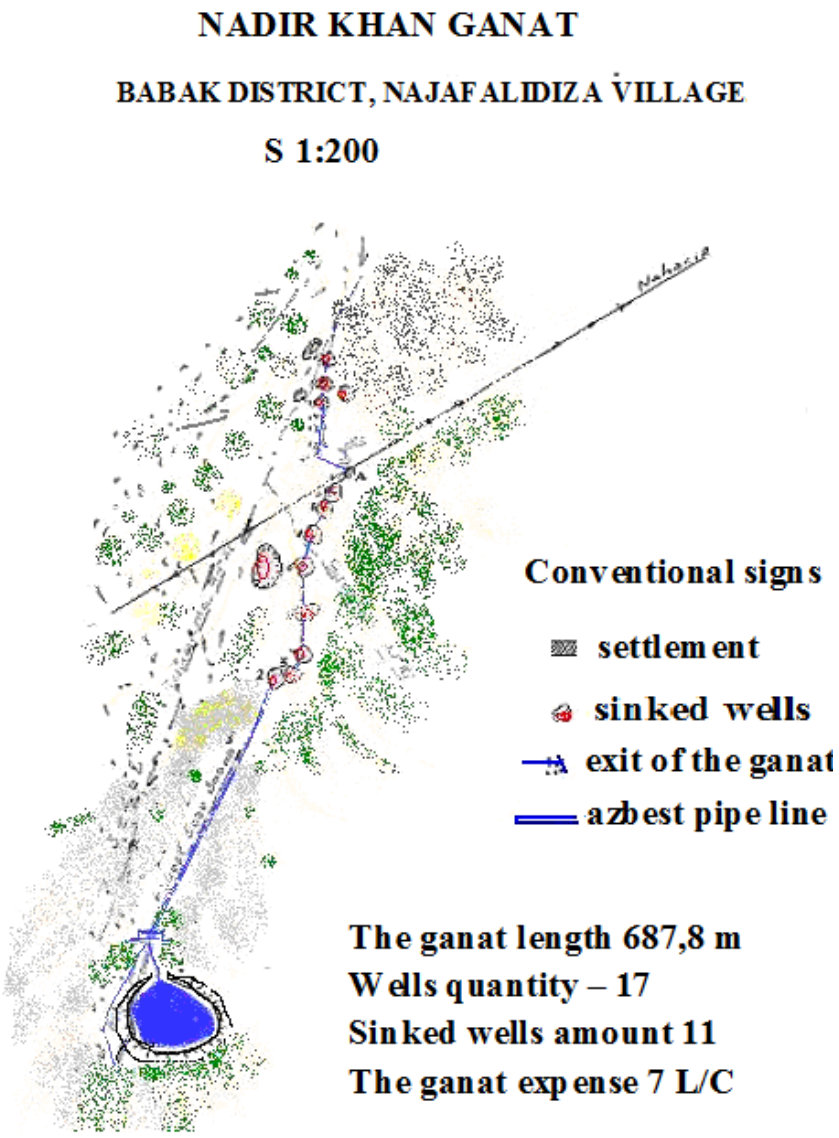
At first they use the scientific- mass references, press, state, archives, documents which reflect information about the sections work of the offices which were busy with the ganat exploitation, past urban and rural soviets. So the additional information is got from the kankans working on the ganat , the executive leaders and elders. Besides it, it is possible to get information from search works, accounts of the hydrogeological expeditions and results of these affairs.

Pic. 45. Geodesy works on the ganat.

The water expenditure of the ganat gives an opportunity to calculate a hectare which will be irrigated by its water, an economic rationality of the expenses. The ganat expenditure is grounded on its relation with the watery underground flow. The relation of the ganat nourishment (both foothill and under river bed) with the hydrogeological condition (picture 46-49).



Pic. 46. Plan of Tolkhuj ganat in the Garabaghlar village of Kangarly region.



Pic. 47. Plan of the Najafalidiza village ganat in the Babak district.

Figure 48. Shahbuz r. Badamli village (output)

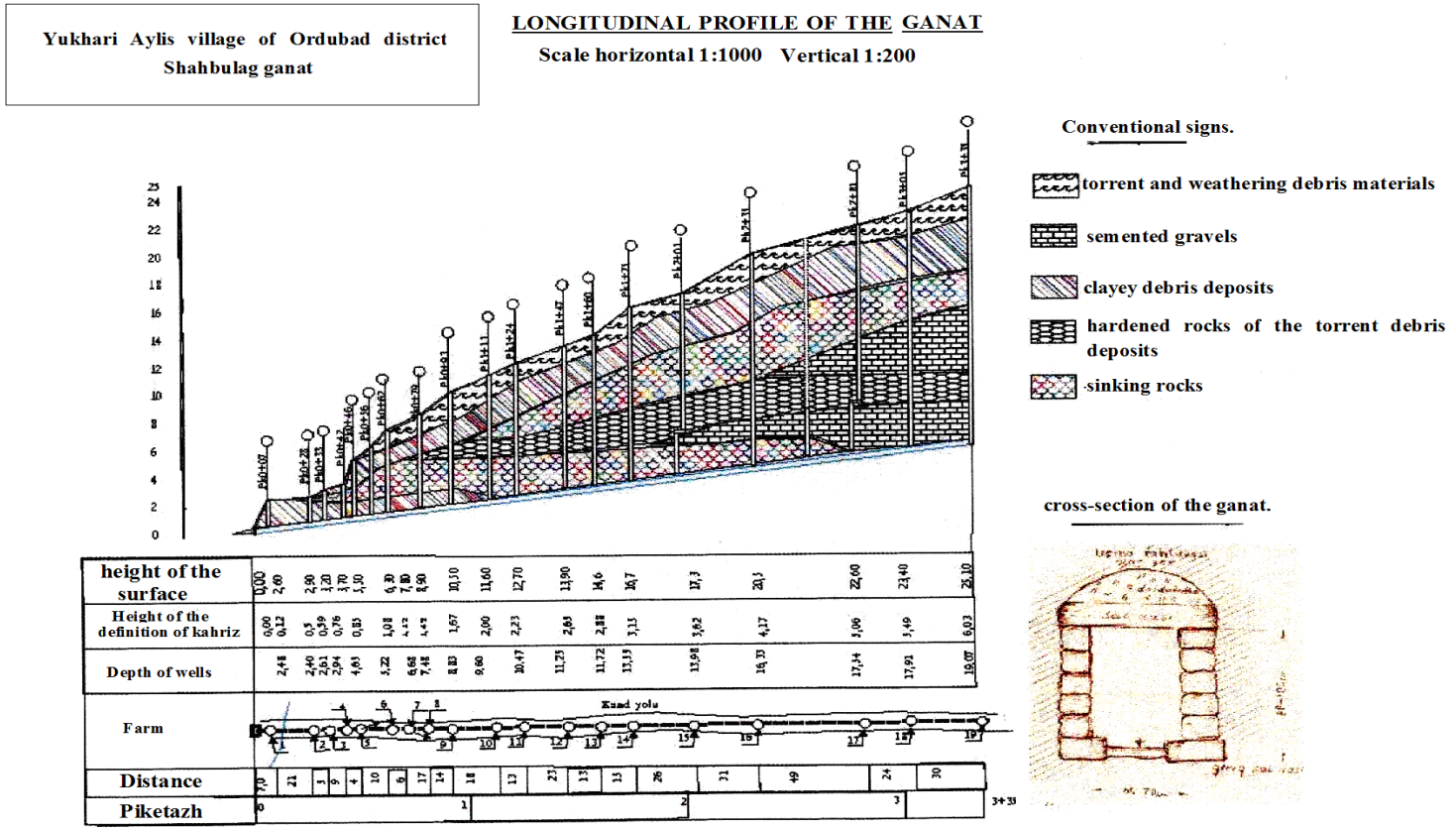
The generic characters are very little in ganats activity, the individual features belong to each ganat. It is impossible to refer to only one ganat system to conclude a general overview on ganat systems. Therefore monitoring must be performed on ganats and this should be carried out by the following rule;

-Collecting information about the ganat;

-Performing visual works on ganats (hydrogeological , engineer-geological, geodesy measures and geomorphological observations) and their analysis;

-The simple bussol plan or scheme reflecting inter wells distance of the underground line direction on land surface of the ganat;

All the situations should reflect in the plan. A water-collector area, potential watering ability, regime, factual expense, an available hydrogeological and engineer-geological condition of the ganat are studied by the specialists, the information about the wells lithology is obtained.As a result of the engineer-measure works performed for this purpose the plan (1:2000, 1:5000) profiles (1:100, 1:200 or other scale) of the ganats, the bloomery, expense values tables and other works are fulfilled.



Picture 49. Shahbuz district Badamli village ganat (exit).

It should be remembered that a constant expense of the ganat is a main element of its economical index.A basis of the ganat constant expense is grounded on their relation with the underground flow.At the same time a relation of the underground flows nourishing the ganat (both foothill and under river-bed) to the year with less or more water is main term.

The hydro geologist, hydro technicians, hydrologists, mining specialists and professional kankans debate, come to the conclusions and decide how to begin the work on the basis of the collected materials.

The experience shows that the ganats were drilled in the best place from the ancient times and therefore it gives the previous expense after restoration work.That's why restoration of the old ganats is very expedient.

Tools for ganats drilling and requirements put on them

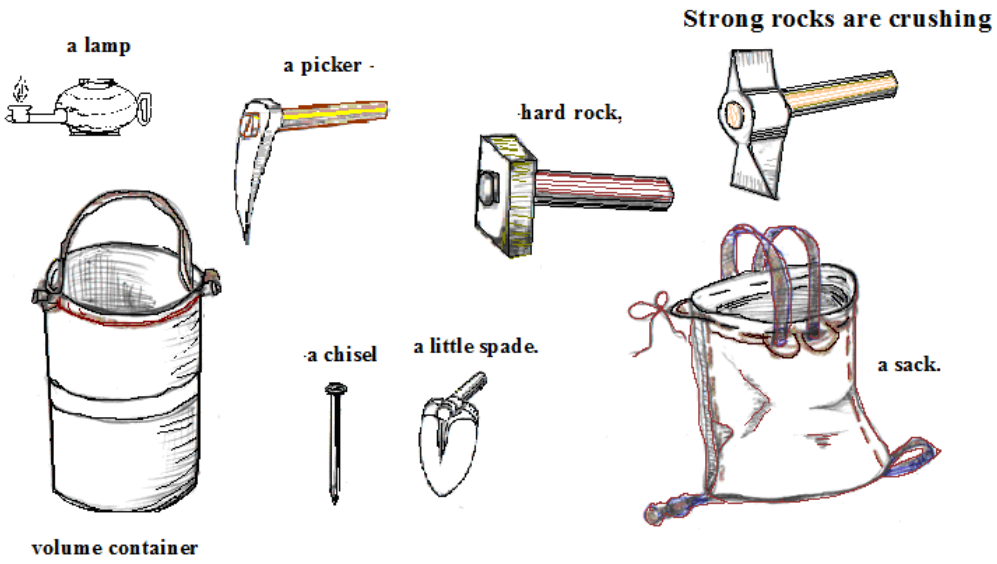
Majority of the tools used in restoration of ganats are primitive hand tools from ancient times [x] up to now. The venerable kankans easily use these tools in restoration works. The youth hasn't an experiment and this makes a little difficulty, but they gain their object with the professional kankans' help . We must say with regret that a quantity of the kankans having an ancient experiment was 80-100 people on Nakchivan Autonomous Republic at the beginning of last century, but today they can be calculated with the fingers.

The kankan's work tools were shown in Picture 34.

Their duties and using rules are as the followings:

1. A picker. This tool is one-sided and it is prepared from a qualitative tool steel. Size is 30-45 cm. Its arm is short, weight is 3-5 kg.
2. A little spade. The Kankan's little spade differs from the ordinary household spade by its measure and form . It is smaller several times than the ordinary spade, suken by the form, sharp-pointed, short-armed, but its handle material consists of the black pine tree.The soft rocks are drilled by it, and they filled up into the pots.

3. A chisel. This tool is used to digest the most difficult rocks ("soldering" cemented conglomerates) length is 35-45 cm. Its tip is sharp, it is prepared from tool steel. The hardest rocks are easily scattered ("gold soldering", "kepir" layer) by it.
4. A kankan's hammer.It is used to drill hard rocks. Its handle is short. Their weight is 2-8 kg. The hammers are used to break stones in the wells and to strike on the chisel. Each professional Kankan chooses a hammer compatible for the strength of his arm.
5. Volume container. It is two-handle container resembling with the cylinder shaped pail for lifting soil in the crashed, collapsed wells. It is possible to lift the groundwater at 60-80 kg weight by the mechanisms are used.



Picture 50. Kankan work tools.

1. **A sack.** is a pouch like leather bag made from the cow skin for lifting of the drilling soil from the sewerage. This skin sack is called "dol" (sack). The man who draws a sack is called dolkesh. There are handles on the edges of the sack for catching by hands. An additional trailer fastened to the mouth part of the sack brings the sack into the wells towing in a semi- bent state from 10-15 m distance, then the sack is joined the raised upwards and emptied out of the well mouth.

2. **Kankan wheels.** Their form and measures are different.The wheels managed by the hand and foot are considered reliable.The main work is fulfilled in the ganat by the wheels.The Kankan wheel is the most responsible work tool. . The kankans go up and down into the wells by them. Extraction of the drilled soil is fulfilled by this tool. The wheel is made from black pine, and from metal in some places. At all the stages (before working) a wheel is repeatedly controlled. Regulation of its prop-axis, horizontal state is attentively realized. The safety rules are seriously followed.

3. **A rope.** In the ancient times the traction ropes, i.e. the cards were weaved by the thread of the goat's hair. Their length is from 20 m to 40m, sometimes it was more. At present the ropes prepared from the materials possessing the highest firmness are used. Today the different materials, including multiplied splint, polymer rope, steel cable (diameter 5-8) and so on are used. The ropes are previously tested under the appropriate load, and the width cut sizes are partly taken more for easily holding. . The rope is a main working part of the kankan's wheel. The rope is repeatedly tested in advance.

4. **A subsidiary rope.** The subsidiary rope is used for the kankan's security. (There is no relation of this rope with the wheel). One end of this rope is fastened to the hard tack at the mouth of the well, the other end is lowered in to the well. It is necessary to take width cut dimensions more that the Kankan can easily get out of the well when the wheel doesn't work or is damaged.

5. **Lighting system a lamp, a lantern.** In the ancient times a lamp was used to provide lighting. A lamp was used to provide lighting in the ganat bloomery. The lubricant, grease, black oil products were used as a burning product for lighting. Afterwards carbide lamp, lanterns with the different accumulator or disposable lanterns were used. The carbide lamp possesses an ability to provide better light. But it switches off quickly by incidental touching. It is dangerous during an accident time, it is difficult to breathe in the bloomery due to its narrow size. Thus, accidents can be happened under the airlessness condition. At present the most reliable electric lanterns, flashlights, hanging lantern and forms of fastened to helmets are used. The most convenient lantern which is fed from the

battery. They have an ability of continuously lighting for 6-8 hours. But their negative feature is its more size. The accumulator batteries are the harvest means which hinders the Kankan to work. There is a need for serious improvement in lighting work.

The requirements for the Kankan tools should provide the followings:

a) The drilling tools must be made out of stainless steel.

b) The arm of the tools should be short, handle must be catchy, convenient and made from hard wood;

c) The tool mustn't loose its sharpness while working in the hard rocks.

d) When the tools are damaged, they shouldn't create dangerous disturbances.

e) The tools [x] should possess a cozy feature. . They shouldn't fatigue a worker.

f) The tool heaviness must be suitable to the potency of the kankan's arm.

Materials used in ganat restoration

The local building materials are used in ganat restoration. . They consist of mountain stone, cobblestone, float stone, clay and so on.

The mountain rocks (float stones) and rabble-stone are used in building of "chala-gardan" in the soft parts of the groundwater in the wells and for "sayband" building in fastening of the bloomery to the weak horizons.

The cement-sand solution isn't used these building kinds unlike other buildings. The soil is simply used in wells building instead of the solution, but the ordinary mud taken from the bloomery is used in bloomeries building.

Float stone – is used for covering of the bloomery after the bloomeries building by the "sayband" method.The used float stones are mainly at 0, 8x0, 5 size, 5-8 cm density. They note that their composition are mainly used from sandstone without clay. Because such stones loose hardness under the humid condition.

While selecting the stones for the restoration of the ganats building, the main attention is directed on sending them to the bloomery and easily carrying and using them in the bloomery. The medium sized stones exceed for building in the bloomeries for this reason.

Safety rules in ganats drilling.

It is dangerous to perform restoration work in the sunken bloomeries of the ganats.Mixing of the above underground waters with the land waters, collapsing, sinking and etc constantly cause accidents. Sometimes a definite part of the ganat and its wells penetrates, joins the ganat bloomeries by the indirect way again and they think that the ganat is active.In fact the ganat action stopped and it has long been in emergency.The water running into the ganat can be partially less or somewhat more depending on filtration features of the rocks around the bloomery.That is an extraction of water from the ganat exit doesn't approve its activity.For this purpose, performance of the following works on the ganat is considered expedient:

-Defining the sunken bloomeries state and work ability:

-Defining the wells situation and water level in them:

-Deciding for drilling a new well for an additional passage line far from it while it is difficult to clean the collapsing wells:

-Organizing the fastening work in the places where collapse and sinking can be happened:

-To constantly communicate between the Kankan working underground with the man on land surface:

-Seriously obeying the safety rules in soil-ground waters carrying:

-Fastening the lamps to the relevant place to achieve the correct positioning of the light system.

-to follow the safety rules seriously while using from new technique;

-to receive an order from below during lifting and lowering of loads;

-prohibiting to stand at the bottom of the well during lifting of loads;

-to perform fastening work in the bloomeries for the collapsing danger;

The kankans feel the ground firmness in initial contact under work condition. They immediately know firmness of the rock structure and feel collapsing danger. Therefore, the evasion measures from initial wreck are fulfilled. At first the Kankan immediately provides his security, then think about fastening or countenance (sayband) work.

As a result of water swelling in the bloomeries an increase of the swelling area on the bloomery walls rises. This indicates that there is collapsing danger in the ganat bloomery. The professional Kankan can immediately notice it and takes necessary measure. Sometimes a new technology is used to exclude water from the bloomery. This time the pump is lowered into the well and the water is absorbed and extracted. Then the Kankan falls from the well and cleans the bloomery.

The restoration work of the ganat is usually started from the bottom. During the restoration, water leakage from the side and above into the bloomery in the transit zone can be one of the dangerous occasions. Such cases can happen during the irrigative waters flowing into the zones surrounded by the ganat bloomery in the villages, but it can be occurred as a result of wrecks in water lines and sewerages or leakages in the towns. In both cases the deposits are met on the surface. At this time before the restoration work the surface waters running into the zones to the right and left from the surface level of the ganat line must be taken equal to 1, 5 times of the depth of the ganat well. For example, a depth of the well on the ganat line is 10m.

The extraordinary problems are met in the restoration work performed in suburban zones. During flowing of the sewerage waters into the ganats. It is very heavy and dangerous to work when the gases formed during the sewerage waters flowing into the ganats fill in the bloomery. Because of ignorance the cleaning work performance can be ended with tragedy in such places. Sometimes preventing from the waters from bottom of the ganat causes formation of the pressure-invaded zone. The rocks in the bloomery filled with water for a long time change the structure and can be plastic. After the water flows, these rocks are inclined to collapsing because of heaviness and plasticity.

Therefore it is strictly prohibited to perform cleaning work in the bloomery without water and wells.

The countenance (sayband) work must be directly performed in fastening restoration work without ceiling and side fastening operations. . Generally, the kankabashi must have control in the (canvas) dangerous place of the restoration work. The danger of the pressure water flowing from the surface area is avoided through drilling “sideways” to the sunken wells to the main bloomery.

Therefore, the professional Kankan approaches the old bloomery knows that there water is by the sound of the hammer or the examination of the rock. At this time he will bore from the bloomery bottom and make condition for gradually flowing of the water. At the same time the Kankan knows everything from the water pressure and goes towards the well and demands pulling the rope upwards. If the security measures aren’t intended the water flow kills the Kankan in the bloomery. That’s why this operation must be started with 100% success probability ratio.

The most important problem of the ganats repair is taking a prophylactic measure against any incident. Due to such carelessness the kankans have been repeatedly exposed to avalanche. The airlessness condition, in the bloomery, location of the bloomery in the deep, extension of rescue operations doesn’t even allow deliverance of the survivors. The main responsibility of the work still lies with the kankanbashi or the master. Therefore the most anticipated event in ganat repair is collapse and flooding. That’s why the prophylactic measures are important.

So work character of each ganat, a state of the bloomery and wells are separately studied. Then the necessary measures are received as the followings:

-The ganat bloomeries must be attentively controlled, the fastening work must be performed in the suspicious places;

-The Kankan must hide 70-80% of his body in the safety zone when the dangerous places are drilled: If the destruction happens, he can save himself from the avalanche:

-The Kankan and his assistant should be ready for what could happen by standing at a certain distance from each other.

-At the moment when the water leaks from above in the ganat bloomery the work should be stopped, and the fastening operation must be performed:

-While working in the watery places: the electric conductors of the applied new technology must be carefully used:

The general safety regulations should be controlled everywhere:

In ganats repair the dangerous and unique events beside the events we mentioned can happen. . These can be mainly as the followings:

-In many ganats repair the snake and scorpion bite is also happened.

-There can be charcoal and carbon dioxide, in the ganat.

-These gases paralyze the brain and respiratory tract and the person who meets an accident can't produce a sound.

In such case the salutary with the respirator goes down and draw the victim off. The other people who saw the victim must wear respirator, too. Otherwise they can stay there.

Therefore, the control measures are fulfilled before starting work in such place. In ancient times this situation was known by the lamp sooting or its completely turning off. It is advisable to use artificial ventilatin beforehand when entering such bloomeries. The artificial respiratory and initial health care should be provided gas choking, and the victim should be examined by a doctor immediately.

The walls of some wells are built with the stone.As time goes by they have been neglected, the space and back of the stones were excavated and emptied by various animals.Accidentally when touching such places the stones can roll out and down.To prevent it the well walls should be examined and there should not be a person below during the work time.

MONITORING AND RESTORATION OF THE GANATS

Essence and evaluation of the restoration work

Most of the work performed in ganats restoration is grounded on the engineering scientific principle. Therefore there is a serious need for the restoration work monitoring in an engineering direction. The work

will be completed through in transforming of the accidental places into the useful state grounding on complex engineering measures.

These measures can justify itself after the following problem solution:

-Evaluation of the well and bloomery state of the ganat which will be restored;

-Evaluation of the possibility in collapsed wells and bloomeries restoration;

-Selection of the tools and equipments which will be used in restoration work, checking the resilience and reliability;

-Advantages of the new technology and materials use in restoration work and assessment of the work which will be performed;

-Assessment of the ganat water use state (ditches, lakes);

-Organization and evaluation of the control work for the qualitative restoration performance;

The researches show that the excavation work of the new ganat is easier than the old ganat repair.

It is necessary to fulfil the followings on the ganat which will be restored for this purpose;

-Checking the stability of the collapsed wells and bloomeries before beginning to work;

-Determining the restoration possibility and safe work situation;

-Selecting the mechanism, tools and equipments used for lightening the hand labor;

-Preferring the new technology and materials in work;

-Defining the water-penetration ability of the ditches beginning from the ganat exit and cleaning the water collector lake;

-Defining the measures against filtration;

-Expert evaluation of the restoration work result. .

A main essence of the ganat restoration is provision of their bloomeries and wells cleaning and unloading of groundwater to the surface. The ganat bloomeries and wells must be wholly checked and be released from the aside sediments to liquidate the obstacles. If the Kankan can’t intervene the ganat well then he should drill a new passage well from the near place. This well is built from the bottom to the mouth

by using the stone material or concrete ring and its mouth is covered with the flagstone, or with the lid prepared from the concrete. There is a need for the necessary engineering- measure work here. Otherwise the professional Kankan is appealed.

The followings are before the work;

-Specification of the wells of which restoration is possible and selection of their private restoration methods;

-Injection of the aside passage wells and its connection to the main bloomery;

So, the sinking reasons of the ganat are investigated, an answer of the question of "why was the ganat collapsed" is specified. There is a great importance to know the ganat destruction under an influence of the antropoghenic factors.

One of the most important problems is to know a structure, physic-mechanical characters of ground waters (rocks) which surround the bloomery where the restoration work is performed.

According to the first information (on the basis of the materials collected about the neighboring wells lithology) the places where the repair is performed (in the collapsed well zones) are studied precisely and in a short time. At first the places in which the 'sayband' work will be performed in the ganat bloomery and their lengths are specified. Then the ganat restoration is put on the agenda. The followings are fulfilled in the ganat;

-Definition of the restoration work from where:

-Opening of the closed places in the bloomery:

-Drilling the new wells:

-Preparation work for the expected dangers:

-Lowering of the water level in water swelling:

An aim of the sinked bloomeries restoration is to prevent the ganat water from penetration to the other place, i. e to turn these waters to the ganat bloomery again and to extract it to the surface by its flow.

The restoration work is begun from the ganat exit.

While drilling the bloomery "monochrome" places are preserved, but "sayband" and "chalagardan" are built with the masonry in the places where there is danger of collapsing. The ganat water should run in the

bloomery. If there is no leak, the water swells and damages the bloomery, the walls and ceiling may sink from humidity.

The aside “passage well” in apart distance from the sinked wells is drilled and an operation of combining to the main bloomery is performed. A hole is opened from the bottom of the bloomery to the main well by a thin fixture and made a condition for the water to go down gradually. After the water level reduces, they expect that the water in the rocks around the water in the rocks around the bloomery to run out and not create an accident. The “chalagardan” is built at the bottom of the drilled well but the iron – concrete rings are put on the upper part.

The water flowing from side and above into the bloomery unlike nutrition zone can be one of the danger sources. Such cases can appear during the irrigative waters leakage into the zones surrounded by the ganat bloomery, in the villages, it occurs as a result of the accidents happened in water pipes or penetrations in the towns. At this time the surface waters leakage to the right and left zones is stopped before the restoration work.

10-20 m distance from the ganat pipeline to the both sides is called a free zone, any surface flows to this zone should be prevented. . After it the underground work can be started.Each ganat has a special restoration work.

There is a need for substantial control of the ganats in such places.

Sometimes the antropoghenic effects should be taken into account in some ganats action (irrigation waters and the waters penetrating from canals). . These effects can be positive and negative.Though the Aliabad ganat wasn’t repaired for more than 40 years, an expenditure didn’t reduce much, the springs created around the ganat operate. A reason is an influence of the waters penetrating from the water storage to the nutrition zone of the ganat. Presence of the ground water springs informs about an accident of the bloomery in the near distance to the exit. The bussol, theodolite, nivelir and marksheider work performance on the basis of the scientific principles is considered expedient during infliction of the new bloomeries. Lightening of the Kankan’s hand labour is a main term in ganat drilling work. Especially, an operation of the subsoil waters extraction is fulfilled at the expense of the hard labour. The ground

drilling by the primitive hand tools, pulling it from the narrow bloomery to the well mouth, lifting it from there by the wheel, release from the wheel and carrying aside aren't easy. Unfortunately, all the work is fulfilling by the ancient drilling operation.

Tool and equipment for the restoration work

Today the primitive Kankan tools, but in some places the new technologies are partly used in restoration work. Such utilization depends on local condition and restorer's economical chance.

Unlike the wheel or boring tools used from ancient times, today by using from the modern technologies such as, auto-wheel, compressors, in some places electric boring device, cranes, excavators, the ganat repair can be finished for a short time. (pic.51)

Picture 51. . The loader mechanism with the twist replacing the kankan's wheel

Recently, the wheels which work by the mechanical and electric energy are used as a result of the new technology application. Lightening the kankan's labour and extracting the hard ground are possible by such wheels. Besides it, such wheels are safe and secure. In modern wheels

the hard and stable cables prepared from steel are used. It is considered very secure in mechanical wheels managed by hand.

At present the new materials besides the traditional tools are used in ganats boring and restoration. An application of these materials accelerates building or restoration work, rises the devices stability, reduces building- restoration work value.

At present the Kankan groups use the special uniform suits and protective means in restoration and repair work of the ganats. These means protect the kankans from injury and make a chance for light and flexible motion during work. They differ from the old systems with the elasticity and other characters. There is difference in kankans' autumn – winter, and spring – summer uniform suits.

The uniforms and protective means are used:

-ordinary and warm combines;

-waterproof combines;

-fabric hats and helmets;

-rubber boots; (to the knee)

-rubber boots; (to the belt)

-rubber half-combine;

-rubber entire combines;

-ordinary fabric and rubber gloves;

-safety belts;

-respirators;

-special spectacles;

-lighting systems;

-communication means ;

-medical bag

During the restoration the kankans can meet different difficulties; Depending on specific features of the work the newest tools and equipments (compressors, water pumps, autoloader and so on) are used.But mechanisms are not allowed to stand and work on the ganat itself. A course of action should be monitored, working limits of the mechanism and their action directions should be shown to the mechanic.

Control of the restoration work quality

Checking and evaluating the fulfilled work quality before the ganat commencement is very important. Correctly realization of this work depends on exactness and quality of work and is quarantined for the further long normal activity of the ganat.

The control sequences of the carried out restoration work is as the following;

-the water expenditure must provide the project expense in the ganat of which restoration was finished; Its control is performed in the ganat exit;

-Cleaning the water flow in the exit; The water should take out from the ganat exit freely. In some places the pipes are put for easy usage of the water in the ganat exits. The whole free flow of the water in these pipes must be provided. The water swelling can't be allowed in the pipe entry. The swelled water returns and causes the water level ascension in the bloomery. This is a reason for the monochrome swells in the exit and complicates control for the ganat bloomery. In general, putting a pipe on the ganat exit isn't considered a correct variant. There should be no obstacle for the free flow of the ganat water.

The second important factor after the ganat restoration is a control for the qualitatively performing of the weak horizons which are in danger of collapsing of the wells and bloomery. The deficiencies in this work appear in the spring months and hinder for a normal activity of the ganat. Though the ganat acts with the same deficiencies for sometimes at last they will make problems. While sinking happens in the wells and bloomeries, firstly the water begins to become tubid, and then the ganat water decreases.

For this reason the places with the collapsing danger should be reflected in the documentation performed during the restoration. The fastening work performed in connection with the weak horizons are evaluated by checking a quality of the work carried out on the basis of these documents in the further controls.

The wells and bloomeries are also inflicted in the areas with the weak horizons depending on physico- mechanical features of the grounds of the zone where the ganat is situated.

The weak places which possess collapsing danger are checked after the boring and cleaning work are summarized while reviewing the bloomeries. These controls are necessary for the work bukly and calculation of the fastening materials which will be spent on.

The wells are built with the stone by the "chalagardan" building method beginning from the hard rock or the ganat bloomery. Today "chalagardan" are found in the most ganat wells and that's why they should be checked. In some places the well is built from beginning to end depending on softness of the rocks where the well is drilled.

But the rest parts are preserved unfigured in the places without collapsing danger. Generally, the mouth parts of the most wells consist of "chalagardan" building at 1,5-4.0 m height beginning from the rocks with the hard structure. At present the wells inflicted on the weak horizons are fastened by constructing of the reinforced concrete rings.

Correct perform of the building in the " chalagardan" wells, correct selection of the stones, the stones covering each other in building are important factors. At this time the deficiency is shown itself with the accident. For example, one stone not closed in the incorrect building can cause severe consequences leaving a slight touch. Depending on covering of all the stones with each other, a slight displacement causes unloading of the place of other stones.

There is a need for the qualitative preparation of the rings in reinforced – concrete rings setting. Sometimes the rings are installed after a definite height of the well. The holes are opened on the wall for the prop on the defined part, the ends of the iron props (at least 25-30 cm) are put in the same holes and concreted. The concrete rings are put on these props. . Durability and stability of the props fastened to the holes should provide a stable state for the concrete rings constructed rings run into the wells and cause accidents.

Swelling of the ganat because of water prevention, bloomery collapsing and problem of extraction from the well turns into a very painful affair.

The fastening work should be controlled on the weak horizons. The fastening work is performed by using of the ordinary stone – the two-sided sayband is built at h=1, 2 m height of its side walls, the flagstone or

concrete wads are put on the stone building. Building of these walls are performed with the special masterly and the stones are tied. . Any solution isn't used on the building itself. The stones with flat shape should be used on the walls foundation. The first stone is buried and then building is built on it. "Sayband" building durability depends on correctly tying of the stones and correctly selecting and installing the connector slab. Using the fissure and short slabs for tying should be prohibited. Otherwise it causes problems in the future.

At present the reinforced – concrete rings with the oval shape in the bloomeries are used. Their installation is economically rational and quick. These rings must be installed in the bloomery precisely. They must be unilaterally arranged and fastened with the metal wirings, then their back parts must be filled with ground in the large bloomeries.

The work quality in the restored ganat should be checked on the surface, too. An experiment indicates that certain ganat systems are damaged from the surface parts. The damages of the surface parts are: - spontaneous irrigation water, streams heavy technics, realization of the new project work, constructing roads and so on. . They hinder a normal work of the ganat, but in definite cases stops its activity. A special attention should be paid in solving the safety problems on the surface of the ganat during the control. When these measures aren't performed, the water are likely to be collected in the depressions around the well and on the bloomery (as a result of the atmospheric rainfalls or incidental flows), penetrates into the bloomeries and enters the ganat. It is firstly resulted in ganat water pollution. Then it causes humification of the well and bloomery walls, deformation and collapsing.

The following protect measures must be fulfilled:

-there shouldn't be depressions around the well. For this purpose "chalagardan" building should be lifted 0, 5 – 0, 7 m from the surface by the cement solution. The well mouth must be tightly closed. The sides of the well should be filled with soil towards sides in an inclined form;

-After the sinking and collapsing work restoration comes to an end in the blomeries, it must be fastened and smoothed on the surface. In other words, the "fish waist" inclined form must be given and the water collection must be prevented;

-If the water ditch passes on the ganat bloomery, one part of the ditch on the bloomery should be replaced by the pipe at a distance of L=hx 1, 5 m in the ganat depth.

-A free flow of the water must be provided beginning from the ganat exit; The water swelling cases by the constructed doors for the purpose of division in the exit shouldn't be allowed;

After the ganat extraction in the settlements the water usually are used in a graded from; firstly for drinking, then taking water and washing clothes. In such places drilling the hollows or creating the pools for different aims aren't acceptable from sanitary and hygienic stand point (Pic. 52).

Pic. 52. Stone ponds in the exit of the ancient ganat

The ganats bloomery is closed by the iron grille network for the animals entering in the settlements and beyond it (Pic. 53).

The problems of the ganat waters utilization differ from one to another and therefore it is impossible to create a single control system in their exploitation. An interesting state for Nakhchivan is that the ganat water of which water expenditure is little (1-3 L/c) cant reach the irrigative area. The reason is more losses and filtration along the way. 70-80% of the water in such ganats are lost and it is impossible to use of them in irrigation. The

water- collector lakes are constructed in the ganats exit in order to use from water rationally. The water gather in this lake at nights, but it is given to the plots with a great expenditure in the mornings.

Pic. 53. Protection of the ganat bloomery from outsider interference

Water transportation and control for the water utilization after the ganat exit

In the ganats where the water expenditure is more the water is directly given to the plots by the ditches.

-Infliction of the ganats must be prohibited in the nourishment zones because drilling of the subartezian wells causes the ganat drying.

-Movement of the heavy transport means on the ganat bloomery causes collapsing of the same bloomery. they must be attentively in the places where the ganat bloomery is near the surface.

Working of the bloomery under the heavy load mustn't be allowed;

-the ganat mouths should be tightly closed, and prevented from the surface flows;

-the irrigation shouldn't be performed around the ganat wells in the yard areas;

-entering the extra mixtures into the ganat water should be prevented, the sanitary norms and rules must be obeyed;

-the ganat expenditure must be controlled while exploiting: Therefore the ganat systems should be reviewed. This work is fulfilled by the community. Its main duty consists of the following;

-the regular inspections must be performed to control the ganat bloomery and wells state;

-the water expenses of the ganats should be measured and noted on the journal;

- when the ganat activity stops, it must be complexly reviewed, and a reason of the accident should be revealed;

- the water expenditure in the transit zone of the ganat must be controlled;

- change of the water level in the head well should be controlled;

Pic. 54. Artificial lake created in the exit of the ganats with the less expenditure

Safety rules in ganats restoration

The experienced people can be attracted to the ganats repair and restoration work. At the beginning of the work these people must form a group or brigade, they should train theoretically and practically.

The experienced kankans should be lowered into the ganat the bloomeries which will be restored and a state under the earth must be

evaluated. At the beginning of the work the kankans and workers' positions, work ability, understanding each other though convential means of communication should be checked once more. One of the important problems is quietly and silently leaving the bloomery during a danger of collapsing and sliding, in the recent measures the work is planned on the earth surface under the calm condition and the rescue work is fulfilled.

The structure of ground and physic-mechanical characters of the ground of which the bloomery is formed are important during the ganat restoration. The professional kankans learn it by means of the pratical habits transmission to each other, and during the training. Approximate definition of the rocks is considered slightly suitable in ganat restoration work. In advance the grounds extracted to the surface in the collapsing well zones are studied on the basis of the materials about the well lithology. Then the reasons of sinking are investigated. . There is a great importance to know ganat destruction under an influence of the antropoghenic factors.

During the restoration water flowing into the bloomery from the side and above can be one of the danger sources. Running of the irrigation water into the ganat bloomery in the villages, but accidents happening in the water pipes sewerage lines in the towns cause such dangers.

Many problems performed in restoration work are met in the suburban. That is, absence of the sewerage lines in the settlements, mixing of the waster water with the subsoil water cause pollution of the ganats which are nourished from underground water and the same sources. Using polluted waters can create an epidemic danger at every moment. Running of the waste and sewage waters into the ganat bloomeries due to carelessness can create a problem for breathing in urban. It is dangerous to work there because such state causes respiratory tract poisoning. In such places transmission of the fresh air into the bloomery by the compressor or ventilators while the restoration work is performed. At the time of pulling the ground up from the bloomery it is necessary to drill a place of concealment and protection for the person on the bottom of the well. . In ancient times

such place is called “canpana”, that is , the place where the soul takes refuge.

Durability of the wheel, fastening the bottom of the prop, rotation of the wheel over the horizontal axis, should be easy and it mustn’t transpose at the time of work. Safety precautions should be followed when lowering and lifting tools. The tools must be carried in the sack or special bag. At this time using of any string, incidental imprudence canbe resulted in an unexpected catastrophe. The outsides should not be allowed around the well. The grinder assistant must carry the bucket with caution, the hook release must be performed outside the mouth of the well. The bucket shouldn’t be allowed to be filled, because the remnant ground can be poured down if the bucket is bent over its mouth. (picture 55).

a)Dangerous ***b) safe***

Pic. 55. Performance of the work in ganat restoration- repair dangerous (a) and in low-risk pitches(b)

When tying emptied bucket to the wheel and lowering into the well, it is necessary to be attentive. The work must be performed outside the well mouth. The bucket released into the well after the hook has been calibrated for a moment in the mouth so that it does not strike. Unlike the ancient wheel and drilling tools, today’s modern uniforms, helmets, rubber boots, twist mechanisms, compressors, in some places the electric boring installation, cranes, excavators are used and the security rules must be followed. In the

work place using of only the most important and guaranteed tools, checked cable system, wheel, the responsible and attentive, people with physical strength is expedient. A special attention should be paid to rules of behavior with tools, their structure, ensuring security, preserving of the useless things and tools outside the work place.

While the mice build a nest in the “chalagardan” well, the gaps are created behind the rocks. When the work is performed in the same wells, the poisonous viper, a red shake, shahmar (kind of poisonous shake), black scorpion and other terrible animals and insects can be found. (picture 56).

Picture 56. A snake is always found in the ganat bloomeries and wells.

If accidentally the snake and scorpion sting happen the immediate first aid should be performed. That’s why the Kankan must keep a medicine bag and snake poisoned drugs next to him.

Ganat exploitation and protection. Bases of the ganat exploitation

The ganats are always treated with respect and reverence, the special rules are followed in their exploitation and protection in Azerbaijan. After the adoption of the Islam religion, in this area the Islamic rules play a main role. The population paid a special attention to the ganats, because they are considered as a symbol of purity, cleanness and holiness. Today the ganats are still exploiting with the sharia rules in some places.

The main responsibility of the ganats utilization is that they continuously provide the population with the drinkable water and irrigation water during the year. Any additional expense and energy are not required for this system utilization unlike the other systems.

The only demand of the ganat system is to follow the use rules correctly, and to perform its repair in time if it is necessary.

The ganats are mainly used with three purposes;

- with the purpose of drinkable water provision;
- with the purpose of the irrigation water provision;
- for mixed purpose;

A nourishment source of the ganats with drinkable water provision purpose is aside the village, but the ganat exit is at the entrance of the village. The experiments show that as time goes by as a result of the village expansion a definite part of the ganat falls to the settlement. The population use from the ganat with the drinkable water. The rest water is flowed to the yard areas or sowing areas aside the village by the ganat ditch.

The irrigation- ensured ganats start from the village end in the fields accidentally. Generally, these ganats are hitted aside the village – the zone with the sown areas. The water – collector lakes were usually built in front of these ganats. It doesn't need large financial means for the ganat storage in comparison with the other systems. A main factor in storage of these systems is attentiveness and interference with changes happened in system activity. For this purpose the ganats should be reviewed for the care. The followings must be resolved:

-Annual review of the ganat- Dolasov operation is regularly performed during autumn every year;

-Basic cleaning work is performed in the ganat bloomeries and wells every three years;

-Basic inspections are fulfilled in the ganat wells and bloomery every 5-10 years;

One family community or farmer economy can benefit from the ganats, depending on water amount of the ganats. The water expense of 15 ganats in Nakhchivan Autonomous Republic is by 30-110 L/c. Kalba Musa (60-80) in Nakhchivan, Aliabad village ganat (60-110), Janan bay (25-45), Boyukgol in the Shahtakti village of the Kangarli district, (25-30), River in the Khok village (100-120) and so on ganats can be shown as an example. Though most of them are registered at the expense of the municipality and used, they need a serious repair.

An exploitation of the ganats in community level is suitable for the condition of Nakhchivan AR. More than 200 ganats can be used in community farming over the Autonomous Republic. For this purpose the pass porting of the ganats must be documented on the basis of the engineering graphic the ganat plan, profile, places with Sayband and without Sayband, being in danger of collapsing or previously crashed places. The morphometric sizes and financial means of the ganats are reflected in such documents, and they make a condition for utilization, and also confirm the ganat availability as a meliorative device.

The fund is supervised by the community, and municipalities. Today “Ganat storage fund” is created in some municipality structures. The sums paid by users are collected separately, then they are spent on repair and restoration of the ganat.

According to water use laws the population of the zone pay the fee for the water they spend. The sums collecting for every irrigation provide formation of “storage fund”, Besides it, the gifts which are given by the separate philanthropists are a way of the “storage fund” of the ganats formation.

As everywhere in Azerbaijan, in Nakhchivan AR, as a result of not taking into consideration, n the ganats in land reform made a problem. According to the rule the soil plots allotted to the peasants must be given

by keeping 15-20 (according to the well depth) distance in every two directions around the ganat lines. Here the drilled wells fall to the different people's land distribution, the citizen fills the same wells, and begins to use of it by adding the ganat zone to his area because neither ganats nor protective zone are taken into account. As a result the devastation process of the ganats.

Last years the international organizations, businessmen, affordable business people, state and municipality structures are paying attention to the ganats restoration. But as most of the work consist of "amateur" principle and get out of the expert's control, their quality evaluation becomes impossible. The ganats don't possess a legal status because of absence of the applicable normative and legal documents about ganat systems up to now.

Inspections, current cleaning and service activities on the ganats

There is a great need for registration and restoration of the ganat systems on the basis of the normative and instructions. The observations show that a fate of the ganat systems depend on the following problems.

For many years neglect of the ganats and filling of the surface waters in the ganat wells and bloomeries made it useless. Therefore before the work a visual review must be performed and engineering evaluation should be fulfilled. The most important factors which influence the ganat activity on the surface are determined by the visual review:

- a state of the bloomeries and wells, predictable dangerous sources are determined in a review of the ganat underground condition.

-the safe measures are defined. The ways avoiding from any possible catastrophe state are found:

-After definition of the measures creation of a plan against the accident cases which will be happen, the compatible tools and equipments, special clothes and medical equipments are obtained.

While the ganat systems are exploited, the community must pay special attention to the ganat work and expenditure.

Review to the ganat system is fulfilled by the responsible person. It is main duty consists of the followings;

-performance of the inspections and registration about inside state of the ganat wells and bloomeries.

-control the ganat water regime;

-complex review of the ganats and at the same time elimination of deficiency;

-cleaning of the plant cover and dumps around the ganat:

-level measuring in a head well, and definition of growing turbid in the bloomery:

A special commission is created by an order of the ganats institution for inspection and review of the ganat systems in an exploitation period. This commission performs review to the ganat as the following rule:

-scheduled review:

-current review:

-catastrophe checking:

The scheduled review is performed by the meliorators, hydro - geologists, hydro -technics and other skilled specialists in the 4^{th} quarter every year. The act the inspection result is drawn up, the accidental places and repair work are shown in the act. If the basic shortages are revealed, then this is noted in the ganat passport. An aim of the current inspection is to fulfil work appeared during the scheduled review:

Random inspection is performed during the cased expecting or occurring by the constant commission created with the order of the service office for the ganats. A chairman of the standing commission must assemble the commission members within 24 hours as the recipient of information about the event and learn the happened accidents is investigated , cost of damage is calculated, the work volume, removal time and start time are determined.

The commission chairman is authorized to enter the advanced specialists the commission structure and to invite the employees from other scientific- research institutions. After the review, the commission draw up an accident act and this is considered a main document for the accident removal.

The measures intended for the additional work in the ganats can be realized in the following cases;

-a time of sediments and growing turbid in the ganat water;'

-a time of remaining the wells with the open mouth and becoming useless as a result of occurrences;

-a time when water losses increase in the transit zone of the ganat;

The conditions and characters are defined for the exploitation of the ganat. All the work is performed on the basis of the receipt and exploitation rules of the hydrogeological and meliorative control in ganat system is fulfilled in the following rule:

-Performance of the systematic observation on subsoil waters level change by the observing and piezometer wells.

-Eco-meliorative evaluation of the salt change analysis results in the soil and ground waters;

Perspective importance of the new ganats projection.

The perspective importance of the ganats is rather great. 100 years have passed from last ganat drilling and surrender (1901-1909, Kalba Musa ganat) in Azerbaijan. During the Soviet times study of projecting and restoration problems wasn't attached importance. The Ganats Institution was established in Nakhchivan AR in 2004. Only the old ganats were repaired by this organization during the last years.

The ganats speraded in the most regions of Azerbaijan and they were used as a water source. A length of their bloomeries in the plains with little inclination of Nakhchivan AR changes from 1km to 3 km, to 6 km in Samukh, this distance changes 50-400 m in the zones with more inclination.

An essence of the ganat projection is that the ganat appeared as a new scientific investigation object because of the work principle, main devices reconstruction and problems encountered of the ganat were explored.

The ganats are mainly drilled in the inclined plains. Forecasting about drilling and project of the ganat is one of the responsible works. For the project, it is necessary to begin the first exploration work. Performance of them in the following rule is considered expedient:

-On the earth surface the visual observation is performed, the geomorphological and hydrogeological condition is attentively studied, a direction of surface and underground flows is determined:

-A quantity of water in the ganat is defined by learning the thickness and mellowness of the watery layer, aeration;

-Nourishment sources and resources of the underground waters are calculated.

-The underground water regime, chemical composition of waters, roughness, compliance with sanitary and hygienic norms and so on parameters are fixed;

-An influence of the artificial and natural factors on underground water regime is evaluated;

-An ecological and economical assessment of the new ganat project is performed;

- The financial source is found for the project fulfillment.

-The ganat drilling is started by fulfilling the project work after it. At first the well drilling place is determined. Then the “gumana” well is bored. The ganat boring is guaranted when revealing the water which will provide the ganat in the “gumana” well playing a role of exploration well. A point of the ganat which will extract the surface in the future is determined taking into account the indination rielated to this depth and its depth from the surface by the water extraction. This work is fulfilled at the expense of the corresponding geodesy measurements (picture 57)

The kankans investigate an area in which the subsoil waters mostly collect according to the landscape, ground structure, plant features. At the next stage one or some wells-“gumana” well is inflicted in the investigated area. Depth of these wells is 10-40m, sometimes more depending on subsoil water waters depth. Then a direction of water extraction and an exit point are fixed. A place and boring depth of the wells which will be drilled according to the height difference and distance of the point in which” gumana” well is drilled is determined by this point, (niveliring operation). If it is necessary the changes and corrections are made depending on depth of the “gumana” well the underground passage(bloomery)and wells are drilled.

Picture 57. Geodesy-measurement work is performed on the ancient ganat wells

On a simple principle, this is based on nivelir work principle. It is a tool grounding on combined dishes law. At first the toll is made in a vertical state, then the water is filled into the pipes until water level is equal. The ring moving on the tamasalar is pulled up and down and regulated until 0-0 level of balance. That is, the level is brought to 0-0 and a constant level is fixed on other two tamasa. After it the inclination is given to the bloomer bottom. This operation can be performed on the surface.

They simplify a boring work by fixing drilling place and height of the wells with the simple niveliring operation (from middle or forward) in the places where the relief is good and work condition is easy.

When enough water is got in “gumana” well, collection of the underground water moving downwards from its surroundings is performed. For this purpose the subsoil water collecting work is fulfilled by inflicting the assistant arms in the direction of flow from the “Gumana” well. At present there is a great need for performance of this work on the basis of the modern scientific principles in order to increase the ganat expenses. (picture 58).

The water-penetration ability of the grounds often changes depending on mechanical composition in the zones where the

Nakhchivan ganats spread, According to these characters the grounds with clayey and partly heavy clayey composition can be belonged to weak water conductor, the medium clayey and loamy soil-sub soils to middle, sandy-like soil-grounds to the high filtration.

Picture 58. Concrete rings in the ganat bloomery (Iran)

For a long time the stratum called “kapir” layer among the people is formed on the watery horison in connection with the subsoil waters activity. The subsoil waters with the pure composition are available below such layer. These waters are considered very reliable water source for the ganats. Possessing high water conductivity of the grounds in such places and less coincidence to disperse clays among the particles is characteristic. It is possible to prevent the water loss filling the capillars by decreasing clayey particles with the artificial way in the grounds of the transit zone. Putting the concrete rings in the ganats with ”Sayband” building is important. This work is widely applied in Iran Islamic Republic (picture 59).

Picture 59. Lineage of the concrete rings put in the ganat bloomer

The wells make a good situation for the drilled soil extraction along with the provision of the bloomer ventilation in the ganat. Besides, it plays a role of control or observation for the boring are necessary for extraction of the drilling ground. Ground is pulled up by means of “the wheels” from the bloomery.

At present it is possible to solve the problems about the ganat with the appropriate tools and measurements. Definition of the inclination and distances is rather important by the nivelir operation or “markshaydar” during the new ganats. Inflicting creates a condition for exact results acquisition.

Lightening of the kankan’s hand labor is main objective in projecting work. Especially an operation of the extracted ground is fulfilled at the expense of the heavy human’s Labor (pic. 60, 61).

Picture 60. Mobile twist mechanism Lowering and lifting the loads into the ganat bloomery

Drilling the grounds with the primitive hand tools, pulling of them from narrow bloomer to the well mouth, lifting up wards by the wheel, release from the wheel and carrying aside aren't easy. unfortunately, all the works in the ganat restoration-repair are based on an ancient kankan's technology up to now.

Picture 61. Conrete rings preparing for the wells. (Nakhchivan)

The new technology must be applied in ganat work. At this time a rate of the work rises, and the work becomes qualitative. At present an application of the new methods in ganat works can find its solution in the following terms.

-To achieve an application of the “rib”(gabirgha) system with the modern form in their repair by restoring the old ganats on the basis of the new technology.

-Before performance of the ganats restoration by a new method the kankans must be studied on the basis of btical and practical knowledge on boring new orifile and putting new forms in there.

-The modern technologies are used for lightening the boring and load lifting work in the ganats.

-An application of the optimal variants of the lighting systems should be achieved;

-The newest technology applied in the world on boring and restoration of the ganats and progressive work experiment of the neighboring states should be used;

-During the work the air regulation in the bloomer should be achieved by applying an optimal system of the artificial ventilation.

Brief hydrogeological character of the sloping plains in Nakhchivan Autonamous Republic.

Intermountain sloping plain of Nakhchivan is situated between the south-western foothills of the little Caucasus and the Araz river. Its zone is separated into some parts differing from each other for its geological and geomorphological features. They play a leading role under the hydrogeological condition of the zone, Sadarak, Sharur, Kangarly, Boyuk duz, Nakhchivanchay, Julfa-Ordubad sloping plains enter here.

A main nourishment source of the subsoil waters: Arpachay, Nakhchivanchay, Alinjachay, Garadara, Gilanchay, Vanandchay, Ordubaychay and other small zone play a special role in rocks Lithofacies forming landscape and watery horizond of the zone, while the clayey rocks exit the surface, more dependent particles created from their weathering deteriorate soil-ground water-conductivity characters by filling in space of the gravel and sandy forming watery horizons.

The fundamental rocks in intermountain plain are alluvial, alluvial-proluvial, proluvial- delluvial , a total density of the IV period sediments is 200-220 m from Lithological standpoint with homogen origin in the plain and they consist of gravels, sandy, loamy and clay layers. The gravls are related to the debris come of the rivers and they are mostly found on their upper parts.

Density of the IV period sediments and clayey rocks rises, but large debris ones reduces towards the Araz river.

Homogen sediments spread in Kangarli plata. These sediments consist of Lithologically traumatizing, conglomerate, Limestony travertine and total density is 30-70m and they are on miosene clay.

The subsoil waters excel in the IV period sediments in all the zones of the Nakhchivan intermountain plain, but pressurized watery horizons dominate in the Sadarak and Sharur plains.

The subsoil waters are investigated everywhere in the zone. Their bed depth is 0, 5m-34m, the most shallow places are along the Araz.

The deepest areas of the level are in Kangarly plata and Julfa-Ordubad plain. The watery rocks are formed from sandy, sandy like and loamy gravels.

The watery rocks bare formed from sandy, sandy like and Loamy gravels

-gravels, in a direction of the water movement sands are replaced by the qumluca and clay arağat density increases between the layers. In Kangarly plata, travertins a density of watery rocks is 6-181 m along the zone, mostly 15-90 m. An absolute value of the level is 630-1320 m, inclination is 0, 04-0, 002.

During the water-intake-0, 15-20 l/sec. of water got from their wells, a special expenditure was 0, 01-15, 8 l/day. The filtration coefficient in the watery rocks is 0, 2-15 m/day; 26 m/day in the places: 60 m/day in çaqıl and grqavel sediments, but yhe waterconductivity coefficient reaches 3155 m^2/day and usually 100-400 m^2/day. The most watery area and the place with these high indices coincide with the central part of the plains.

The waters possess different characters over the zone. Total mineralization of subsoil waters changes by 0, 2-21 g/l and in general rises towards the Araz river.

Table 1.

Characters of the water-carrier horizons of the sloping plains in Nakhchivan AR.

Names of the sloping plains	Depth of the watery layer, m	Density of the watery layer, m	Static level stae according to the surface, m	Incliation of hydrorelief	Wells expenditure, l/day	Special expences l/day, m	Fitration coefficient of rocks, m/day	Water-conductivity of rocks m/day
Sadarak sloping plain. . Subsoil waters pressurized waters	— 30 – 100	22, 7 -121, 9 22, 7 - 95, 6	0, 9 - 20 10, 2 - 13, 33	0, 0095 - 0, 011 0, 0038 - 0, 0072	0, 4 - 6, 8 1, 6 - 38, 0	0, 06 - 4, 38 0, 8 – 5, 7	0, 2 - 20, 5 0, 8 - 57, 6 3 -15	20 -1100 40 -1940 40 - 900
Sharur sloping plain subsoil waters Pressurized waters	— 19 – 120	23 -181, 0 6, 5 - 94, 0	0, 9 - 22, 5 +0, 15 ÷ +1, 05	0, 002 - 0, 011 0, 0086	0, 2 - 13, 6 1, 8 - 14, 4	0, 02 - 6, 5 1, 2 - 7, 2	0, 2 - 22, 0 7, 2 - 15, 8	8 - 3155 100 - 400 200 -1390
Kangarly inclined plain Underground waters	—	13, 2 - 78, 5	1, 3 – 27, 5	0, 0108 - 0, 0251	0, 1 – 5, 0	0, 01 – 0, 45	0, 2 – 18, 0	3 – 644 4 - 90
Julfa-Ordubad inclined plain subsoil waters	—	11, 0 – 64, 0	4, 0 – 14, 6	0, 0105	0, 15 – 0, 8	0, 05 – 0, 7	0, 2 – 8, 8	13 – 179 13 — 50
	—	6, 0 – 20, 0	2, 0 – 30, 0	0, 006 - 0, 0176	0, 3 – 1, 7	0, 01 – 0, 7	0, 04 – 37, 0 1 — 10	1 – 145, 0 1 — 90
	—	20 – 80	2 - 34	0, 0079 - 0, 0414	0, 4 – 20, 0	0, 5 – 15, 8	0, 01 – 60, 6 1, 3 – 15, 0	1 – 2303 30 — 500

They are sweet everywhere of Kangarly plata, they possess slight mineralization in some areas. . They are sweet in the north of the Boyukduz plain. Mineralization rises in a direction of the underground flow downwards, reaches 2-5 g/l.

It is sweet in Nakhchivanchay and Jahrichay slope area, their mineralization grows in the rest areas (3-5 g/l), They rise near Nehram and Guznut villages-10-21 g/l. . This related to the high saltness of the rocks in the same zone.

With the exception of the north-west part of Julfa-Ordubad plain (here mineralization reaches 7, 2 g/l), the waters are sweet in the rest areas.

The characteristic indicators on sloping plains of the water vcarrier horisons in Nakhchivan AR are given (Table 1). A total expenditure of 356 ganats in Nakhchivan region was 2, 722 m^3/day in 1955.

Though an extraction of 85, 6 million/m^3 of subsoil. water (1955) was possible, this amount reduced till 32, 5 mln. m^3 (2008) at the end of the centure, on average 53, 1 mln. m^3 of subsoil water was not used, despite hundred hectares of the fertile land areas were removed from the crop rotation for the water shortage every year.

Investigation of the ganat systems on GPS technologies

GPS gives an opportunity to copy coordinates of the ganat systems to the map.

The work principle of the monitoring system in ganat systems can fulfil an operation of transmitting the information to the scientific-research or farming centers of the country and checking the ganats by fixation with GPS GARMIN etrex by means of the GPS/GLONASS satellite.

It is possible to insert the GPS information both online regime and google earth in order to take into account the irrigation canals, ditches and so on which will influence the work regime of the ganat, roads, obstacles, collapsed accidental, places, registration of the ganat wells, the information from the satellite following system.

Registration of the most important ganats in Nakchivan AR in measurement works and transmitting them on to map were realized in 2012. The consequences are reflected on the following table.

Geographical coordinates(GPS ,MUT-registration materials)of the ganat monuments and ganats assuming important significance (we may say ganats important parts) in Nakchivan AR.

Table 2

N=of GPS point	Name of the ganat	District, village	Width,N0	Length,E0	Height (from sea Level)	Expenditure,L/sec	state
1	2	3	4	5	6	7	8
1	Ancient Duzdag ganat	Kangarly Duzdag	390 16’53,9”	45014’ 53,73’’	864	t.a.	Historical monument
2	Kotuja ganat	Julfa Bananiyar	390 08’54,4”	45039’ 45,9’’	1174	0,4	t/e
3	Sanan boy ganat	Nakhchivan town	390 13’58,9”	45025’ 49,7’’	896	32	t/e
4	Aliabad ganat	Nakhchivan town	390 13’52,7”	45024’ 16,5’’	903	34	t/e
5	Huseyngulu ganat	Kangarli Givrag	390 23’58,3”	45006’31,7’’	908	0,3	t/e
6	Shahmammad spring	Givrag	39021’11,6’’	45006’29,1’’	893	4,1	Repaired

1	2	3	4	5	6	7	8
7	Kalba Alakbar ganat	ivrag	39024’20,9’	45006’24,5’’	891	6	Repaired
8	Majid spring	Givrag	39024’06’’	45006’41,7’’	910	2	t/e
9	Kalba Abbas ganat	Givrag	39023’50,5’’	45006’30,5’’	891	1	t/e
10	Alakbaroglu spring	Givrag	39024’48’’	45007’18’’	929	10	Repaired
11	Tikanli Place ganat	Givrag	39023’35,5’’	45005’32,7’’	854	3	t/e
12	Kabla Mahammad ganat	Givrag	39023’36,0’’	4500,5’27,2’’	920	2	t/e
13	Kurd spring	Givrag	39024’07’’	45006’33,5’’	900	2	t/e
14	Kurdlar spring	Shahtakhti	39021’59,2’’	45005’28,5’’	832	0,5	t/e
15	Haji Gasim ganat	Kangarli shahtakhti	39022’39,5’’	45006’14,7’’	894	0,7	t/e
16	Jalilaga ganat	shahtakhti	39022’23,3’’	45006’13’’	903	1	t/e
17	Girkhpilla ganat	Shahtakhti	39022’15,5’’	45005’52,7’’	883	2	t/e
18	Agsu ganat	Kangarli Yurdchy	39024’36,18’’	45009’05,9’’	1014	38	t/e
19	Mashadi Ibrahim ganat	Yurdchy	39024’59’’	45009’55,6’’	1047	9	t/e
19a	Suleymanli ganat	Kangarli garabaghlar	39024’49,8’’	45010’4,7’’	1049	14	
20	Namaz spring	Garabaghlar	39025’39,2’’	45011’42,9’’	1169	2	t/e
21	Tolkhuj ganat	Garabaghlar	39025’21,6’’	45011’42,1’’	1149	6	t/e
22	Hajibakhshali ganat	Garabaghlar	39025’25’’	45011’50,7’’	1149	3	t/e
23	Panah spring	Garabaghlar	39025’200,2’’	45012’21,8’’	1188	6	t/e
24	Mashadi Alakbar ganat	Garabaghlar	39025’26,5’’	45012’17,7’’	1193	7	t/e
25	Almadat ganat	Garabaghlar	39025’29’’	45012’1,3’’	1181	5	t/e
26	Aghbulag ganat	Garabaghlar	39025’36,2’’	45012’52,9’’	1224	8	t/e
27	Gochagha ganat	Garabaghlar	39025’34,5’’	45013’15,6’’	1258	10	t/e
28	Agha baghi ganat	Garabaghlar	39026’12,6’’	45013’23,8’’	1355	7,4	t/e
29	Taharlilar	Garabaghlar	39026’15,5’’	45013’23,6’’	1356	5	t/e
30	Taharli-2	Garabaghlar	39026’14,8’’	45013’21,8’’	1355	5	t/e
31	Uchgoza ganat	Garabaghlar	39026’14,6’’	45013’12,6’’	1358	16	t/e
32	Asni ganat	Garabaghlar	3902631,5’’	45012’55,5’’	1405	90	t/e
33	Asni magbara ganat	Garabaghlar	3902631,4’’	45012’54,5’’	1405		
34	Mashabitan ganat	Garabaghlar	39025’21,4’’	45011’4,5’’	1115		t/e
35	Javadali ganat	Garabaghlar	39025’21,6’’	45011’4,7’’	1113	5	t/e
36	Chay ganat	Kangarly	39023’15,3’’	45010’20,7’’	1048	60	t/e
37	Haji Lake	Khok	39022’34,4’’	45009’44,2’’	1026	0,2	t/e
38	Kahriz kand	Khok	39022’1,5’’	45010’2,8’’	992	2	t/e
39	Elgolu ganat	Kangarly Sust	39021’54,5’’	45018’06,6’’	1027	0,2	collapsed
40	Soyudlu ganat	Sust	39021’53,2’’	45017’13,6’’	998		collapsed
41	Ordaknishan ganat	Kangarly, Chalkhangala	39021’39,1’’	45017’ 59’’	1022		collapsed

1	2	3	4	5	6	7	8
42	Gasimbay ganat	Kangarly Tazakand	39024’15,3’’	45017’49,6’’	1151	5	t/e
43	Ufan spring	Kangarly, Chalkhangala	39026’56’’	45016’53,2’’	1424	1	t/e
			39026’42,4’’	45016’38,2’’	1420	2	t/e
44	Gafar spring	Chalkhangala	39026’51’’	45016’36,5’’	1416	1,2	t/e
45	Badam spring	Chalkhangala	39026’46’’	45016’37’’	1417	2	t/e
46	Pandam spring	Chalkhangala	39027’09,0’’	45015’54,5’’	1467		t/e
47	Bash spring	Chalkhangala	39026’10,7’’	45015’56,6’’	1408		t/e
48	Javizdi spring	Chalkhangala	39025’36,5’’	45014’05,5’’	1310-	0,5	t/e
49	Khudabakhish Lake	Kangarly Chalkhangala	39026’07,8’’	45016’46,6’’	1348		t/e
50	Ancient ganat	Kangarly Chalkhangala	39023’36,7’’	45017’49,8’’	1116		t/e
51	Rustam bay ganat	Kangarly Tazakand	39023’58,3’’	45016’25,8’’	1165	2	t/e
52	Jamish Batan ganat	Kangarly Khinjab	39024’46,2’’	45016’22,1’’	1225	4	
53	Gara gol (black lake)	Khinjab	39023’59,3’’	45016’48,2’’	1158	0,5	Repair
54	Huseyn ganat	Khinjab	39023’51,6’’	45016’19,4’’	1146	0,3	t/e
55	El ganat	Khinjab	39023’17,5’’	45016’25,4’’	1145’’	0,8	t/e
56	Kalba Allaheran	Khinjab	39021’39,1’’	45017’59’’	1027		t/e
57	Sust ganat	Kangarly sust	37016’32,3’’	45017’23,9’’	448		t/e
58	Duzdagh ganat	Babak	39023’43’’	45030’43,5’’	1164		t/e
			39027’2,8’’	45031’46,5’’	1440		t/e
59	Salasuz ganat	Shahbuz Salasuz	39024’29,8’’	45023’19,5’’	1222		t/e
60	Badamli Kand ganat	Shahbuz Badamli	39011’36,2’’	450 41’44,1’’	1613		Trumble-down
1	2	3	4	5	6	7	8
61	Ashaghi	Shahbuz Tirkesh	39011’37,4’’	450 41’42,6’’	1622		t/e
62	Pool 1	Alinja gala	39011’43,3’’	450 41’42,1’’	1676	sulu	t/e
63	Pool 2	Alinja gala	39011’45 “	450 41’36,3’’	1704		t/e
64	Pool 3	Alinja gala	39011’36,2’’	450 41’47,2’’	1658	sulu	t/e
65	Pool 4	Alinja gala	39011’36,’’	450 41’47,4’’	1642		t/e
66	Pool 5	Alinja gala	39011’36,7’’	450 41’46,4’’	1653		t/e
67	Pool 6	Alinja gala	39011’36,9’’	450 41’46,7’’	1649		t/e
68	Pool 7	Alinja gala	39011’39,3’’	450 41’48,1’’	1680		t/e
69	Pool 8	Alinja gala	39011’40,0’’	450 41’47,6’’	1688		t/e
70	Pool 9	Alinja gala	39011’41’’	450 41’44,6’’	1670		t/e
71	Pool 10	Alinja gala	39011’39,7’’	450 41’44,8’’	1632		t/e
1	2	3	4	5	6	7	8

72	Pool 11	Alinja gala	39011’41’’	450 41’44,6’’	1670		t/e
73	Pool 12	Alinja gala	39011’39,7’’	450 41’44,8’’	1632		t/e
74	Shahabbas ganat	Julfa, shurut	39009’25,6’’	45048’463’’	1385		t/e
75	Kand ganat (village ganat)	Babak Gahab	39015’04,7’’	45030’54,5’’	1020	5	t/e
76	Kalba Oruj ganat	Gahab	39014’11,9’’	45032’33,9’’	1029	3	t/e
77	Khalil Kand ganat Well N=11	Gahab	39015’52,11’’	450 26’38,45’’	915	izi	
78	Khalil kand ganat well N=2	Gahab	39015’51,66’’	45026’ 31,8’’	914	izi	
79	Khalil kand ganat Well N=3	Gahab	39015’49,54’’	450 26’ 33,09’	920	izi	
80	Tirkesh ganat	Gahab	39024’42,08’’	45023’15,7’’	1226	0,2	
81	Tirkesh spring	Shahbuz	39012’30,7’’	45028’11,5’’	1264	0,4	t/e
82	Yukhari ganat	Shahbuz	39025’30,5’’	45028’31,3’’	1279	8	Repair
83	Orta ganat	Shahbuz	39025’09’’	45028’21,8’’	1255	14	Repair
84	Badamli ganat	Sahab Badamli	39026’59,7’’	45031’42’’	1437	8	Repair
85	Orta cheshma (spring)	Badamli	39027’3,8’’	45031’43,4’’	1434	1	t/e
86	Kand ganat	Babak Kultapa	39021’08’’	45027’59,3’’	1054		t/e
87	Baydilli ganat	Babak Sirab	39017’21,3’’	45031’26,6’’	1089	10	t/e
88	Ashaghi ganat	Sirab	39017’26,6’’	45030’27,8’’	1076	5	t/e
89	Guznut ganat	Julfa, Guznut	39007’37’’	45031’42,8’’	891	4	t/e
90	Arazin ganat	Julfa Arazin	39006’54,1’’	45034’50,2’’	948		t/e
91	Abragunus 1	Julfa Abragunus	39008’14,3’’	45038’2,03’’	1184	0.3	t/e
92	Abragunus 2	Abragunus	39007’54,3’’	45038’1,09’’	1085	2	Repair
93	Abragunus 3	Abragunus	39067’56,8’’	45038’063’’	1066	12	Repair
94	Abragunus 4	Abragunus	39007’58,3’’	45038’12,7’’	1065	3	t/e
95	Abragunus 5	Abragunus	39008’01’’	45038’25,4’’	1072	4	t/e
96	Alinja ganat	Sulfa Khanagah	39011’27,1’’	45042’11,9	1316	0,5	Repair
97	Yukhari Cheshma (spring)	Khanagah	39011’28,2’’	45042’’11’’	1321		t/e
98	Khanagah spring	Khanagah	39011’28,7’’	45042’10,4’’	1322		t/e
99	Khanagah ganat	Khanagah	39011’27’’	45042’11,7’’	1317		t/e
100	Naimi ganat	Khanagah	39011’18,6’’	45042’55,4’’	1344	1	Repair
1	2	3	4	5	6	7	8

101	Bahruz spring	Khanagah	39009’47’’	45044’43,8’’	1427	0,5	t/e
102	Gal	Julfa,Gal	39007’37,5’’	45045’15,7’’	1257	0,8	t/e
103	Gal	Well	39007’38,2’’	45045’14,7’’	1262		t/e
104	Pir ganat 1	Well	39007’25,4’’	45044022,4’’	1365	12	t/e
105	Pir ganat 2	Well	39007’26,2’’	45044’21,08’	1373		t/e
106	Garadara ganat	Well	39002’20,9’’	45044’56,8’’	933		t/e
107	Gara Kol ganat	Julfa Diza	39001’4,7’’	45044’50,2’’	884	20	Repaired
108	Yurdchu ganat	Kangarly	39024’03’’	45007’54,5’’	927	4	t/e
109	Tannam Kand ganat	Sharur	39030’49,1’’	45010’29,9’’	1340	10	t/e
110	T,k,k well 1	Sharur	39°30'49.15	45°10'30.35	1340		t/e
111	T,k,k well 2	Sharur	39°30'49.18	45°10'30.72	1340		t/e
112	T,k,k well 3	Sharur	39°30'49.28	45°10'31.02	1342		t/e
113	T,k,k well 4	Sharur	39°30'49.33	45°10'31.28	1341		t/e
114	T,k,k well 5	Sharur	39°30'49.36"	45°10'31.64	1341		t/e
115	T,k,k well 6	Sharur	39°30'49.38"	45°10'32.07	1344		t/e
116	T,k,k well 7	Sharur	38°56'45.36"	45°59'11.71	1349		t/e
117	Haydarabad Spring(IH)	Sadarak					t/e
118	Sadarak ganat	Sadarak center	39043’19,8’	44052’23,4’’	855	0,8	t/e
119	Ag oglan ganat	Sadarak	39043’39,2’’	44052’21,8’’	876	0,5	t/e
120	Bulag basha	Sadarak	39043’28,5’’	44052’51,9’’	883	50	t/e
121	Damirchi ganat	Sharur	39038’26,7’’	44056’42,7’’	885	8	t/e
122	Akhura spring	Sharur	39033’29,5’’	4500,7’57,9’’	1103	20	t/e
123	Gushlu Cheshma(spring)	Ordubad Yukhari Aylis	38057’40,6’’	45058’54,5’’	1219	3	t/e
124	Gushlu Cheshma exit	Y.Aylis	38058’38.1’’	45058’53,5’’	1213	3	t/e
125	Agharra Cheshma,Yopilla	Y.Aylis	38057`42,2``	45058`55,2``	1216	0,5	t/e
126	Agharra Cheshma exit	Y.Aylis	38057`41,8``	45058`55,3``	1216		t/e
127	Gushlu Cheshma Girkhpilla	Y.Aylis	38057`42,5``	45058`56,5``	1230		t/e
128	Girkhpilla the 1st well	Y.Aylis	38057`47,3``	45058`57,6``	1215		t/e
129	The 2 nd well	Y.Aylis	38057`46,6``	45058`57,9``	1215		t/e
130	The 3rd well	Y.Aylis	38057`46``	45058`57,7``	1214		t/e
131	The 4th well	Y.Aylis	38058`45,8``	45058`57,5``	1214		t/e
132	Vang Cheshmasi	Y.Aylis	38056`44,3``	45059`25,7``	1052	4	Repaired
133	Sinag ganat	Y.Aylis	38056`44,7``	45059`13,2``	1059	7	Repaired
134	The 1st well	Y.Aylis	38056`44,9``	45059`13,1``	1062		Repaired
135	The 2 nd well	Y.Aylis	38056`45``	45059`12,8``	1061		Repaired
136	The 3rd well	Y.Aylis	38056`45``	45059``12,6``	1060		Repaired
137	The 4th well	Y.Aylis	38056,6`45,1	450			Repaired
138	The 5th well	Y.Aylis	380	450			Repaired
139	The 6 th well	Y.Aylis	380	450			Repaired
1	2	3	4	5	6	7	8

140	The 7 th well	Y.Aylis	380	450			Repaired
141	The 8th well	Y.Aylis	380	450			Repaired
142	The 9th well	Y.Aylis	380	450			Repaired
143	The 10th well	Y.Aylis	380	450			Repaired
144	The 11th well	Y.Aylis	380	450			Repaired
145	The 12th well	Y.Aylis	38056`45,9``	45059`11,2``	1059		Repaired
146	Garabagh ganat	Y.Aylis	38057`19,1``	45058`41,1``	1157	3	Repaired
147	The 1st well	Y.Aylis					Repaired
148	The 2nd well	Y.Aylis					Repaired
149	The 3rd well	Y.Aylis					Repaired
150	The 4th well	Y.Aylis					Repaired
151	Sham ganat	Y.Aylis	38057`7,6``	45058`47,4``	1124	6	Repaired
152	The 1st well	Y.Aylis	38057`0,8``	45058`44``	1220	4	Repaired
153	Amrah ganat	Ashaghi Aylis	38056`11``	45059`12,9``	989		Repaired
154	The 1st well	Ashaghi Aylis					Repaired
155	The 2nd well	Ashaghi Aylis					Repaired
156	The 3rd well	Ashaghi Aylis					Repaired
157	The 4th well	Ashaghi Aylis					Repaired
158	Dava (camel) ganat	Ashaghi Aylis					Repaired
159	Dovlat ganat	Ashaghi Aylis	38055`34,6``	45059`24,1``	918	7	Repaired
160	Well 1	Ashaghi Aylis					Repaired
161	Well 2	Ashaghi Aylis					Repaired
162	Well 3	Ashaghi Aylis					Repaired
163	Well 4	Ashaghi Aylis					Repaired
164	Aghamali	Ashaghi Aylis	38055`55,8``	45059`30``	947	2	t/e
165	Tumay ganat	Ashaghi Aylis	38055`39``	45059`34,9``	919	13	t/e
166	Gulbasar ganat	Ashaghi Aylis	38055`24,1``	45059`9,4``	884	0,5	t/e
167	Gosha gol (lake)	Ashaghi Aylis	38055`21,4``	45059`14,9``	883	5	t/e
168	Gandi ganat	Ashaghi Aylis	38055`6,5``	45059`11``	856	4	t/e
169	Ahran yeri(place)	Ashaghi Aylis	38055`4,9``	45059`23,1``	853	2	t/e
170	Sharshahar ganat	Ordubad town	38054`43,2``	46001`36,8``	926	0,5	t/e
171	Andash ganat	Ordubad town	38054`46,7``	4600,1`51,1``	947	5	t/e
172	Meydan ganat	Ordubad	38054`51,7``	4600,2`2,7``	978	8	t/e
173	Nahar ganat	Ordubad	38054`59,6``	4600,2`3,3``	1001	1,5	Repaired
174	Garahovuz ganat	Ordubad	38054`40,3``	46001`31``	899	5	Repaired
175	K.Mahammad ganat	Ordubad	38054`38,3``	4600,1`28,3``	898	0.9	Repaired
176	Madrasa ganat	Ordubad	38054`39,2``	46001`21,1``	875	4	Repaire
177	Haji Fattah ganat	Ordubad	38054`58,3``	4600,1`21``	942	4	Repaire
178	Shora ganat	Ordubad	38055`14,1``	4600,1`16,2``	989	7	Repaire
179	Haji Tagi ganat	Ordubad	38054155,6``	4600,1`22,8``	958	6	t/e
180	Mammad Sadig	Ordubad	38054`28,1``	4600,1`2,8``	865	3	Repaire
181	Shai ganat	Ordubad	38054`21,6``	46001`34,5``	880	6	Repaire
182	Haji Ahmad	Ordubad	38054`18,2``	46001`41,3``	877	3	Repaire
183	Kotam kand spring	Ordubad	38053`13``	46003`12``	660		t/e
1	2	3	4	5	6	7	8

184	Kotam ganat	Ordubad,Kotam village	38053`17,0``	46003`15,4``			t/e
185	Toyanak ganat	Ordubad	38053`56,9``	46001`37,5``	829	5	Repaire
186	Vanand ganat	Ordubad Vanand	38057`29``	45055`49``	1129		
187	Aghri ganat	Ordubad	38055`28``	45055`39,5``	947	0,3	Repaire
188	Chukhur cheshma (spring)	Nakhchivan	39010`59,7``	45024`57``	840	12	t/e
189	Hajiniyyat ganat	Nakhchivan	39009`17ç9``	45028`40``	860		Works
190	Kalba Musa Ganat exit	Nakhchivan	39012`49``	45024`02,4``	889	30	t/e
191	Galandar khan ganat	Nakhchivan	39013`03,5``	45024`04,2``	876	2	Restored in 2011.
192	Mirza Badal ganat	Nakhchivan	39013`04,3``	45024`06,7``	819		Collapsed in 2009
193	Huseynali ganat	Nakhchivan	39013`09,84``	45024`43,3``	200		t/e
194	Gizlar spring	Nakhchivan	39°12'25.49	45°24'18.31	861	14	t/e
195	Sarvanlar ganat	Nakhchivan	39012`09,4``	45025`38,0``	877		t/e
196	Aghamali ganat	Nakhchivan	39012`14,43``	45024`22,2``	870		Demolished in 1968
197	Mir Huseyn cheshmasi (spring)	Nakhchivan	39012`06,1``	45024`22,2``	854	2	t/e
198	Mahmud agha cheshmasi (spring)	Nakhchivan	39011`49,9``	45024`39,9``	860	8	t/e
199	Mahmud agha cheshmasi (spring) Well-1	Nakhchivan	39°11'49.37	45°24'42.74	868		
200	Mahmud agha cheshmasi (spring) Well-2	Nakhchivan	39°11'50.01	45°24'43.38"	868		
201	Janan bay cheshmasi(spring)	Nakhchivan	39013`58,9``	45025`49,7``	896	32	t/e
202	Chukur Cheshma(spring)	Nakhchivan	39012`46``	45024`10,3``	877	0,4	t/e
203	Gadim ganat (Ancient)	Nakhchivan	39°14'45.10"	45°24'19.96"	870	2	

Morphometric measurements and expenses of the ganats in Nakhchivan A.R.

Nakhchivan AR possesses rich underground water resource (338-352 mln/m3). More than 400 ganats were drilled and one part of this resource (85-90 mln.m3) was used to take the subsoil waters by our ancestors. During the Soviet period, the ignorance for the ganats, caused their fall till 180, but the expenses raised 2-3 times.

The Ganats institution is established attached to the Agency of Melioration and Economy of Nakhchivan AR in 2004. An establishment of this institution stimulated the assessment and restoration as historical monument and reliable water source.

As a result of the fulfilled work (2001-2013) a state of the ganats utilization and a comparative analysis of their expenses and other problems in Nakchivan AR were resolved.

Half of the ganats in Nakchivan AR spread in Kangarly and Boyukduz inclined plains of Kangarly district, Nakchivan sloping plain, Julfa- Ordubad sloping plains, Julfa- Ordubad sloping plains. The information about measurement, calculation and evaluation performed on the same ganats in 1955, 1971, 2003 and 2013 was collected and analyzed by the Author.

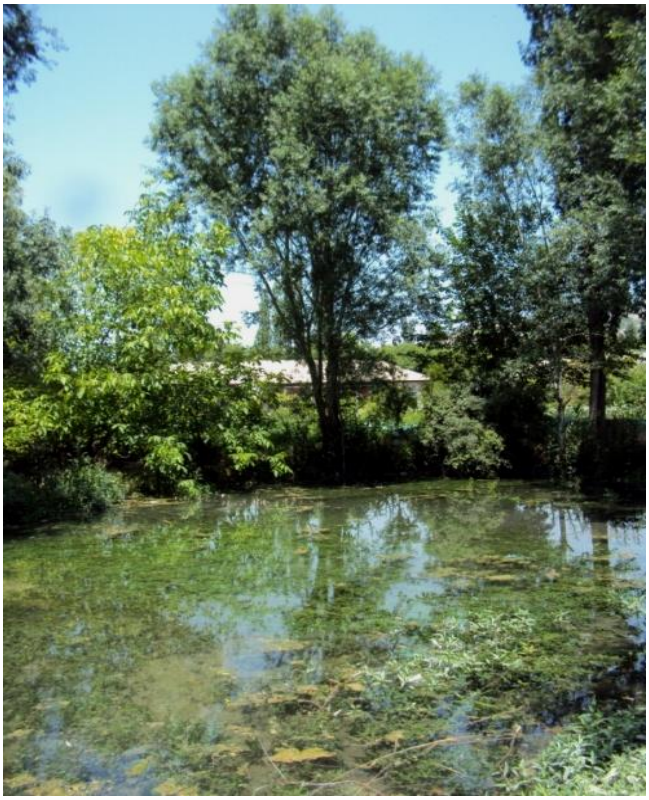
Ganats of Kangarly and Boyukduz sloping plain

The flows of 181 ganats of 1955 on Kangarly sloping plain were 772,6L/ sec, 568,2 L/sec in 1971, 377,6 l/sec in 2003, 403, 0 L/sec in 2013. 24,365, 17,918;11,91; 12,7mln. M^3 of water were taken from subsoil water resources in Kangarly sloping plain during the shown years. The comparisons show that an amount of water taken by the ganats in Kangarly sloping plain decreased for by half. At the same time more than 30 ganats were totally ruined, the rest were semi-active. (pic. 62,Table 4)

Table 4.

Measurements and expenses of the ganats on Kangarly region.

N= S	Name of the settlement	Quantity of the ganats	Length of the bloomery, m	Quantity of the wells	Expenses,L/sec.		
					1955	1971	2003
1	Garabaglar	39	8322	317	285,1	216,1	156
2	Yurdchu.v.	6	1194	43	41	33,6	22,6
3	Givrag.v.	35	17596	417	179,0	126,5	83,5
4	Shahtakti	29	3077	124	83,1	63.7	45.0
5	Khok.v	13	4821	164	187,2	131,9	69,5
6	Chalkhangala	36	5793	288	166,9	132,4	74,6
7	Khinjab.v	15	7774	297	63,7	42,0	7,1
8	Tazakand.v.	3	2239	81	13,6	12,6	7,5
9	Sust.v Total	5	4292	138	13,8	7,0	0,5
		181	**55108**	**1869**	**1033,4**	**765,8**	**466,3**



Picture.62. A lake in the ganat exit of the Garabaglar village in Kangarly.

About 60 ganats are active in Boyukduz sloping plain. 275,0 L/sec water was taken in 1955, 209,9 L/sec in 1971, 91,8 L/sec in 2003, this is accordingly 8,672 mln. m^3 and 6,62 mln. M^3 ,2,89 mln.m^3 water annually. The population left their native village in 1974 because four ganats inactivated due to neglect in Sust village. The harvest in record number was taken from the irrigative wheat fields at the expense of 4 ganats at the beginning of the XX century. At present there are subsoil waters under these soils. The Chay ganat is one of the ganats with more water in Khok village on Kangarly region.

There is hydrometric measurement information about 150-160 L/sec of its water flow. At present the ganat provides the Khok and Boyukduz villages with the drinkable and irrigation water.

From the abandon watery ganats mention can be made of; Suleymanli ganat, Goch ALA, Uch goza Garabaghlar village, Boyuk chay, Xirda chay, Alakbaroghlu in Givrag village, Agsu in the Yurdchu

village, Bash bulag (spring), Shamaga, Hajibaba in the Chalkhangala village, Gash and so on in the Khinjab village.

Ganats in the Nakhchivan sloping plain

The ganat systems are used in 25 settlements with the Nakhchivan town in Nakhchivan sloping plain. (Table 5).

The number of the ganats was 80, the flow rate - 832,5L/sec. in the middle of the last century, but this number was 231,5 L/sec at the end of the century.

The ganats are used in irrigation of the mosques, welfare and yard areas. There is a problem in a restoration of the ganats, because of absence of the corresponding laws and instructions about the ganats in finance, and because there is no interference with the wells in the different yards.

In 1971 there were 43 ganats, the flow rate was 43,1,1 L/sec, but there were 38 and the flow rate was 231,51 L/sec in 2003.

Here the ganats expenditure and number were analogically for 50 years. That is if in the middle of the last century 26,25 mln.m^3 water was taken from subsoil plan, this number decreased till 13,59 mln.m^3 , in 1971 and 7,3 mln,m^3 in 2003.

So reduction of the ganats activity which plays a role of the natural drainage is resulted in swamping and secondary salinization in the zone.

Some of the abundant watery ganats weren't repaired for the last periods and their expenditure reduced for 2-3 times. For example, an expenditure of the Kalba Musa but today it absolutely reduced. Just as Aliabad ganat gave 110 L/sec, today it processes 30-35 L/sec. If the restoration repair work is correctly performed, its is possible to establish the previous flow rate. At present many springs created from leakage are active the around the exit of this ganat. It shows that an accident happened in the parts near the ganat exit and the bloomery collapsed.

Ganats of the sloping plain in Nakhchivan

N=	Name of the settlements	Number of ganats (at the beginning of the centure)	Ganat spheres length? m	Number of wells	1955		1971		2003	
					Number of ganats	Expenses, l/sec	Number of ganats	Expenses, l/sec	Number of ganats	Expenses, l/sec
1	Nakhchivan	28	17009	632	18	343,2	16	139	13	72,5
2	Garakhanbayli	4	2180	85	1	6,0	1	5	1	3
3	Tumbul	4	3993	116	3	51,5	3	29	3	7
4	Yamkhana	2	752	25	2	30	2	20	2	14
5	Gahab	1	746	35	1	10,6	1	8	1	4
6	Sirab	2	925	53	2	13,6	2	11,6	1	2
7	Suramalik	2	1200	48	2	18,6	2	11,6	2	6
8	Najaflı Diza	2	794	31	1	2	1	2,0	1	2
9	Kultapa	2	832	45	2	30	2	27,0	2	21
10	Yarimja	2	868	33	1	20	1	16	1	10
11	Jahri	1	345	31	1	13	collapse	0	0	0
12	Payiz	4	1597	48	4	103	4	92,4	4	47,5
13	Gulshanabad	1	557	26	1	20	1	20	1	2,0
14	Nazarabad	1	243	9	1	5	collapsed	0	0	0
15	Vaykhur	1	1156	46	1	12	1	12	1	8
16	Garachukh	2	150	4	1	2,5	1	2,5	1	2,0
17	Bulgan	1	558	19	1	11	collapsed	0	0	0
18	Tazakand	2	711	26	2	19,5	collapsed	0	0	0
19	Garagala	11	7905	282	10	111	2	14	2	11
20	Alagoz Mirza	1	225	11	1	0	collapsed	0	0	0
21	Shakarabad	1	305	13	1	2,0	1	2	1	1,5
22	Shakarabad	1	831	32	1	0	collapsed	0	0	0
23	Cheshmabasar	1	403	16	1	6	1	5	1	1,5
24	Nehran	2	1422	54		0	collapsed	0	0	0
25	Hajiniyyat	1	808	31	1	15	1	14	1	4
	Total	80	44804	1586	57	832,5	43	431,1	38	231,5

Though the Jananbay ganat extracted the surface in the north-east direction from Nakchivan town gave 45-46 L/sec, water, its exit was filled with the wastes, the water level rose above the threshold. Though it is in a neglect state, the ganat possesses 15-20 L/sec. water flow. I consider advisible to give historical information about some ganats.

“Karbalayi Musa” (Kalba Musa) ganat

One of the abundant watery ganats of Nakhchivan is Kalba Musa ganat. It was drilled by the philanthropist from Nakhchivan Karbalayi Musa. In many places of Nakchivan the ganats are called spring.

Karbalayi Musa was born in Nakhchivan in 1851. He became rich by creating farming in the soils which he took on lease at the end of the XIX century, owing to his skills and hard work and he was engaged in charity. He was one of the most famous and well- known in his native country.

According to what was said Karbalayi Musa decided to build a ganat from underground water flows near the village Shikhmammad, 3 km from Nakhchivan when he saw that the population suffer for water. In spite of the obstacles he was confidently moving toward his goal and he achieved that. The work performed at the expense of great sums begins from 1901,ends in 1909. That is , the spring begins to act. Below the spring exit a mill was built. Though drinking and washing chothes from the ganat water was moneyless, the people paid money for a quantity of the water used for yard and sowing areas.

Karbalayi Musa built stables for the poor people’s animals for a short time, sell seeds on credit for the people who were engaged to agriculture, gave water without money, in a word, gained reputation in Nakhchivan and beyond it.

The revolution began in productive period of his work in Russia, the revolution tide came to Nakhchivan. Not paying attention to the events in the country, the overthrow of the Tsar, the Bolsheviks coming to power, and even the warnings of his son in military service of Russia, he answered his loyality to the king by saying “it doesnt matter to me, not be that Russian, be another Russian”

Karbalayi Musa who was not politically educated by the time didnt evaluate the processes to that extent, bough new soil areas, expanded his farming. Not expecting the trouble of the upcoming Bolshevism Karbalayi Musa’s hope was in vain, he lost his lands, stables, cattles and wealth, but he was called “a man contrary to structure”

Karbalayi Musa who could not tolerate all injustice, was paralyzed in her old age.

At first he was taken to Yerevan, then to Tiflis for treatment. As treatment failed to produce the desired effect, he eventually returned to his native Nakchivan. Karbalayi Musa died in 1924 and was buried in the city cemetry, Karbalati Musa bequeathed that he be buried as a “deposit”

Since then his generation has been persecuated, some of them have been exiled. The grandson of today’s elder of generation Musa Musayev was exiled with his family, later moved to Ganja and gained profound respect there. Today uncle Musa (all call him so) is 80 years old. He honored his grandfather’s memory and wrote about his exile life and next rehabilitation with great effort, “Spring water is limpid, “memories about my grandfather Karbalayi Musa”.

“Chronicle of life “and so on documentary publisher books were published.

In the middle of the XX centry 3000 families used from Karbalayi Musa spring its expense is 60-90 L/sec. A lenght of the ganat is 2388, an amount of the wells is 130, depth of the deepest well is 25 m. The ganat water totally decreased in 1968-1969 yy. Because the ganat wasnt looked after in necessary level. Consequently, the repair restoration work was needed again the restoration work was performed again by deceased Yusif Nabiyev who is chairman of the Council of Ministers and the water expense of the ganat was returned to the previous limit.

In the early years of reconstruction and independence due to neglect the ganat collapsed, since 2003 the water completely decreased and its activity has stopped. As a result of stopping the ganat work the subsoil waters reached the surface in the north-east part of the town, swamping happened.

In 2007 the repair- restoration work was begun in the ganat by Chairman of the Supreme Assembly of Nakhchivan AR Talibov’s instruction. The water flow of the ganat increased till 30 L/sec. The Ganats institution performed restoration work under Agency of Melioration and water economy of Nakhchivan AR.

“Janan bay” ganat

The “Janan bay “ganat is situated in the north- esatern of Nakhchivan and it is one of the abundant watery ganats. This ganat is in

the north side of the Khatai massive. Beginning from the south of the Shikh-Mahmud village, the ganat occupies a great distance and emerge to the surface near the Khatai massive. The ganat known as Janan bay among the people was drilled by him. Janan bay is a representative of the generation called Bakhtashi. Janan bay (over time the name was distorted and was Janan bay) caused to bore this ganat in order to meet the urban people's demand for drinkable and farming water.

The ganat was built during the Soviet times. But over time it collapsed and Janan bay did the restoration and cleaning. During the ancient and mediaeval, the ganats were property of the man who built them, but after the same person died the ownership rights were transferred to the children. In the XIX centry this ganat was under the control of his predecessors. Janan bay performed restoration work in this ganat. Baktashilar built a canal which was called Baktash ditch among the people and remained in the north-eastern part of the town after the ganat was drilled. A history of the canal built in the beginning from Janan bay ganat and took the water from Bazarchay goes back to the Safavid period. Russian scientist K.N.Smirnov, who was in Nakhchivan for 30th years of the XX centry, spoke about this channel and wrote that that channel was Baktashi dervishes kept water use in their hands. One of the respectful sheikhs of the Baktashi dervishes was called Pirab- Sultan. It is assumed that Baktashilar controlled the water provision and water use in the period of saliva in Nakchivan. Likely, the Baktashi dervishes who led and controlled over the water use in Konya, paid attention to irrigation work, water use in Nakchivan, for this purpose they drilled a ganat and build a canal. Janan bay ganat of which lenght is 1067 meters, an amount of wells is 28, water flow is 25-45 liters in a second,

15-20 litres in a second in the droughty years played an important role in provision of the Nakhchivan population with water for a long time, and also widely used for farming purpose. The ganat shows half activity at present. The water of the spring nourished from 10-15 meters depth is very pure, light and useful for drinking. Absence of settlements in the zone where the water passes, and not flowing the sewage waters is one of the factors conditioning the purity of the Janan bay ganat.

Though the ganat hasn't been repaired for a long time, 15-20 L/sec water is running from an exit of the bloomery filled with water. (pic.63).

Picture 63. An exit of the Janan bay ganat

"Khan" (Kazim Garabakir pasha) ganat

The Khan ganat exits to the surface on the slope of the famous Khan hillock in the south of the town, nourishes from the ancient river-bed of the Nakhchivanchay- from the north-east of Nakhchivan.

A name of the ganat was called Khan till 1918, Kazim Garabakir till 1930, but then it was called bolshevik Samad Aghamaloghlu.

An aim of its construction was to irrigate the vineyards and sowing areas in the same zones. But then the ganat remained in the zone of the towns it grows. It is one of the longest ganats in Nakhchivan. Its lenght is 1370m, the number of the wells is 38. Depth of the deepest well was 22m, water flow was 13 litres/sec.

It is assumed that it was built in the XVII century, in the years of the 1st Shah Abbas. Filling of the stream waters into the ganat well next to the past state bank in connection with overflowing of the famous Bazarchay running from middle of the Nakchivantown in 1968, in the west side of the Iranian Consulate Office, near the Mammad's tea-house. The many initiatives were for the ganat restoration. At present restoration work is continueing on the ganat.

"Nazarabad" ganat

One of the most important ganats in the Nakhchivan region is Nazarabad ganat. It is situated in the north of Nazarabad village in the

Babak district, on the left shore of the Jahrichay. Its lenght is 741,5 meters, the numer of the wells in 29. The water of this ganat is 20 liters in a second after restoration (May 19,2008) in the sinked state.

173 families use the ganat water.

"Mahmud Agha" ganat

This ganat exits to the surface from the tough slope in the south-west crossing under the historical Nakhchivan fortress monument concering to medieval, calling Kohna fortress among the people in the south of Nakchivan.

A boring history of the ganat runs into the most ancient period. According to the historical information Mahmud agha spring was a very reliable water source in the period of Nakhchivan fortress defence. Some of its wells are in the fortress, some archeological materials which assume a historical importance in the ganat bloomery and its arms are met. We can not define a true name of the ganat. Simply we determine that a name of the ganat is related to a name of the landowner Mahmud agha who spent monet on its repair restoration.

The ganat length is 351m, the number of the wells is 17, the flow rate is 4-6 L/sec, mineralization is 0,8g/l, the content is hidrocarbonate – sulphate- natrium. It was restored in 2004. At present it is used in greeness irrigation.

"Sarvanlar" ganat

The Sarvanlar ganat nourishing from the subsoil waters at 18-22 m depth of ancient Nakhchivanchay and Bazarchay bed in the north-east part of Nakhchivan exits to the surface in the south- west of the city. The ganat length is 312 m, the number of the wells is 8, water flow is 4-6 L/sec, it is a half- active ganat. A name of the Sarvanlar ganat is assumed in connection with the Sarvanlar tribe coming from Iravan region to the Nakhchivan town.

“Aliabad” ganat

The Aliabad ganat extits to the surface above Aliabad settlement in the north-west side of the Nakhchivan town. There is no information about the ganat history. The length is 354m the number of the wells is 31, water flow is 110L/sec. Water mineralization is 0,7 g/l (1971). Water mineralization changed by 0,7 g/l and 1,5 -2,1 g/l after using from Uzunoba reservoir above the ganat nourishment zone. Increase of mineralization was at the expense of washing out of the salts from layers under stratums by its influence. At present some salty watery springs are met around the reservoir.

The ganat water is only used in irrigation and welfare. It irrigates all the yard soils of the Aliabad village with its flow (now it becomes a massive and joined the Nakhchivan town). At present the water flow of the ganat decreased to 30-32 L/sec. Many ganat water springs are met around the exit. It shows that an accident occured in the ganat bloomery of the Aliabad ganat outflies from the yard of the military part placing in a distance of 100-150 m from its exit. For a long time entering here and working was prohibited as a confidental object. In 2002- 2003 an exit part and some wells of the ganat bloomery were cleaned with help of Aliabad municipality and local philanthropists. 288 antitank mines, ball shells and other military supplies remnants are found in the cleaned bloomery and wells (picture 66, 67).

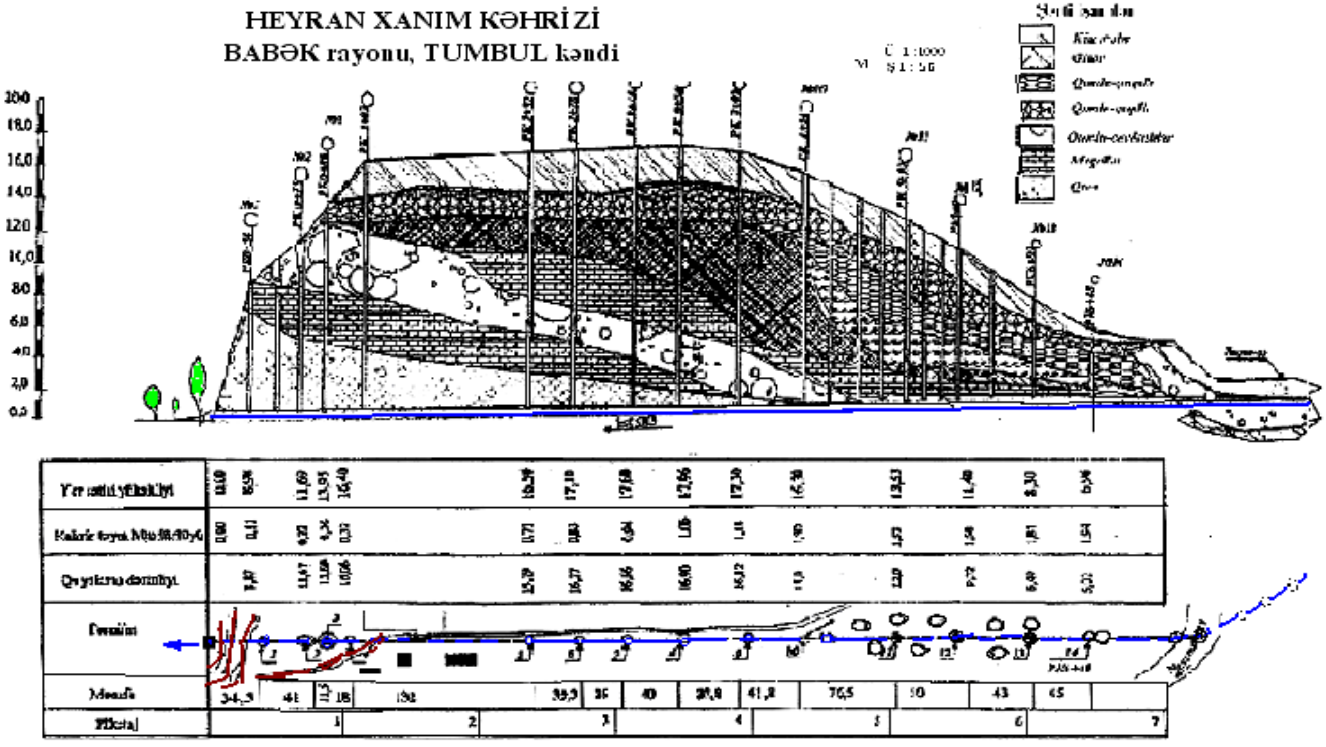
Hayran Khanum ganat

Hayran Khanum ganat nourishes from the Nakhchivanchay bed waters. It provides the population of the Tumbul village with water. In 2006-2007 it was restored by means of the international organisations. The profile of the ganat drawn on topographic bases is given in Picture 64.

Picture 64. "Heritage" from Soviet troops remained in Aliabad ganat.

Picture 65. "Explosive headlines" of the anti-tank mines extracted from the Aliabad ganat wells.(2002).

Hayran Khanum ganat
Babak district Tumbul village



Picture 66. Profile of the Hayran Khanum ganat in Tumbul village of the Babak district.

Ganats of the Ordubad sloping plains

The number of the ganats is 102, water flow 566,9 L/sec on the Ordubad region. Most of the ganats are nourished from watery layers of the debris cones in the Ordubad, Ganza, Aylis, Kotam, Kilit rivers. The flow rate of the most ganats change by 3-8 L/sec (Table 6).

Table 6.

Analysis of the measurements and expenses onthe Ordubad points.

N=	Name of the settlements	Ganats quantity	Ganats lenght,m	Ganats number	1955		1971		2003	
					Ganats number	Expenses, L/sec	Ganats number	Expenses	Ganats number	Expenses
1	Ordubad	36	16314	569	32	165	27	104	24	54
2	Yukari Aylis	15	6075	211	11	89,5	L/sec	31	12	32,9
3	Ashagi Aylis	31	12497	440	24	156,5	16	42	15	52,6
4	Anabad	3	550	18	3	32	3	30	2	20
5	Andamij	3	1970	57	3	23,5	2	15	2	12
6	Dasta	3	1668	46	3	19,4	1	10	1	4
8	Kilit	3	477	12	3	29	3	25	2	25
9	Disar	2	192	7	1	3	1	3	1	2
10	Vanand	1	1410	42	1	8	1	6	1	2
11	Nus-Nus	2	1582	52	2	18	1	15	1	4
12	AZA	1	180	6	1	4	1	4	1	4
13	Kotam	1	208	6	1	8	collapsed	0	0	0
14	Valavar	1	340	9	1	6	1	6	1	6
		1	245	8	1	5	1	5	1	4

Sum

The water flow of the ganats on 1955, 1971 and 2003 years were accordingly 566,9 L/sec, 296,0L/sec, 217,5 L/sec. Here the ganats flow decreased 2 times, the sinked ganats number reached 35.

The Ordubad town had one or some ganats at each blocks. These ganats provided the population of the block with the water. The north part of the central square in the town was ensured with the water of the Madrasa ganat.

The Mingis block of the city used from Mayramcha spring, the Angaj settlement from the Yukhari Anbaras block from Haji Mammadgulu, but the people of Ashagi Anbaras from Haji MammadSadig, Girkayag and Chol ganats. The Shora ganat in the north part of the city provided the people living around the Andamij road.

Hamam spring, as seen from the name, met the need of the population living around and bath in the Mingis block square. Some ganats which are active in the Ordubad town today attract attention in terms of economic and welfare importance.

Abbasbay spring. is one of the important ganat systems in the Ordubad town. It is called so, because Abbasbay built this spring. It concens XVIII century.

Alibay spring. This ganat in the Tabriz street of the Ordubad town was established by a person called Alibay. For this purpose it is called Alibay spring among the people.

Mayramcha ganat. This ganat in the Tabriz street of the Ordubad town got its name from the block in which it is situated.

Naharbashi ganat. It is situated in the north- east side of Ordubad, Usturlanga block, in the north 200 m from Agha square. the lenght is 545 m. – the ganats number – 18. Water flow is 2-3 L at a second in ordinary times. It concerns XVIII century. There was a mosque near it.

Sarshahar spring. It is located in the Sarshahar block of the Ordubad town, Gafar Babayev street. There are forty steps on the ganat built in the XVII century.

Shikhalikhan spring. It is situated in the Samad Vurghun street of the Ordubad town, in a personal yard. After annextion of the 1st Kalbali Khan's son to Russia, he worked as a naib in Ordubad, it is called so, as it was drilled by Shikhalikhan (Sheykhalikhan). The other ganats were built for the population's use in the Ordubad town in the XIX century.

Ganats of the Julfa sloping plain

The ganats of the Julfa region spread in debris cones of the Alinjachay and Garadara rivers. The most watery ganats of the district are Yengija (20L/sec) in Kirna village. Garagol ganats in Girizja (14L/sec) and Diza village.

Table 7

Analysis of the measurements and expenses of the ganats on blocks of the Julfa region

S.n	Name of the settlements	Ganats number	Ganat lenght,m	Wells number	1955		1971		2003	
					Ganats number	Expenses L/sec	Ganats number	Expenses L/sec	Ganats number	Expenses L/sec
1	Kirna	2	713	30	2	34	2	30	2	22
2	Bananiyar	2	336	11	2	19,5	2	14,1	2	12
3	Abragunush	2	757	26	2	15	2	11,2	2	6
4	Xacaparaq	3	851	34	3	10,5	3	8,0	1	3
5	Gal	4	197	13	4	9,5	4	7,0	4	7
6	Paradash	2	447	17	2	1,7	2	1,5	0	0
7	Shurut	2	331	15	2	4,1	2	3,5	2	3
8	Gulustan	4	3162	129	2	8,0	1	5,2	1	4,5
9	Yayji	3	2976	119	3	26,0	3	20	1	5,0
10	N.Diza	3	1707	75	2	37,6	3	10,4	3	14,0
11	Jamaldin	2	727	27	2	5,0	1	1,7	1	2,0
12	Khoshkeshin	1	348	14	1	2,5	**collapsed**	0	0	0
13	Nahajir	1	256	8	1	5	1	4	1	3
Total		**31**	**12838**	**518**	**28**	**178,4**	**26**	**116,6**	**20**	**83,5**

The water flow of the ganats (Abragunis village) nourishing from the zone under the Bananiyar water storage increased after it began to work. Whereas the repair-restoration work wasn't performed in these ganat for 40 years.

Ganats of the north parts in Nakhchivan sloping plain

These ganats nourish from the sediments of the Nakchivan river and debris cone of its arms. Their water is used for drinking and irrigating the yard areas;

The ganats of the Shahbuz region are in Badamli, Turkesh, Salasur,village Shahbuz, Mahmudova, Nurs and other villages. The bloomeries length is 2173 m, the wells number is 95. The water flow of the ganats were 70 L/sec, 49L/sec, 37 L/sec on 1955, 1971 and 2003.

Table 8.

Analysis of the measurements and expenses of the ganats in the Shahbuz region

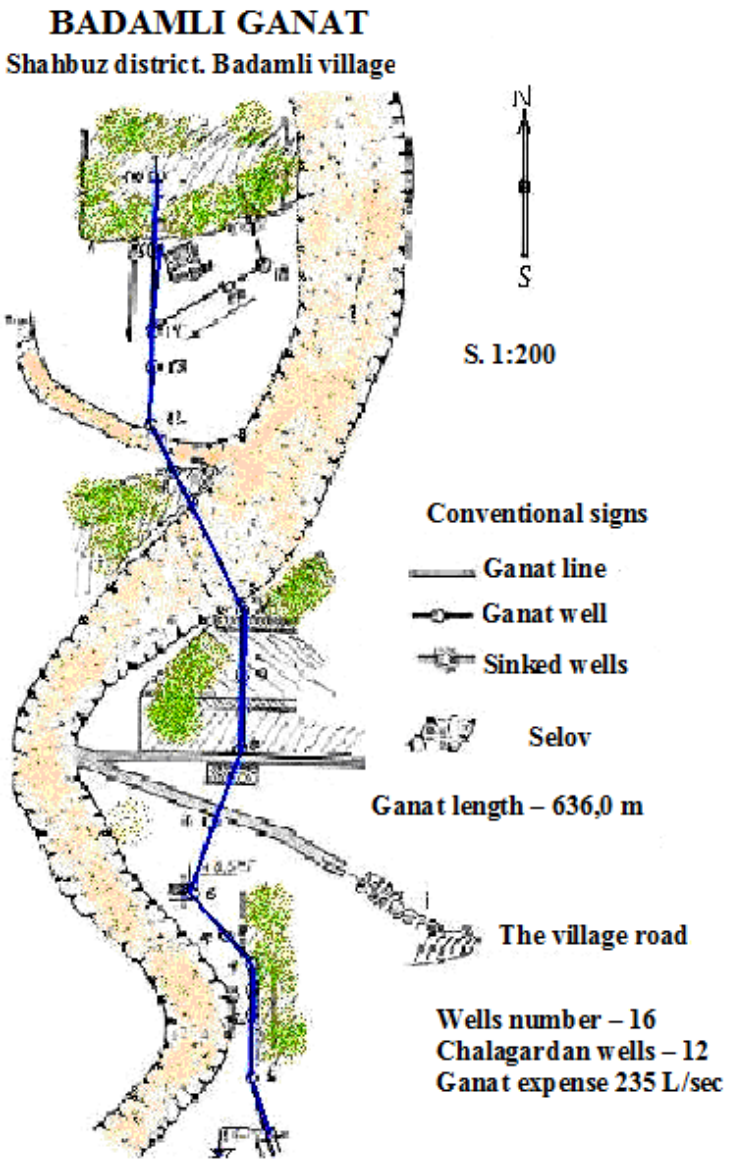
N	Name of the settlements	Name of the ganat	Bloomery length m	Wells number	Average expenses, L/sec		
					1955	1971	2003
1	Turkesh	Yukharig	60	3	1	collapsed	0
2		Yukharig	553	34	5	4	3
3	Badamlı	Ashaghig	315	13	15	8	6
4	Nurs	Yukharig	60	3	3,0	3,0	2,0
5		Ashaghig	234	6	6,0	5,0	3,0
6	Mahmudova	Village.g	150	5	3,0	collapsed	0
7	Salasuz	Village.g	60	2	4,0	3,0	3,0
8	Village Shahbuz	Ashaghig	82	4	8	6	5
9	Kolonli	Village.g	123	6	collapsed	0	0
Total			**2173**	**95**	**45,0**	**29,0**	**22,0**

As a result of the restoration work performed in the Badamli and Turkesh villages, acting here over time, but then completely sinking ganats were restored again and migrations in the villages were prevented because the population use their water for drinking and irrigation.

” Badamli “ganat

This system situating in the Badamli village of the Shabuz region and consisting of two parts is known as Gogak and Uzun ganat among the people. The ganat takes its source from the Selov valley on the upper part of the village (this zone was an empty area when the ganat was built, the wells remained in the yards as the residental houses were constructed passes from some yards, and a part of the water exits to the surface in the center of the village.

A pecularity of the ganat is that the rest part of the water from the Golak ganat continues its flow by the underground passage and exits to the surface approximately 100 m below. This ganat is longer than the other ganat in terms of distance and therefor it is called Uzun ganat. There are two wells between the Godak and Uzun ganats. A total number of the wells in this system is 15.



Picture 67. Schematic plan of the Badamli ganat in the Badamli village of the Shahbuz district.

Depth of the head well in the ganat is 32 meters. The wells depth decreases while stretching to the south. A distance between the wells is different. According to the landscape this distance changes from 10 meters to 40 meters. The walls of some wells which are likely to collapse have been built with the mountain stone. Diameter of the wells is 1-1.5 m. A mouth of some of them is covered with the flagstone.

It is assumed that this ganat was built for population's use at the time of the I Shah Abbas a ruler of Safavi in the XVII century.

Ganats in the Sharur sloping plain

The ganats were available in the villages of Pusyan, Khanliglar, Tananam, Damirchi, Tazakand, Billava, Darakand, Hamzali, Gunnut and so on. (Sharur district). But they are inactive today because some of them turned out to be useless in the middle of the XX century. The swamping and salinization processes continues in the places with the ganat. (In Pusyan and Tazakand). The negative processes continue though the collector drainage networks are used in the zone. (Picture 67, table 9).

Table 9

Analysis of the measurements and expenses of the ganats in the Sharur district

N	Name of the settlements	Name of the ganat	Length of the bloomery.m	Wells number	Average expenses, L/sec			
					1971	2003	2003	Qeyd
1	Pusyan	Nation ganat	1014	36	Collapsed	0	0	
2	Khanliglar	Nation ganat	1187	39	Collapsed	0	0	
3	Tananam	Village.g 1	73	3	6,0	6,0	5,0	
4		Village.g 2	22	2	2,0	2,0	1,0	
5		Sari-aghil	515	18	15,0	14,0	0	
6	Damirchi	Safar ganat	220	8	3,0	3,0	1,0	
7		Nation ganat.	276	9	7,5	7,0	2	
8		Movlanverdi	282	9	7,0	6	1	
9		Hasangol	45	2	0,5	0,5	0,5	
10	Tazakand	Village.g	468	18	Collapsed	0	0	
11	Billava	Village.g	226	12	Collapsed	0	0	
12	Darakand	Village.g	348	15	Collapsed	0	0	
13	Hamzali	Village.g	218	13	Collapsed	0	0	
14	Gunnut	Village.g	149	7	Collapsed	0	0	
15		K. Hasan gol	207	11	Collapsed	0	0	
Total			**5250**	**202**	**41,7**	**38,56**	**10,54**	

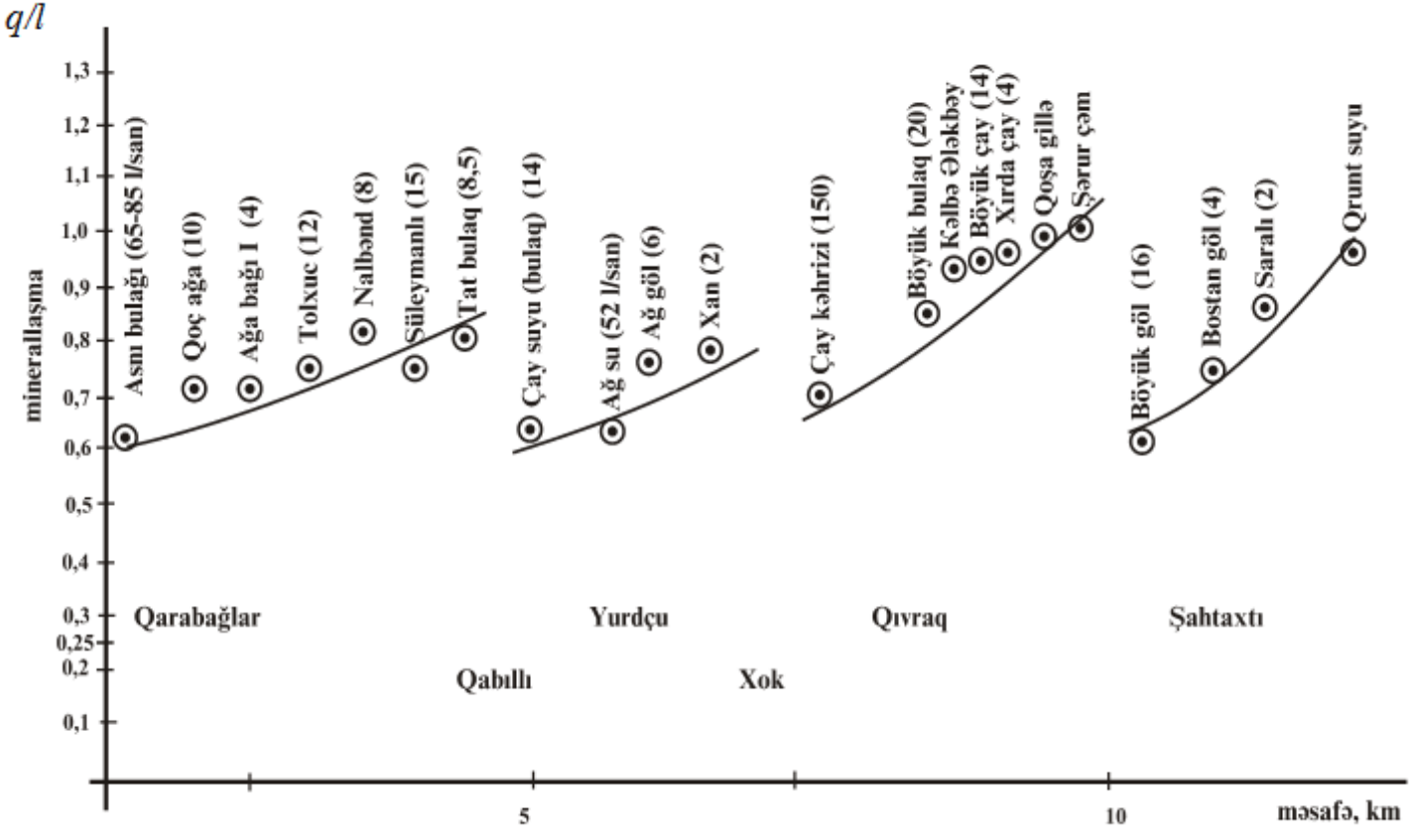
In 1955 the ganats expenditure was 41,7 / sec in 1971 – 38,56 L/sec, in 2003- 10,54 L/sec, an amount descended till 6. In the Sharur district.The ganats number reduced 3 times, the flow rate – 4 times in the Sharur region.

Chemical composition of the ganat waters

Chemical composition of the ganat waters in the Kangarli sloping plain.

The water of Asni spring and Bash spring runing from higher than Garabaghlar and Chalkhangala villages possess the least (0,43-0,6/L) mineralization degree. The waters having the most mineralization are noted in the Gosha Aghil and El golu (1,54-1,74 g/l) ganats of the Sust village. The waters coarseness is 3,8- 6,4 mg- ekv/L.

The waters composition of the wells and ganats in the yards of the Khinjab village are close to each other and mineralization changes by 0,41-1,3 g/L. A type of the waters is hydro-carbonatic- calcium – natrium and hydrocarbonate – sulphatic- chloride- calcium, downwards, i.e reaching the Duzdagh plateau increase of both mineralization degree and chlorides (Na+ K) is observed. The waters coarseness is by 3,3 – 6,4 mg –ekv/L. The mineralization degree of the waters in the Kalba Rustam and Gasim bay ganats in Tazakand is 0,92 – 1, 17 g/L and hydrocarbonatic – sulphatic calcium. The mineralization degree of the Eloglu ganat 1,6 km below it in the Sust village is 1,58 g /L and it concerns natrium –sulphate – chloride-hydrocarbonate type. The waters mineralization degree is 0,6-1,8 g/L in Kangarli and Boyukduz sloping plains a type of the most waters is hydrocarbonatic- calcium. Its reason is an extraction of waters from trias aged calcareous –travertine rocks. Mineralization of waters of the Asni,Gabilli and Shahtakhti springs vibrates by 0,4 – 0,45 g/L as it is seen in the graph which shows mineralization change of the ganat waters on the zone from the Araz spring to the Araz river of the Kangarli sloping plain. According to F. Aliyev's idea an origin of the subsoil waters in the stations concern the fissure waters exiting from the cracks between the rocks of the breaking zone. The qualitative indices of the sanitary – hygienic of the water are near the norm (pic.68)



Picture 68. Change and expenses of the mineralization in ganat waters on Kangarli sloping plain. (L/sec)

On Jahrichay valley the mineralization degree in the Payiz kand ganat is 0,39 g /L 0,43g/L in Mashadi Abbas ganat of the Jahri village, 2,45 g/L in Kalba Abbas spring. The water type in the first is hydrocarbonatic – calcium, but in the latter hydro-carbonatic- sulphatic-chloride – natrium-calcium. The coarseness is 4,2 – 23 mg.ekv/L.

The mineralization degree of the ganat waters in the Nakchivanchay Valley changes by 0,55-1.25 g/L.

The mineralization degree of the ganat waters in the Cheshmabazar,Guznut villages reaches 2,2 g/l.A type of these waters is sulphatic- hydro-carbonatic-chloride calcium-natrium. They are only used for irrigation. The coarseness is 6,8-7,2 mg-ekv/l.

At the same time change of the mineralization degree of waters by 2,6-4,5 g/l taken from Cheshmabasar and Nehram collector,open and closed drains has been determined.

The types of the drainage waters are sulphatic-chloride-natrium. The waters coarseness is 5,6-6,6 mg-ekv/l.

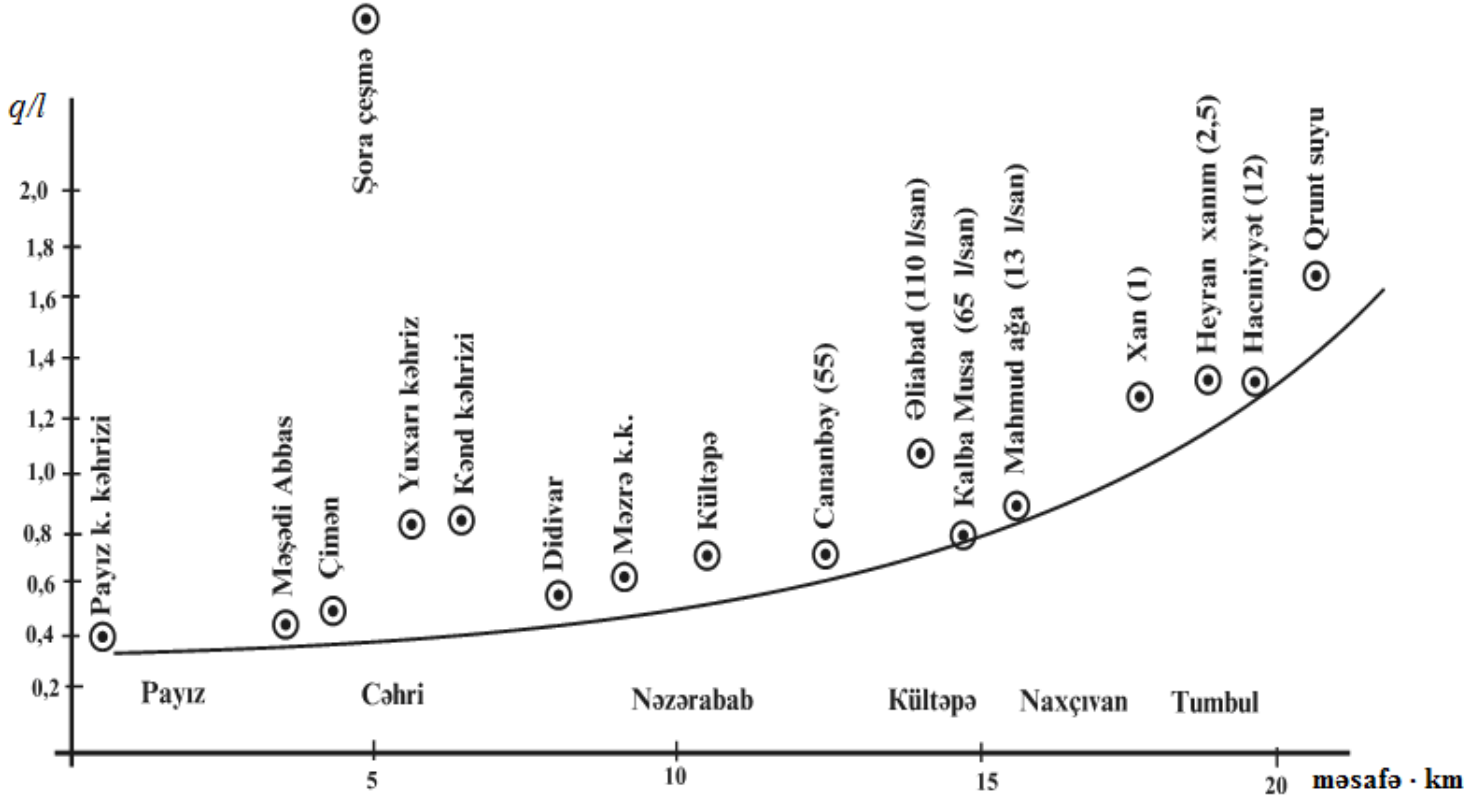
The mineralization in the ganat waters spreading along the Nakhchivanchay bed rises towards the Araz river.

The lowest mineralization in the Payiz kand ganat is (0,398 g/l),average mineralization in the Nazarabad kand ganat (0,552 g/l),but the highest mineralization in the Tumbul kand ganat (1,316 g/l) is observed near the Araz water junction.

Chemical composition of the ganat waters in the Ordubad sloping plain

The waters having the Lowest mineralization (0,2 g/l) and coarness (2,2-mg-ekv/l) are in the Ganza river of the Ordubad sloping plain. The water of this river is very soft.

The mineralization degree of the waters used in Vanand, Vlaver, Goruglar, Anabad villages of the region is 0,5-0,7 g/l, but the coarseness is 5,8-7 mg-ekv/l.



Picture 69. Mineralization change and expenses (L/sec) in the ganat waters spreading in the Nakchivanchay basin.

Sulphate ion wasn't observed in most of the water samples taken from Ordubad unlike the other regions but presence of definite quantity was noted in Andamij, Shoracheshma villages.

The mineralization degree in the Aylis village (vang garden. Uzun spring, Amrah, Chinar, Aghamali, Darevaza, Dava, Gulbasar, Gosha, Lake, Dovlat, Tumayi, Gandi, Hesar, Ahran place) rises approximately 2 times in comparison with the mineralization degree of the Yukhari Aylis ganats,but the coarseness changed 3,8-7,2 mh-ekv/l.

The mineralization degree of the shora spring under Damiryol is 1,48 g/l ,but the coarseness is 11,8 mg-ekv/l. Though the ganat waters are ecologically considered pure water, today anti-sanitary areas are found in nourishment sources.

Mineralization of the waters in Yukhari and Ashaghi Aylis ganats rises towards the Araz river. Here, the lowest mineralization is in the Nurgadah ganat (0,36-g/l)of Yukhari Aylis, but the high mineralization is in Gandi (0,73 g/l)and Hesar (0,745 g/l)ganats of the Ashaghi village(picture 70)

Here, the lowest mineralization is in the Nurgadan ganat (0,36 g/l) of Yukhari Aylis, but the high mineralization is in Gandi (0,73g/l) and Hesar (0,745 g/l) ganats of the Ashaghi village.

Chemical composition of the ganat waters in the Julfa sloping plain

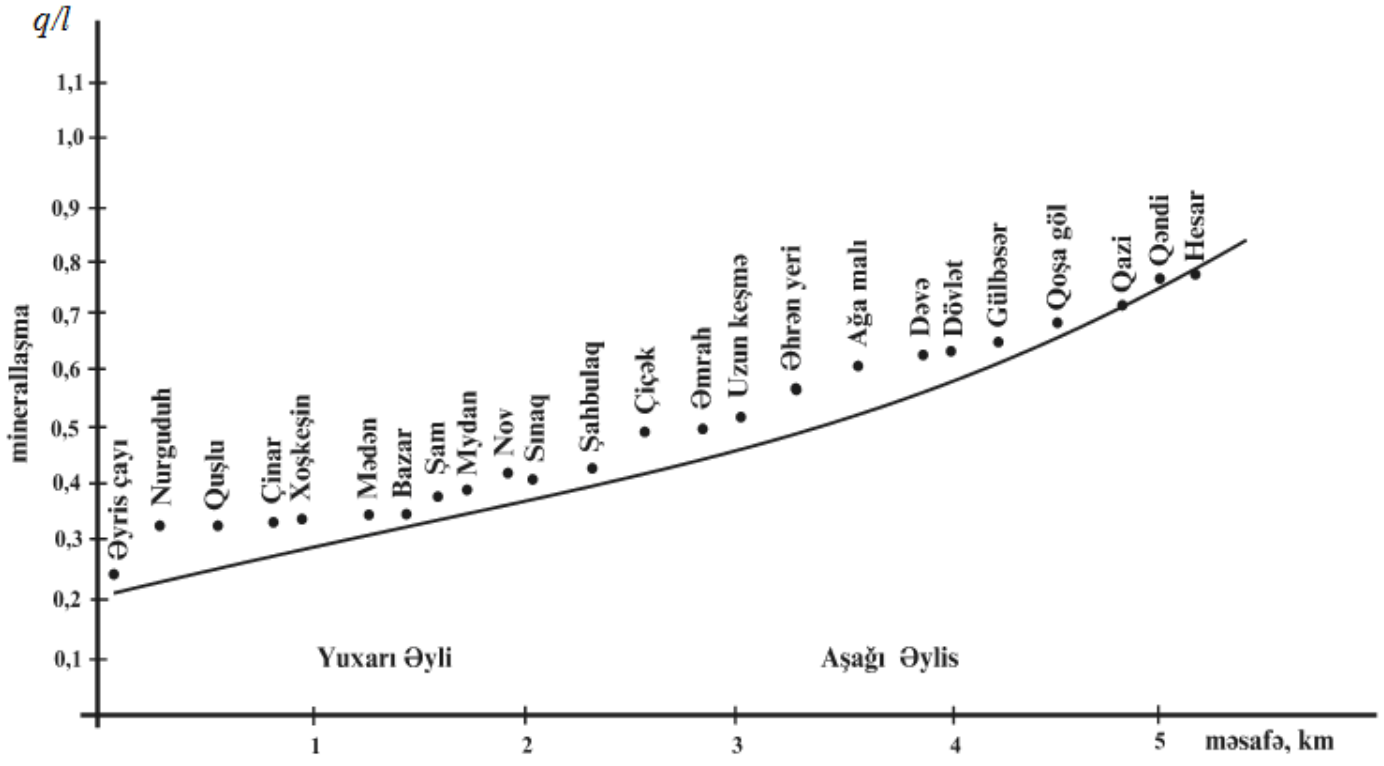
The lowest mineralization degree in the Julfa sloping plain (0,45-g/l ,coarseness-3,8-4,2 mg-ekv/l) is in the Gal and Shurut ganats. The average mineralization degree (0,8-0,96 g/l,coarseness-5,0-14,0 mg-ekv/l) is in Kirna, Abragunus, Gizilja, Jamaldin ganats. The highest mineralization is in Diza and Yayji ganats water (0,9-1,33 g/l, 7,1-8,1 mg-ekv/l). Mineralization degree of subsoil waters is 0,9-1,2 g/l, coarseness is 7,4 mg-ekv/l but the spring water mineralization is 0,5 g/l,coarseness-6,0mg-ekv/l.

Chemical composition of the ganat waters in the Sharur sloping plain

Though the ganat waters of the Damirchi and Akhura villages have average mineralization (0,7-0,8) degree there are more sulphate ions in the content, 93-95 % of the salt content of these waters is hydro-carbonates-sulphate-chloride.

The Arpachay waters under river bed possess partly lowest mineralization. Beginning from the water storages the waters under river-bed passing under the settlements gradually exposed to pollution, Aggravation of the sanitary-hygienic state of underground waters in the zone with the settlements of the Arpachay bed continues till the Araz river.

The mineralization degree of the water running from the collectors is 0,93-1,32 g/l,coarseness is 8,2-11,0 mg.ekv/l. Mineralization degree of drainage waters is 1,03-1,83 g/l coarness-5,8-7,6 mg – ekv/l.



Picture 70. Change and expenses of mineralization in the ganat waters on Ordubad sloping plain. (L/SEC).

Eco-geographic condition of the Gnaja-Gazakh and Garabagh sloping plains. Ecological condition of the Ganja-Gazakh and Garabagh sloping plains

The Ganja-Gazakh sloping plain placed from foothill zone on the north-eastern slope of the little Caucase to the right bank of the Kur river stretches in a large distance from the east to Garachay valley,from the south to Shahdagh and Murovdagh chains from the west to Injachay and Armenia, administratively it surrounds Gazakh, Aghstafa, Tovuz, Gadabay, Samukh, Dashkasan, Shamkir, Goygol, Goranboy, regions and Gabja town, these districts differ from one another for geological ands geomorphological characters.

The foothill zone is situated 400-700 m from an orthographic point of view, occupies not wide zone and characterizes by broken of the landscape to an average and strong degree. (Aliyev H.A.Mirzayev, 1979)

The erosion basis changes by 200-400m for this zone. The landscape formation condition made condition for the development of the erosion- denudation relief.

The main relief forms consist of water separators and mono-clinical tires (blocs). The water separator slopes were broken by the gorges and they widely spread and formed bed-land areas.

R.H Abdullayev and M.N. Rajabov performed precise geological researches and compiled the zone map on the north-east slope of the little Caucasus, especially among Shamkirchay Zayamchay – Asrikchay. (Akimsev V.V 1928)

The rocks spreading on the north- east slope of the little Caucasus differ with variety from petrographic and mineralogical point of view. Sh.A.Azizbayov (1947), M.A.Gashgay (1952), V.Y (1949) and others' researches show that the volcanic and sedimentary rocks of the Jurassic and Chalk Period, the sediments of the third and fourth period are superior. Depending on bed condition and weathering degree. These rocks consist of either broken weathering shell or rough gravel elluvi.

Spreading of the high clayey eluvi of the maternal rocks in whole little Caucasus was noted in M.A. Salayev's (1966,1991) researches as a result of the specific hydro thermic condition. The sedimentary rocks as crystal limestone and marl widely spread on the north-eastern slope of

the little Caucasus, Calcareous elluvi and delluvi widely spread in Ganjachay, Shamirchay basins, Gazakhk, Tovuz regions and Aghkilsachay of Gadabay. These rocks play a main soil-forming rocks role in the mountain-forest and foothill zone. Ordinary weathering outputs of lime stones are characterized by the loess signs. The loess like fractins (0,05-0,001mm) in thin parts content of the lime stone elluvi reach 30-34% of these elluvis. The stony coarse sand (7mm) in the skeleton part structure is till 50%.

Generally, the history of the antropoghenic activity on the north – eastern slope of the little Caucases is ancient, its appearances strongly display itself in landscape forms, plant cover, and also soil cover.

The Garabagh plain is situated between the foothill part of the little Caucasus and the Kur river, it is bordered. On the Kurak chay by Ganja sloping plain, but on Gargarchay by the Mil plain.

The debris cones of the rivers, the inter cone depressions, ancient river valleys, river bed depressions and so on mostly complicated a relief of the Garabagh plain.

N. Sh. Shirinov (1973) described geomorphological scheme of the plain as the following:

1) The low mountains with denudation structure:

2) The accumulative – denudation foothill zone of the alluvial-proluvial sloping plain broken to an average degree;

3) Weakly broken accumulative – proluvial plains.

The eastern end of the Garabagh chain stretches as a narrow stripe from the south by 600-1100m heights. It was represented by the chain possessing high peaks like Gusardagh (1182 m), Garamaldagh (899 m) and Chobandagh (681m). The mountains with the denudation structure are replaced by the foothill plain in the east direction.

The accumulative landscape is dominant in the foothill sloping accumulative – proluvial plain broken to an average degree.

The zone is wholly represented by the debris cones of the Gargarchay and Khachinchay, inter cones debris and alluvial and alluvial – proluvial sediments of the rivers. The higher parts of the Garabagh plain have 400-500 m height, they conform to the foothill zone. The south- east part of the plain is situated by 0-5m height, it is considered the lowest zone. The flat form of the relief was disturbed as a result of the bra-chianthlicinal uprising in a local form in the northern part.

The Garabagh plain is wholly formed from debris cones of the Injachay, Tartarchay, Khanchinchay and Gargarchay. The mashes and intermeshes depressions are found along the valley on all the cones surface.

One of the main morphological peculiarities of the district is presence of the stages with terrace on the surface structure.

In Volobuyev's opinion (1959), these stages were created as a result of the Caspian Sea transgression, and afterwards they were formed by exposing of alluvial- proluvial debris to denudation processes.

The Abrasion protrusions are noticed at 0, 20, 40-50, 90-100, 120, 140, 180, 200 and 240-260 m absolute heights on the Garabagh plain relief, according to V.R. Volobuyev and N.Sh.Shirinov this corresponds to the level of ancient Khval, Caspian and Gurgan terraces.

Proluvial –deluvial sediments are observed at the foothill part of the sloping plain. This type of sediments spreads as a narrow stripe between the Tartar and Khachinchay, The Gargarchay and Aghja- Goshum rivers of the Mil plain.

As a result of the denudation and erosion processes the soil-forming process on the low highland and slopes is represented by the clay, carbonates, sometimes loess and gypsum which are debris weathering products precipitated in the plain part of the zone. On the other hand the superficial weathering occurring on the slopes washes out the upper productive layer of the soils, precipitate them in the plain zone and aggravate the granulometric composition.

The limestone rocks of the Chalk period are met in the basin of the Tartar river. Tufogen debris is mainly coincided in a mixed form, quartz is their basis. The volcanic debris and mountain rocks are also found in the Tartarchay basin, their surface is covered with the volcanic tuff and breccia, the upper Eocene and andesite of Oligocene consist of andsite – basalt rocks.

The plain zone is wholly covered with deluvial and deluvial – proluvial rocky- gravelly calcareous loams, alluvial, mostly, salinized, clayey-loamy sediments.

The soil forming rocks of the zone is covered with the deluvial sediments of the Garabagh chain slopes and alluvial sediments of the Injachay, Tartar and Khanchinchay for their origin. The deluvial rocks

are calcareous and homogeneous for granul-metric composition, they heighten calcareous after washing to the plain zones.

Alluvial sediments stretch in a form of stripe having 300-500 m width sometimes, they can be found in the ancient valleys of the rivers besides debris cones of the Khachinchay, Tartarchay and Injachay. These sediments possess high density, they are represented by the sandy-gravelly fractions. They have variety as fragment-gravelly, silty, sandy, loamy for the structure.

A.M.Shikhlinsky (1968) separated the little Caucasus as a private climate province for the soil-plant condition. Grounding on his climate regionalization, three climate zones (sub-alp, mountain-forest and dry-steppe) and the following climate types can be divided on vertical zonality on the north-eastern slope of the little Caucasus: a climate of the sloping plains in the right bank of the Kur concerns the mild-warm semi - desert and dry fields type with the droughty winter. The mild-warm climate with the droughty winter is dominant in the middle mountainous zone (400-1500 m) and low upload zone. This climate differs its more rainfalls. (an annual amount of rainfalls forms 50-100% of the possible evaporation). The annual sum radiation is 125-130 ccal/cm ^{2} in the low and middle mountainous zone. The sum radiation rises 0,8 ccal/cm^2 at each 100 m beginning from 400-500 m from sea level, but the radiation balance reduces 1ccal/cm^2 each 100m. An annual radiation balance is 45,3-49,7 ccal/cm^2 in the middle mountainous forest zone. (Shikhlinsky,1968). The average annual temperature is 12-13*C in the foothill plain, but it changes by 11-13 *C depending on affiliation and inclination of the slopes, height of the places in low and middle mountainous zone. The coldest time of the year is December- January, the hottest time is July- August. An average temperature of January in the foothill zone is 0,7- + 1,5 *C depending on height and relief, but it is -2-6*C in the middle upland zone (1000-2000m).

The snow cover in the foothill (300-600) zones is unstable, and its average maximum density is 15-20 cm. An average maximum density of snow cover is 20cm and more at 1200-1400 m heights, but thick snow cover is characteristic above 1500 m. (Shikhlinsky,1968).

The foothill part of the Garabagh plain is characteristics with its complex climate condition.

According to Madatzade and Shikhlinsky's (1968) synoptic-climate regionalization of Azerbaijan the investigating region includes in the east and south foothill sub-region of the little Caucasus passing to the central field synoptic-climate sub-region. That is, the region is situated in cross section of which summer is dry mild hot climate types and winter is dry mild warm. An average annual temperature of the weather is 13,3 – 15,8 *C, minimum temperature is 2,1-5,1 *C in January, maximum 25,7-28,0 *C in July. An amount of the days with 10*C high temperature is 200-210 days, the temperature for this period is 4179-5295 *C. The daily amplitude of the air temperature is 9-14*C.

The radiation balance of the surface is 45,5 ccal/cm^2, its minimum index is 0,2 ccal/cm^2 in December, but maximum index is 7,9 ccal/cm^2 in June.(Shikhlinsky, 1968).

An average annual amount of the atmospheric rainfalls is 299-440 mm, maximum quantity is at the beginning of spring and summer, minimum values are in summer and winter months.

The river network relatively weak developed in the foothill, low and high upland and changed less than 0,05 km/km^2 at the foothill, 0,10-1,15 km/km^2 in the low upland 0,30- 0,60 km/km^2 in the high upland. Lithological structure of rocks, replacement of the forest plants by the sub-alp and Alpine meadows, beginning of the rocky zone and reduction of the atmospheric rainfalls absorption of flow with alluvial sediments along with decrease of the rainfall quantity in the low zone and more loss cause weak development of the river network above middle mountainous zone. The snow, underground, glacier waters participate in rivers nourishment of the zone.

In annual nourishment the spring waters are 45-46%, the snow-glacier waters are 35-36% the rain waters are 14-18%. The annual flow are unequally distributed: the greatest flow is 50-75% of the annual bulk in the spring-summer (March-June) and the least is observed (10-15%) in the winter. 45-50% of the annual flow is formed in the zone below 200m in the spring ,but 35-40% of the annual flow in the zone above 2000 m in the summer.

Generally, 50-75% of the annual flow is in the hot months, but 20-25% is in the cold months.

The Garabagh plain is characterized by the special hydrogeological condition. Here some layers of the waters in the artesian with the subsoil pressure are available. The subsoil waters played an important role in soils salinization (Garasu, ganats, wells) because of utilization in irrigation for

some centuries. The subsoil waters in the relief and deluvial zone of the region possess lower mineralization because they lay in deep layers. But their mineralization degree is higher in the plain parts because the bed depth is near the surface. In this connection under an influence of the hydrogeological factors the condition was created for salinization of the hydromorph soils and soils and soils and carbonation. Depending on chemical composition of the subsoil waters a type of soils with sulphate and sodium spread.

The main water arteries in the research zone are Tartarchay, Injachay, Khachinchay, Gargarchay and Kondalanchay, they are considered transit rivers because their Tartarchay and Kondalanchay source is seen from the Garabagh volcanic plateau (Armenia zone).

There is a close eco-biotic relation between plant and soil cover. Besides being one of the main factors of the soil-forming process the plant cover is considerable in water regime regulation, in climate condition.

At the same time it conditions an existence of the biochemical period and processes. (Prilipko, 1954) (S.A. Zakharav 1934) divides the plants into three groups for their activity in soil- forming process:

1) Tree plants (peanuts, oaks, pumpkin trees, hornbeam)
2) Bushes and half bushes (hawthorn, medlar, hips, and so on)
3) Grass

A)various meadow plants

B) steppe plants

C) rocky and mountainous

D) water and river's bank plants

The plant cover of the research object is rich. Generally, the plant sort more than 1650 spread on the north- eastern slope of the little Caucasus, and this is 41% of the plant sorts (more than 4200) in the Azerbaijan zone. The botanists separate the plants into groups depending on relief- climate unity:

1) Alpine, subalpine, mountain, steppes;
2) Forest;
3) Dry steppes;
4) Semi-desert plants

This zonality begins from semi desert- dry field zone of the plain and foothill (Prilipko, L.I.1954).

Generally, the ideas about what plant zones location between desert-semi-desert plant and forest plant of the low upland are divided. The dry field,

field plants spreading between the semi -deserts and mountain forests are considered derivate (antropoghenic) plant by some geo-botanists. At the same time simplification and complication of the plant structure happens. (Prilipko, 1954).

Dominance of the field formation (mono dominant structure) in foothill plant between Aghstafachay and Tovuzchay made a condition for shiblak antropoghenic degradation.

The dry field plant mainly spread among 250-500 m heights (till 600 m between the Ganjachay and Goranchay). Besides clean plant formation, sometimes mixed formations with different bushes and arid sparse forests are formed. One of the widely spreading from the mixed formations is Shiblak. The white grass (Stipa lessingiana S. pulcheruma), festuca sucata, are replaced by paliurus bushes. Besides lepidium draba, stipa, sp,companila caucasica, lolium, rigidum and so on are met. Paliurus bushes widely spread and xerofit grass plants develop under these shru-berries. The shru-berries aren't sensitive to the soil and climate condition for their biological and ecological characters, and therefore this rises their importance. The forests dispersing caused decrease of its biological barrier impact, this gives an opportunity for the bush and grass plants development (Prilipko, 1954).

The natural plants besides cultural plants in plant cover of the Garabagh plain (cotton, cereals, legumes, grape, mulberry, pomegranate, fruit gardens and etc.) occupy an important place.

Physico- geographical characters of the Ganja- Gazakh sloping plain

The Ganja- Gazakh region is situated in the western part of the republic, it borders on Armenia from south, and on Georgia from west. It connects Aghstafa, Dashkasan, Gazakh, Gadabay, Goranboy, Samukh, Tovuz, Goygol, Shamkir regions, administrative zones of the Ganja and Naftalan towns in itself. It occupies 12,9% of the republic zone. Its total area is 1228 731 hectares. It is one of the developed regions of the country.

The relief is mountainous and partly plain. Conditionally, a landscape of the region is divided into plain, foothill plain, middle and high mountainous zones.

The Jeyranchol massive being used as winter pastures from soil resources is situated in the sloping plain stretching from west to east. The

plain part of the zone belongs to the mild hot climate type of winter. Drought mild-warm of winter and partly drought cold climate condition of the winter exist in the most part of the mountainous zone.

Table 10.

Main climate indices of the region

N=	Metrological station	Climate indices	On seasons				Annual	Periods of the year	
			winter	spring	summer	Autumn		hot	Cold
1	Ganja	Air temperature	2,5	12,0	24,2	14,2	13,2	16,3	6,0
		Rainfall	42	91	80	69	282	175	107
		Air, relative humidity	76	69	55	72	68	60	75
		Evaporation	108	233	533	224	1097	830	267
		Soil surface temperature	3,0	16,3	31,0	16,0	16,0	26,2	6,8
2	Qazax ş.	Air temperature	2,7	16,2	22,2	7,4	12,1	19,2	5,0
		Rainfall	50	140	122	81	393	265	128
		Air, relative humidity	67	72	30	46	46	40	63
		Evaporation	75	194	413	178	860	658	202
		Soil surface temperature	1,3	14,0	28,3	15,0	15,0	23,7	5,7

Change of all the climate elements in connection with the height increase from north to south happens in the region. These changes are reflected in main climate indices of some metrological stations in the region (Table 10).

Change of the average annual temperature of air by 13,2 -6,1*C was noted in the perennial indices of the metrological stations of Ganja, Dashkasan and Ganja. In the warm period of the year an average temperature is 19,2 *C in Gazakh, but this index decreases to 12,0*C in Dashkasan. The average temperature indices change by 06-5,0 *C in these stations in the cold period of the year.

These differences are observed in temperature distribution on the seasons. This index is -28*C in the mountainous zone (Dashkasan), while an air temperature is 2,7 *C (Gazakh) in the winter. The temperature changes by 7,5*-14,2 * C in the autumn. (Dashkasan-Ganja). These changes show themselves in a quantity of the rainfalls. An amount of the annual rainfall is 282-622 mm a maximum quantity of rainfalls

(175-412 mm) is in the hot period of the year. 33-42 % of the precipitation falls in the cold period. An average annual relative humidity of the air is 46 in Gazakh, 76- in Dashkasan and 68% in Ganja, but changes 30-79% during a year. 600-1097 mm possible evaporation occurs on the surface during the year. An average temperature of the soil surface is characterized by a change + 1,3 and – 3,7 *C in the stations where the observation is performed. It occurs in the winter. The surface temperature is 26,2 *C in Ganja in a warm (April- October) period of the year but this index doesn't rise more than 15,2 *C in Dashkasan. The average annual temperature of the surface is 5,7- 6,8 *C in the plain in the cold period (November, March) but it reaches O*C in the mountainous part.

So, it is seen from the short climate character that the climate condition of the administrative regions differ from one another. This gives an opportunity to direct rational utilization of the soil resources to the continous river-bed in the same zones depending on natural condition.

The natural plant cover was preserved in a limited form because of assimilation the soil resources to a high degree. Despite this the plant cover of the zone is diverse.

The semidesert and dry steppe (field) plants dominate. The plants belonging to the grain family are planted- grown in the plain part of the zone. The ephemers and ephemeroids mainly dominate in the Jeyranchol winter pastures.

Generally, flora content of the plant cover is rather poor. The plant cover with desert type spreads in comparison with the semidesert plant cover.

The steppe plant cover is mainly formed from perennial wild grain plants on upper border of the foothill plain and middle mountainous zone.

Meliorative state of the irrigative soils in the Ganja- Gazakh sloping plain

The qualitative groups of the soils in the Ganja foothill plain made a condition for transferic dynamics strengthening downwards. Various dynamic observed in the quality group of soils shows itself in the meliorative state of the irrigative soils of the region. Here 183,3000

hectares (23,6%) of the land resources useful for agriculture consist of the irrigative soils. (Table 11) An available meliorative state of these soils is reflected in the figures.

Spreading of the subsoil waters in the irrigative soils is different for the bed depth. (pic.70). 9,5 hectares (5,2%) of the irrigative soils situated in the areas where the subsoil waters level is at depth less than 1m. Only 62,2 % (114,3 thousand hectares) of the irrigative areas in the region are distributed in the zones where the subsoil waters are at the safe depth (lower than 3,0m).

The observations show that distribution of the irrigative waters in the separate regions of the zone is different for subsoil waters depth.

Table 11.

About useful soil resources

N	Regions	Total area	Distribution of the areas for the subsoil waters depth (m)			Distribution of the areas for mineralization degree of subsoil waters g/l			Evaluation of the areas for depth and mineralization degree of subsoil		
			<1,0	1,0-3,0	<3,0.	<1,0	1,0-3,0	>3,0	Good	Satis factory	unsatisfa ctory
1	Aghstafa	22490 12,2	2205 9,8	8270 36,8	12015 53,4	12061 53,6	6715 29,9	3714 16,5	14419 64,1	3115 13,8	4956 22,0
2	Gazakh	16341 8,9	540 3,3	5888 36,0	9913 60,7	14100 86,3	2241 13,7	-	7848 48,0	5404 33,1	3089 18,9
3	Goranboy	48019 26,1	1874 39	13735 28,6	32410 67,5	13120 27,3	31419 65,4	3480 7,2	16745 34,9	25908 54,0	5366 3,9
4	Tovuz	23198 12,6	180 0,8	1722 7,4	21296 91,8	1059 4,6	21264 91,7	874 3,8	21410 93,2	155 0,7	1633 7,0
5	Goygol	10777 5,9	210 1,9	3540 32,8	7027 65,2	2502 23,2	7140 66,2	1135 10,5	4057 37,6	4083 37,9	2637 24,5
6	Shamkir	38394 20,9	1086 2,8	17278 45,0	20030 52,2	7771 20,2	27975 72,9	2648 6,9	20817 54,2	12537 32,6	5040 13,1
7	Samukh	21708 11,8	3400 15,7	7596 35,0	10712 49,3	4061 18,7	14401 66,3	3246 14,9	15659 72,1	3365 15,5	2684 12,4
8	Gadabay	908 0,5	-	-	908 100	908 100	-	-	908 100	-	-
9	Ganja	1733 0,9	-	1733 100	-	1733 100	-	-	303 17,5	1230 71,0	200 11,5
10	Naftalan	67 0,04	-	67 100	-	67 100	-	-	37 55,2	30 44,8	-
	Total	183635 12,9	9495 5,2	59829 32,6	114311 62,2	57387 31,2	111155 60,5	15098 8,2	102203 55,6	55827 30,4	25605 5,2

So, the irrigative waters with a serious salinization danger and a depth of 1,0 m with new groundwater are found in Shamakhi (3400 h), Aghstafa

(2205 h) Goranboy (1874 h) and Shamkir (1086). Decreasing the available hazardous level is the most serious meliorative problem of the region. Performing definite work in the field of the subsoil water level (less than 1,0 m) decrease in a part of the irrigative soils of the Samukh and Shamkir districts, besides fully compensating a need for irrigative water in the Ganja-Gazakh region in a State Program about social-economical development of the regions.

The irrigative soil is divided into 3 groups for a degree of the subsoil waters mineralization. The underground waters of which mineralization degree is entered the 1st group –less than 1g/l, 1-3 g/l the second group, more than 3g/l the third group. There is no danger for soil salinization in the areas with the mineralization degree of subsoil water less is than 1g/l.

Such areas occupy 31,2 % of the total irrigative soils (57,4 000h) in the region. This index changes in the irrigative soils (100%) of Gadabay, Ganja and Naftalan, but it changes by 4,6 – 86,3 % in other regions. An area of the irrigative soils with 1-3 g/l mineralization degree pf underground water is 111,2 000 hectares, this occupies an important part of the total irrigative soils of the region. Situating 10,5-16,5 % of the irrigative soils in the third group for mineralization degree of the subsoil waters in Aghstafa, Samuskh, and Goygol districts of the region, deep level of the subsoil waters show absence of meliorative condition for salinization of these zones in the near future. At present in the zones where the mineralization degree of subsoil waters in the irrigative soils is 1-3 g/l, nearness of underground water level the surface increases salinization danger. 30-92 % of irrigative soils of the region is in the zones where the mineralization degree vibrates by 1-3 g/l. At present 777,600 hectares or 42,3 of irrigative soils are salinized to a different degree (Table 12, 43-44).

13,6000 hectares (7,4%) of this consist of irrigative soils salinized to an average degree but 9,7 000 hectares (53%) – to a strong degree. Only 54,5 000(30%) hectares of the irrigative areas are weakly salinized. As it is known draining wasn't performed in the irrigative soil areas of the Ganja- Gazakh region of the republic until now. The relevant project – research work about drainage in the areas performed for the irrigative soils improvement is fulfilling in the region in the near future.

Table 12

Salinization state of the total irrigative soils on districts

N-	Regions	Total Area	Salinity degree in 0-1 m layer				
			nonsalinized	Totally salinized	Including		
					Weak	average	strong
1	2	3	4	5	6	7	8
1	Aghstafa	22490 12,2	13961 62,1	8529 37,9	3995 46,8	3906 45,8	628 7,4
2	Qazakh	16341 8,9	11710 71,7	4631 28,3	2326 50,2	2104 45,4	201 4,3
3	Goranboy	48019 26,1	22586 47,0	25438 53,0	21179 83,3	834 3,3	3420 13,4
4	Tovuz	23198 12,6	15533 67,0	7665 33,0	5891 77,0	40 0,5	1734 22,6
5	Goygol	10777 5,9	6878 63,8	3899 36,2	2619 67,2	215 5,5	1065 15,4
6	Shamkir	38394 20,9	21895 57,0	16499 43,0	12655 76,7	1809 11,0	2035 12,3
7	Samukh	21708 11,8	12409 57,2	9299 42,8	3991 43,0	4736 51,0	572 6,1
8	Gadabay	908 0,5	908 100	-	-	-	-
9	Ganja	1733 0,9	-	1733 100	1733 100	-	-
10	Naftalan	67 0,04	-	67 100	67 100	-	-
	Total	**183635** **12,9**	**105880** **57,7**	**77755** **42,3**	**54456** **70,0**	**13644** **17,5**	**9655** **12,5**

So, it is clear from the figures that the meliorative state 102,200 hectares of the irrigative soils for the subsoil waters depth and mineralization degree is good (55,6%), 55,8000 hectares (30,4%) is satisfactory and the rest 25,6 000 hectare (14%) is unsatisfactory.

Subsoil waters of the Ganja sloping plain and their use state

The Ganja sloping plain is situated in the western part of the Azerbaijan Republic. Its boundary is bordered on the Kur river from north, on the Ganjachay from east, on the little Caucassus mountains foothill from south, on Georgia from west.

The chalk and clay rock residues created from strong continental sediments participate in geological structure formation of the Ganja plain. The continental formed sediments of the layers consist of sand, clay, pebble and other rocks. These sediments consist of aluvial, deluvial and proluvial processes of many rivers, especially, the Kur river

dominate among them. Here, difference of the lithological content of the rocks is followed by some legalities. This legality shows itself in distribution of the rocks consisting of collecting river stone, rocky ground, sand, loamy and clay in the intercones depressions in the central part and debris cone of the Kur river from foothill zone. In this zone the differen geologically old layers formation was formed from fractions with the large size from above to the Kur river, rock sedimental stratums with fractions with a large size towards the depression center. The continental density consists of subsoil waters and 2 invaded water bearing layers. The south part of the palin was covered by sand, clay, loamy and river stones. In the direction to the north- east they are replaced by sands, sandy and loamy.

The bed depth of subsoil waters is 60 m and more in the south direction

The place of the subsoil water is situated in the curside zones. The underground waters are related to the surface flow waters for hydrorelief character. All the rivers of the zone towards the Kur are nourished with the underground waters. But in the zones near the Kur river the subsoil waters flow directs to the north and north- east direction.

Hydrorelief sloping decreases in the north direction from 0,013 to 0,005-0,001. The subsoil waters are sweet, calcium hydrocalcerous in the main part of the plain.

Mineralization in the Kurside part is sinificantly high. It is possible to meet whole saline waters beginning from strong salinization.

The first watercarrier layer is found at 40-1,20 m depth. Thickness of water carrier horison from central part of the debris cone in plain reaches 90-100 m. Towards the depression center in the Kur direction density of this layer reduces and becomes 10-15m. Waterpenetration of the first flooding layer is 1000-1200m^2/day in debris cone of the plain rivers.

It is 500-800 m^2/day in the west part of the cone, but 300-500m^2/day in intercones depression and 200-400 m^2/day towards the Kur. The flooding in watercarrier layers increas from the foothill to the Kur river. In this direction piezometric absolute level reduces from 250-330 to 100-200m. But the piezometric sloping decreases from 0,03 to

Table 13

Main characteristic of subsoil waters in the Ganja- Gazakh foothill plains

N	Water bearing layer	Absolute height and depth of the surface part of the well	Bed depth, m	Water saving layer power, m	Water Holding rocks	Subsoil Waters Level, m	Expense L/sec, dropping		
1	2	3	4	5	6	7	8	9	10
1/1	Flooding water bearing layer	320 / 40,0	20,9-21,4 21,31,0	0,60 9,60		2,8	4,5	0,84 / 2,93	$M_{0,7}\frac{So^4 69,7 HCO^3 9,8 CL 20,5}{Ca_{49,6}(Na+K)_{60,4} 6 Mg\, 20,8}$
1/2	Subsoil water layer	340,0 / 75,0	6,3-32,0 32,0-34,0 36,0-73,0	25,7 2,0 37,0		6,3	21,0	7,0 / 0,31	$M_{0,27}\frac{HCO^3 75,6 SO^4 16,2 CL 8,2}{Ca_{64,9} Mg_{24,1}(Na+K)_{11,0}}$
1/3	Flooding water bearing layer	220,0 / 80,0	32,0-35,0 37,0-41,0 42,0-44,0 62,0-65,0 73,0-75,0	3,0 4,0 2,0 3,0 2,0		+2,9	5,6	0,95 / 0,97	$M_{0,5}\frac{HCO^3 47,7 SO^4 36,7 CL 15,6}{(Na+K)_{52,1} Ca_{35,1} Mg_{12,8}}$
1/4	Flooding water-bearing layer	190,0 / 300,0	124,0-138,0 148,0-148,0 170,0-178,0 197,0-204,0 237,0-40,0 247,0-254,0 267,0-268,0 271,0-275,0	14, 0 1,0 8,0 7,0 3,0 7,0 1,0 4,0		+4,02	9,33	0,634 / 0,34	$M_{0,7}\frac{So^4 42,6 C 42,5 HCO^3 14,9}{(Na+K)_{60,4} Ca_{32,8} Mg_{6,8}}$
1/5	Flooding water-bearing	220,0 / 300,0	165,0-120,0 145,0-148,0 156,0-162,0 163,0-162,0 176,0-184,0 200,0-205,0 230,0-234,0	15,0 3,0 5,0 8,0 5,0 4,0 3,0		+4,95	11,1	0,605 / 0,79	$M_{0,48}\frac{So^4 49,5 C 125,7 HCO^3 24,8}{(Na+K) 2 Ca 46,8}$

1	2	3	4	5	6	7	8	9	10
II/I	Subsoil watery layer.Flooding water-bearing layer	280,0 55,0	12,5-27,0 27,0-29,0 29,0-36,0 26,0-38,0	14,5 2,0 7,0 2,0		2,5	13,0	5,14 5,67	$M_{0,45}\frac{HCO^3 66,7SO^4 26,7Cl6,6}{Ca_{50,5}Mg_{25,3}(Na+K)_{24,2}}$
1/2	Flooding water-bearing layer	290,0 60,0	17,0-20,0 22,0-25,0 36,0-44,0	3,0 3,0 8,0		13,2	2,9	0,43 0,77(1) 2,83(2)	$M_{0,7}\frac{SO^4 43,6HCO^3 39,0Cl17,4}{Ca_{63,6}Mg_{32,0}(Na+K)_{4,4}}$
1/3	Flooding water-bearing layer	220,0 50,0	36,0-40,0 44,0-47,0	4,0 3,0		7,3	17,0	4,51 18,46	$M_{0,5}\frac{HCO^3 47,7SO^4 36,7Cl15,6}{(Na+K)_{52,1}Ca_{35,1}Mg_{12,8}}$
1/1	Flooding water bearing layer	350,0 45,0	18,5-22,0 26,6-33,0	3,5 6,4		6,7	20,0	5,0 15,43	$M_{0,5}\frac{HCO^3 61,3SO^4 27,5Cl11,2}{Ca_{56}9^{Mg}26,5^{(Na+K)}{}_{16,6}}$
1/2	Flooding water- bearing layer	410,0 60,0	29,0-41,0 42,0-50,0 51,0-53,0 54,0-56,0	12,0 8,0 2,0 2,0		28,4	3,05	0,21 0,74	$M_{2,0}\frac{SO^4 69,4HCO^3 16,1Cl14,5}{Ca_{55}8(Na+K)_{23,6}{}^{Mg}20,6}$
1/3	Subsoil watery layer	290,0 96,0	33,0-35,0 52,0-53,0 60,0-63,0 67,0-69,0 75,0-81,0	 1,0 3,0 2,0 6,0		8,4	23,0	8,5 20,45	$M_{2,0}\frac{SO^4 56,4Cl33,1HCO4SO^3 10,5}{(Na+K)_{41,0}Ca_{34},Mg_{24,9}}$
4/1	Subsoil watery layer	380,0 80,0	19,0-27,0 29,0-31,0 33,0-40,0 42,0-55,0 57,0-60,0 60,0-64,0 66,0-72,0	8,0 2,0 7,0 13,0 3,0 40 6,0		18,6	6,03	0,324 0,67	$M_{0,8}\frac{SO^4 63,0HO^3 27,4Cl9,6}{Ca_{66}8^{Mg}19,5^{(Na+K)}{}_{13,7}}$

0,007. This case occurs in subsoil waters hydrorelief. The waters of the 1st horison are sweet, hydrocalcerous, but in some Kurside zones it is sulphatic, also chloride. Dry residue of subsoil waters in the places leaning on Bozdagh rises till 3-5g/l. It is sulphatic for chemical composition. The second flooding watercarrier layer begins from the slope part of the plain and is situated at 80-250m depth from plain to the Kur. The watercarrier layer density around the debris cone of the river is 25-40m,but it becomes 10m in the intercone zone. Here water penetration legality of rocks occurs anologically. In the first case the waterpenetration is 500-1000 m^3/day, it is 100-300m^3/day in the second case. Here the highest waterpenetration falls into the east zone. The water floading is from 70-to 150-170 m on the commented layers. Therefore the piezometric level of the Kurside zones rises above 8-10 m from the surface. Here extraction of water to the surface occurs by its flow while digging a well. The water level is at 8-10 m depth from surface in the south part of the plain. Here 350. To 220m, but in the east part from 310 to 70-90m. The piezometric level inclination changes by 0,01-0,007. The waters of the second layer are sweet, calcareous. Solonetzification of these waters can be till 5g/l in the place where Ganja plain leans on Bozdagh chain. These waters are sulphatic, sometimes chloridic for chemical composition.

The hydrogeological condition of the Ganja plain, the subsoil wataers flow and movement in a normal direction are towards the Kur depression.

It was determined by the calculations that the requirment volume which is intended for using of subsoil waters for farming and drinking in the Ganja plain. The need volume is 1300 00 m^3 /day , salinized is 48000 m^3/day. From total underground water supply – 1037000 m^3/day water are extracted. So, the water quantity for the purpose of farming and water supply is 1,25 times more than determined underground waters. But the salted waters is 20% of required rigative water.

Water supply of the ganats in the sloping plays of Ganja- Gazakh and Garabagh.
Water increasing probability and chemical composition on regions

One of the zones with more ganats in Azerbaijan is Gazakh- Ganja and Garabagh plain. The main nourishment sources of the ganats is Aghstafachay, Hasanchay, Tovuz, Zayamchay,Shamkirchay, Ganjachay, Kurakchay, Injachay, Tartarchay, Khachinchay, Gargarchay, Kondalanchay and other seasonal small rivers, they created debris cones in their clows. Beginning from the ancient times the population of this region built ganats. It is known from historical sources.

According to the researches performed in the 40th years of the XX century, 885 (According to the unofficial resources) ganats which are oficially registered in the Azerbaijan Republic are active. So, in Azerbaijan. A length of the bloomeries in 885 ganats is 721,008 km inspection wells number is 27850, water flow is 13,380 m^3/sec, water bulk for a year is 426, 839 million/m^3.

A quantity of the ganats using in the Grabagh and Ganja- Gazakh sloping foothill plains is 623, lengths – 632,8 km, wells number – 24776, water flow – 11,124 m^3/sec, water bulk is 350,806 million m^3.

Information about the ganats in the regions of the Ganja- Gazakh and Garabagh zones was given on Table 15 and 16.

Gazakh and Aghstafa regions were together on time and therefore the ganats number is 89, total lengths of the galleries – 14,47 km, wells number – 521 water flow– 237L/sec, water bulk is 7,474032 million m^3 in a year.

Eight ganats which were active in the Aghstafa region on time have been viewed, the galleries were analyzed (Table 17).

From the ganats – 5 are Girili, Hasansu, Eynalli. A total flow of the ganats in the regions is 160 L/sec, the water quantity using in a year is 5,04576 million m^3.

According to the calculatins it is possible to rise 26L/sec, or 0,819 million m^3 of 5 ganats in Aghstafa region. So, 7,474032 million. M^3 is used by the ganat on Gazakh and Aghstafa regions, it is possible to reach 8,293968 millionm^3.

Table 15

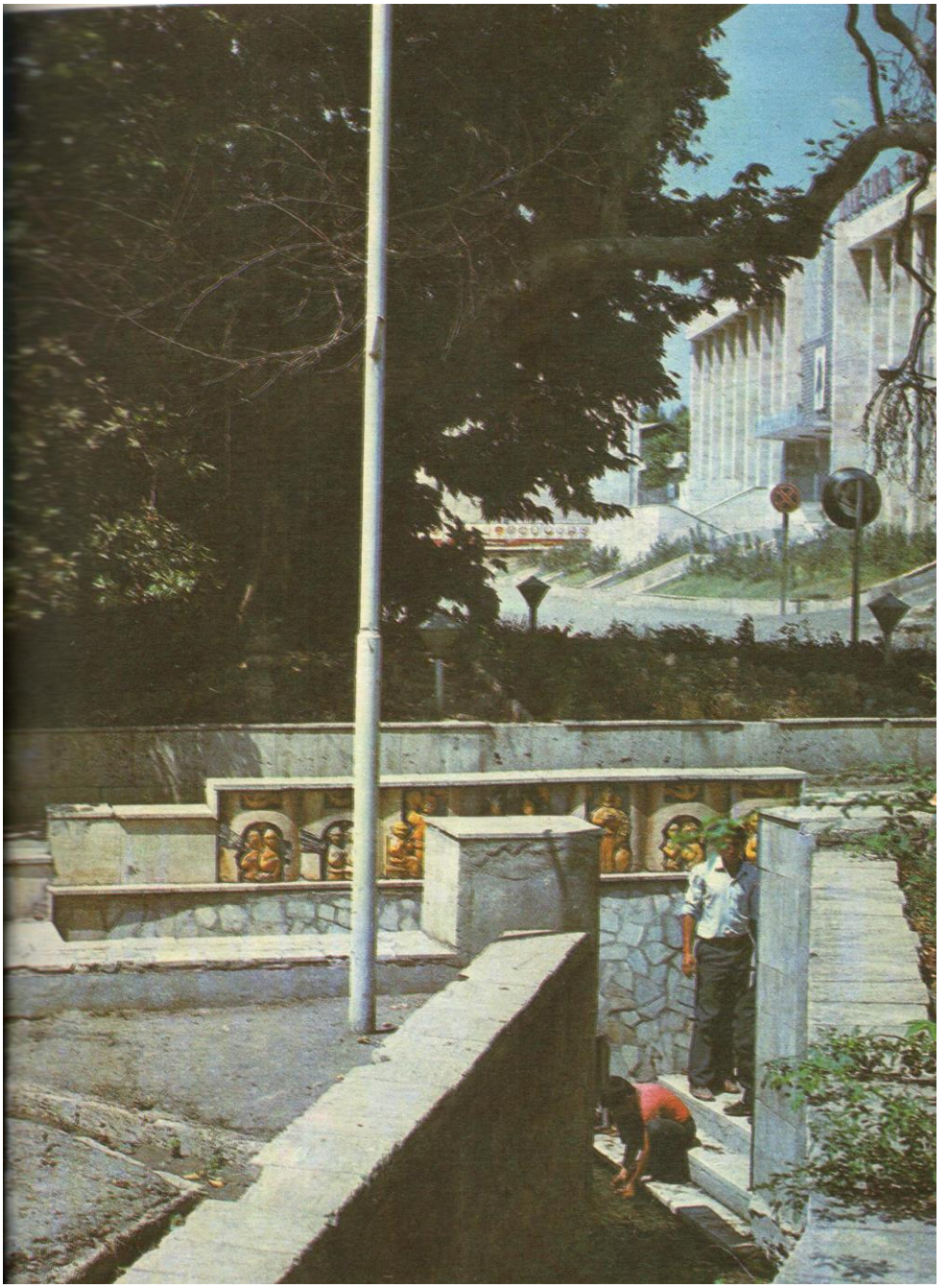
Information about the ganats in the districts of the Ganja- Gazakh region.

N	Region	Ganat number	Eyes number	Length of the ganat gallery L/km	Total expense (L/SEC)		Increase probability of the expense and water bulk			Note
					1938	2016	L/sec	$M^{3/sec}$	M^3/year	
1	Aghstafa	8	434	13.020	195	160	26	0.026	819900	
2	Gazakh	1	87	1.750	42	50	-	-	-	
3	Tovuz	7	136	2.710	125	107	22	0.022	693800	
4	Shamkir	8	245	4.895	184	165.5	78	0.078	6739.2	
5	Samukh	13	580	11.665	-	-	-			
6	Goranboy	10	205	4.100	129	53	34	0.034	2459800	
7	Goygol	7	87	1.740	151	92.5	54	0.054	1702944	
	Total	54	1774	39,880	826	628	214	0,214	6748704	

Table 16

Information about they ganats in the districts of the Garabagh region

N	Region	Ganat number	Eyes number	Length of the ganat gallery L/km	Total expense (L/SEC)		Increase probability of the expense and water bulk			**Qeyd**
					1938	2016	L/sec	$M^{3/sec}$	M^3/year	
	Aghjabadi	5	121	2,41	120	–	–	–	–	
	Aghdam	7	140	2.730	92	46	45	0.045	1419120	
	Barda	8	100	1.955	300	-	-			
	Tartar	5	49	2.100	120	-	-			
	Total	**25**	**410**	**9,195**	**692**	**46**	**99**	**0,099**	**3122064**	
Ganats in the occupied regions (1974)										
	Aghdam	98	3048	112.424	2040,0	occupied				
	Fuzuli	71	1491	37.830	603,75	occupied				
	Jabrayil	111	2234	59.311	1099,5	occupied				
	Nagorno -Karabakh	52	887	20.181	134	occupied				
	Total	**332**	**7660**	**229.746**	**1837,25**	occupied				



Picture. 71. General view of the Chinar ganat in Jabrayil.

Picture 72. Valikhanov spring built on the Huseynagha ganat in Jabrayil.

Picture 73. Papi village ganat in Jabrayil.

Picture 74. Schematic plan of the Korgishlag village ganats in Aghdam.

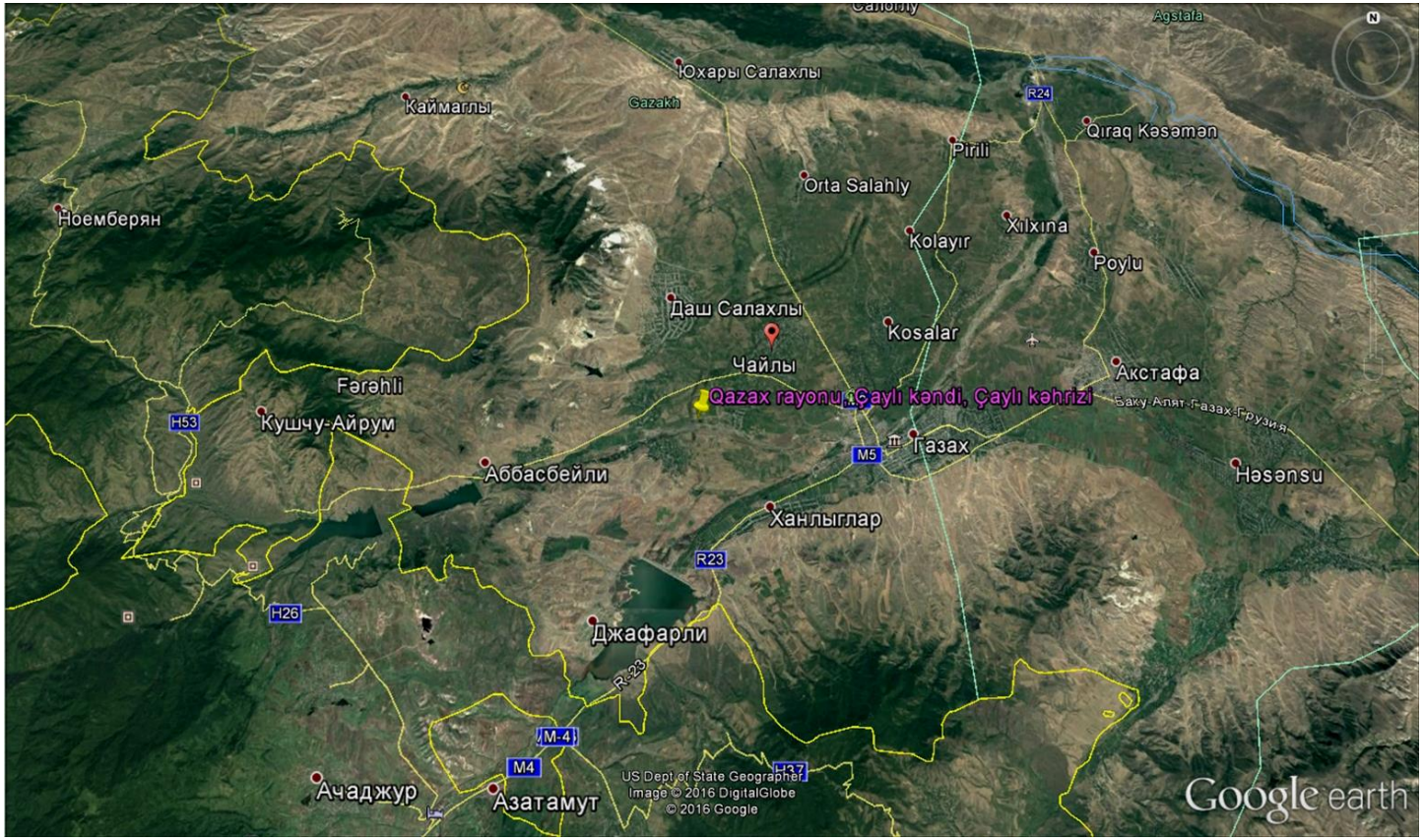
Cədvəl 17

Aghstafa district

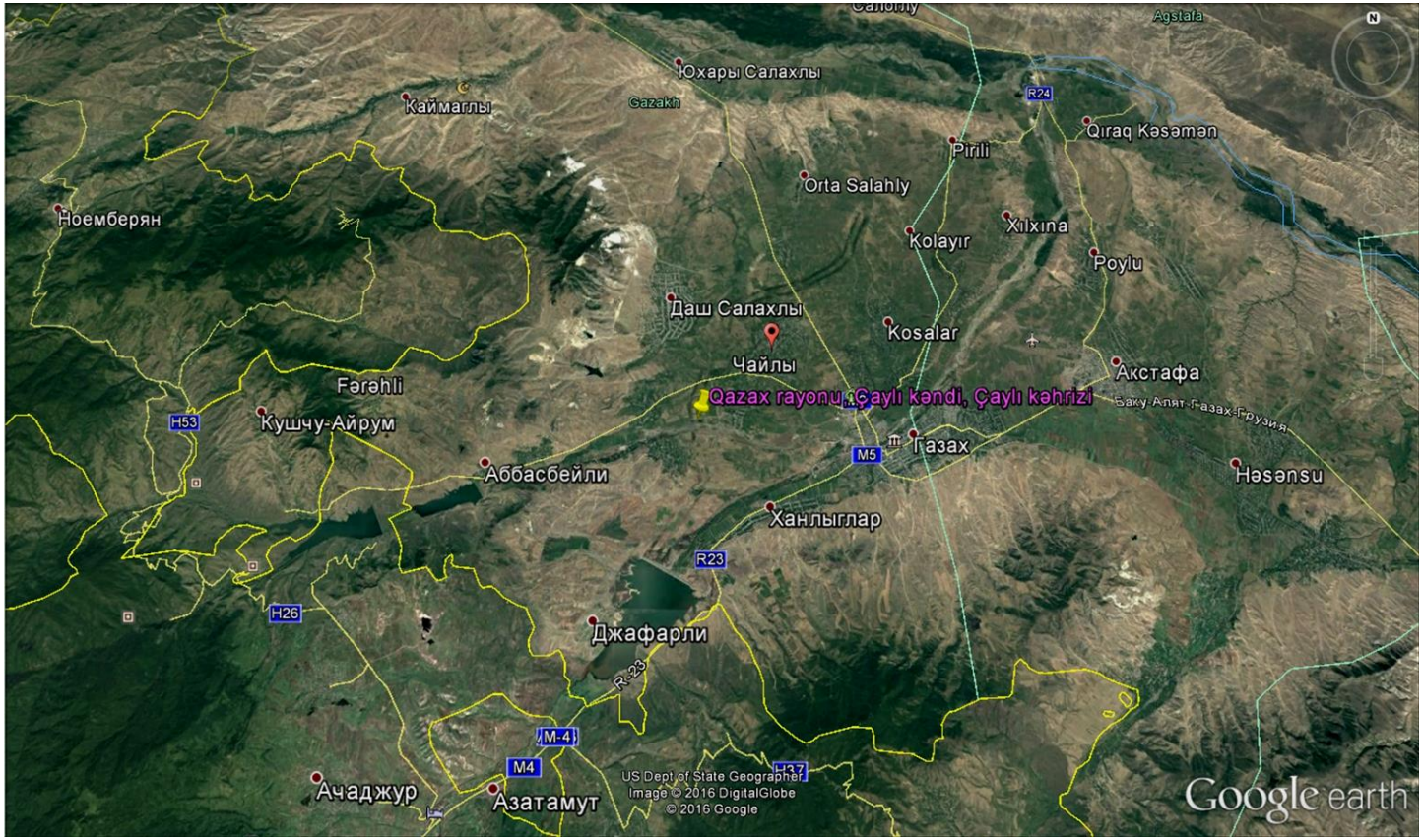
Village	Name of the ganat	Coordinates (exit wells)		Lenght of the ganat		Water expense (L/sec)		Increase probability L/sec
		X	**Y**	**H (m)**	L(m)	**1938**	**2016**	
Girili	Ganat N=1	41° 05' 34.6"	45° 30' 32.7"	354	2050	70	60	10
	Ganat N=2	41° 04' 33.7"	45° 30' 0.03"		1450	35	30	3
Hasansu	Hasansu ganat	41° 04' 36.2"	45° 29' 27.6"	384	1420	-	-	-
Eynalli	Eynalli 1 ganat	41° 04' 33.7"	45° 30' 0.03"	376	20	-	-	-
	Eynalli 2 ganat	41° 03' 57.6"	45° 29' 59.2"	394	1000	40	30	6
Yukhari Goychali	Goychali ganat	41° 02' 33.7"	45° 28' 53.6"	430	1100	25	20	3
Vurgun massive	Vurgun ganat	41° 05' 12.7"	45° 28' 37.1"	385	1900	-	-	-
Kochasgar	Kochasgar ganat	41° 02' 54.8"	45° 79' 38.7"	435	2100	25	20	4
Total						195	160	26

Picture 75. Ganats location plan of the Aghstafa region.

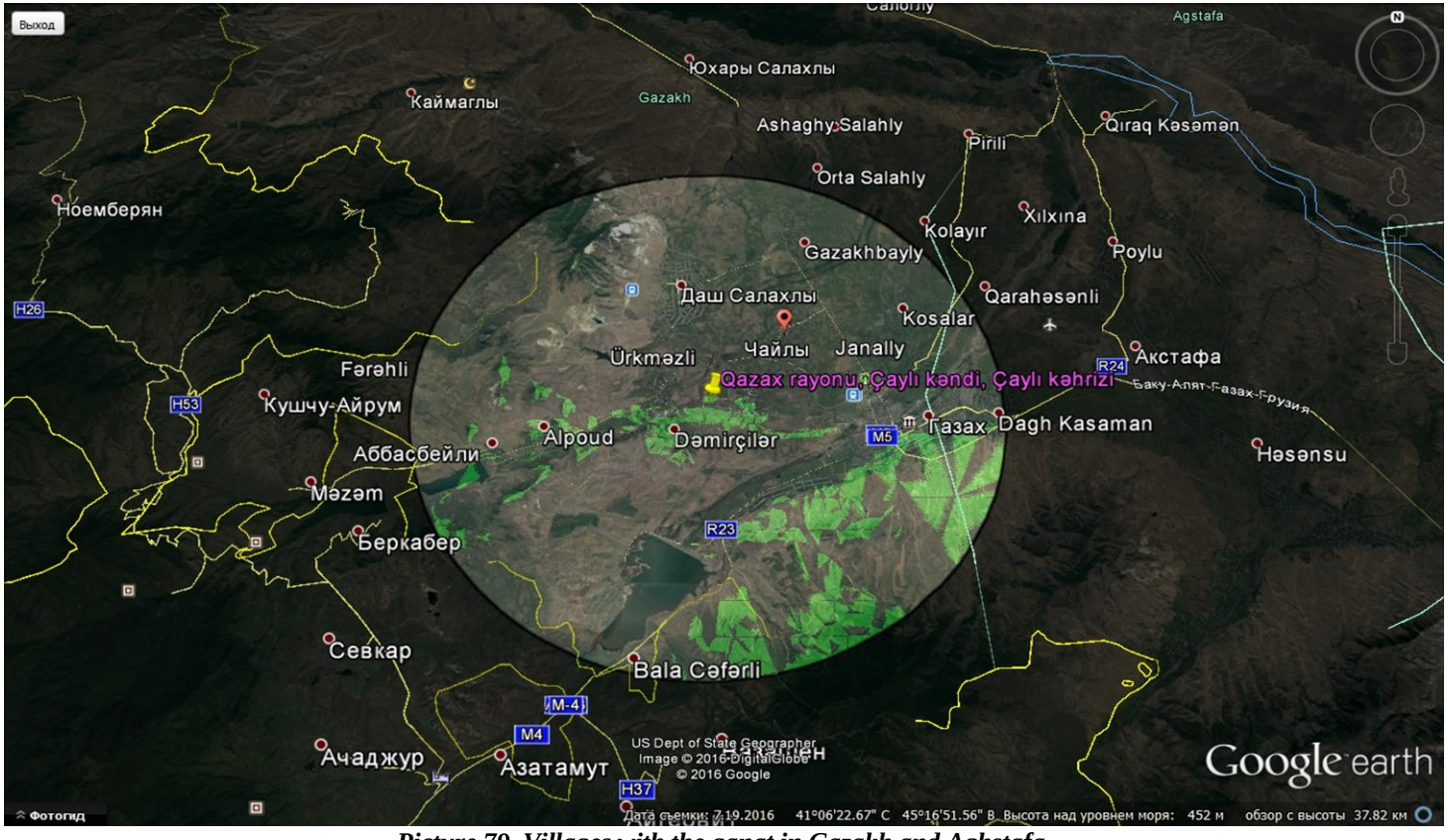
Picture 76. Ganats location plan of the Tovuz region.



Picture 77. Ganats location plan of the Gazakh region.



Picture 78. Ganats location plan of the Gazakh region.



Picture 79. Villages with the ganat in Gazakh and Aghstafa.

Length of the Chayli ganat gallery in the Gazakh region is 1750m, eyes number is 42, expense – 50 L/sec, water bulk for a year – 1,577 milion. M^3. (pic.76-79, table 18).

Table 18.

Gazakh district

Village	Name of the ganat	Coordinats (exit wells)			Length of the ganat gallery	Water expense (L/sec)		
		X	Y	H (m)	L (m)	1938	2016	
Chayli	Chayli	41° 05' 58.3"	45° 16' 39.5"	451	1750	42	50	-
Total						42	50	-

7 ganats were investigated in the Tovuz district. (Table 19). They were in Ashaghi Gushchu, Girikhli, Alibayli villages, their total flow was 145 L/sec water quantity was 4,57 million m^3.

According to the calcultions the water flow of 5 ganats in the Tovuz district can be increased 2,20 L/sec or 0,694 million. m^3 water is used by the ganat on Tovuz region, it is possible to increase it to 5,267 million m^3.

Table 19.

Tovuz district

Village	Name of the ganat	Coordinats (exit wells)			Length of the ganat gallery	Water expense (L/sec)		Increse probability L/sec
		X	Y	H (m)	L (m)	1938	2016	
Tovuz	Ashaghi Gushchu ganat	40° 59' 37.2"	45°37' 17.6"	423	-	-	-	-
Ashaghi Gushchu	Gurdlar ganat	40° 56' 0.08"	45° 39' 57.6"	514	500	35	26	5
	Mahammad Agha ganat	40° 56' 0.02"	45° 40' 9.3"	519	240	-	-	-
	Duz Girigli ganat	40° 56' 16.8"	45° 39' 54.1"	503	550	30	26	4
	Mulkulu ganat	40° 59' 8.5"	45° 48' 21.0"	293	800	60	40	10
Duz Girigli	Yukhari	40° 56' 40.9"	45° 30' 32.2"	585	-	-	-	-
Alibayli	Mulkulu Ganat	40° 56' 37.2"	45° 30' 26.2"	597	620	-	15	3
		TOTAL:		125	107	22		

Seven ganats were investigated in the Tovuz district. (Table 19). They were in Ashaghi Gushchu, Girikhli, Alibayli villages, their total flow rate 145 L/sec, water quantity was 4,57 million m^3. According to the calculations the flow of 5 ganats in the Tovuz, 8 ganats were viewed in the Shamkir district. (Table 20) They are active in the Irmashli, Shishtapa, Morullu and other villages, their flow is 184 L/sec, the water quantity is 5,80 million.m^3 according to the measurement work the flow of 8 ganat in the Shamkir district was 105,5 L/sec (in a total form) or 3.327 million.m^3 in 2016. According to the calculations the flow of 8 ganats can be increased to 68 L/sec or 2,144 million.m^3 during a year, as a result 3,327 million.m^3 water is used by the ganat on the Shamkir region for a year and it can be risen till 5,47 million.m^3.

12 ganats were viewed on the Samukh district, (Table 21). The ganats were mostly used in Aliushagi, Ahmadbayli, Aghasibayli, Hjilli, Giyasli, Tatli, Zazali, Kolyiz villages. The ganats were forgotten due to neglection beginning from 1980 yy. Their activity were stopped once and for all because the subartezian wells were drilled in the zone of the many ganats nourishment in the period of independence, at present though there is water in the wells of some ganats, they have a need for the capital repairs. (picture 80-83)

Table 20

Shamkir district

Village	Name of the ganat	Coordinats (exit wells)			Length of the ganat gallery	Water expense (L/sec)		Increase probability
		X	Y	H(m)		1938	2016	
	Zayam-jirdakham ganat	40°52' 3.9"	45° 49' 52.8"	539	500	24	1,5	15
Irmashli (Former Engels village)	Goraoghlanli ganat	40°50' 14.7"	45° 51' 44.6"	597	465	20	6	12
	Bash ganat	40°49' 16.4"	45° 52' 43.7"	619	600	30	20	10
Shishtapa village	Bala ganat	40°50' 34.8"	45° 55' 31.1"	493	600	10	4	6
	Boyuk ganat	40°49' 31.7"	45° 55' 44.9"	550	450	25	20	7
Morulu village	Hasanagha village	40°48'26.9"	46° 00' 32.3"	533	980	20	74	15
	ganat	40°46' 52.8"	46° 00' 19.3"	626	850	30	20	8
Morulu - Sarkhanli	Sarkhanli ganat	40°46' 41.8"	46° 00' 23.2"	639	450	25	20	5
Total						184	165.5	68

Table 21

Samukh district.

Village	Name of the ganat	Coordinates (exit wells)			Length of the ganat gallery L (m)	Water (L/sec)		İncrease probability
		X	Y	H(m)		1938	2016	
Aliushaghi	Aliushaghi	$40^0$41'12,5"	$46^0$27'29,6"	304	2250		There is no water	
Ahmadbayli	Dayirman ganat	$40^0$43'49,0"	$46^0$27'11,6"	257	2000			
	Kohna ganat place	$40^0$44'52,0"	$46^0$28'04,0"	234				
Aghasibayli	Aghasibayli garant	$40^0$44'38,9"	$46^0$29'30,3"	219				
Hajalli	Hajalli	$40^0$48'14,6"	$46^0$26'43,8"	198	1670		There is no water	
Giyasli	Giyasli ganat	$40^0$42'35,4"	$46^0$26'57,9"	278	1630		There is no water	
Tatli	Tatli ganat	$40^0$41'56,8"	$46^0$26'29,7"	284	1125		There is no water	
Zazali	Zazali ganat	$40^0$42'33,1"	46024'48,5"	320	450			
	Baghbanlar ganat	$40^0$45'33,1"	$46^0$23' 20"	218	455			
Kolayir	Gardashlar ganat	$40^0$45'33,7"	$46^0$22'59,6"		410			
	Garachay ganat	$40^0$45'31,7"	$46^0$27'25,3"	239	750			
Chinarli	Chinarli garant	$40^0$33'18,3"	$46^0$47'08,5"	224	925			
Total								

Picture 80. The ganat well part on the surface.

Picture 81. Upper part of the ganat well, ("the well mouth")

Picture 82. An exit part of the ganat

Picture 83. Ganat cultural monument.

On the Goranboy region (Former Gasim Ismayilov) 10 ganats were viewed (Table 22) According to the information of 1938 general length of the ganat gallery was 21,664 km, the eyes equal to 693 numbers, the water flow was 105 L/sec and annual water bulk – 3,311 million m^3. A general water flow of the ganats is 73 L/sec, in Shafikurd, Tatarli, Dashalti, Kocharli, Garadaghli villages, the water amount was 2,30 million.m^3 during a year.

According to the calculations total flow of 5 ganats is 34L/second or 1,072 million.m^3 in the Goranboy region. It is possible to rise its annual volume till 3,372 million.m^3, while using of 2,30 million.m^3 water by the ganat on the Goranboy region.

Table 22

Goranboy district

Village	Name of the ganat	Coordinates (exit wells)			Length of the ganat gallery	Water expense (l/sec)		Increase probability l/sec
		X	Y	H(m)		1938	2016	
Safikurd	Ashirli ganats	40°32'58.4"	46°47'45.6"	216	-	-	-	-
	Masjid ganat	40°32'14.7"	46°46'51.7"	268	250	15	7	7
Tatarli	Lazgi ganat	40°31'25.8"	46°46'21.3"	298	1500	28	20	8
	Rahimbayli ganat	40°32'38.0"	46°46'27.9"	264	1200	22	13	-
Dashalti Garagoyunlu	Dashalti Garagoyunlu ganat	40°29' 3.8"	46°46'33.0"	348	700	40	15	15
Kocharli	Evoghlu ganat	40°17'41.9"	47°03'39.1"	107	450	24	18	4
	Evoghlu village ganat	40°18’42.8’’	47°03’42.1’’		-	-	-	-
	Mamirli ganat	40°18’49.2’’	47°04’17.5’’	108	-	-	-	-
Garadaghli	Ganat	40°40’4.5’’	46°33’42.8’’	296	-	-	-	-
	Karvansaray ganat	40°40’23.9’’	46° 34' 1.8"	1215	-	-	-	-
Total						129	53	34

On the Aghdam region the ganats number was 105, a length of gallery was 112,424 km, the eyes number was 3908, total flow was 2040,0 L/sec, or water bulk was 64,333 million.m^3 in 1938. Eight (8)

ganats were investigated in 2016 (in the nonoccupied zone). (Table 23). Total water flow of the active ganats was 46 L/sec, the water quantity which is used during a year was 1,45 million.m^3. According to the calculations it is possible to rise total flow of the ganats 45 L/sec, or 1,419 million.m^3 in the Aghdam district, That is, the water supply can be reached 2,869 million.m^3 by repairing the ganats in the Aghdam region.

Nine (9) ganats were investigated in the Goygol region. These ganats are mainly in Goygol town, Garabaghlilar and Balchilar massive, Balchili and other villages, The total water flow was 161,0 L/sec, the using water quantity was 5,077 million.m^3.

The water flow of 6 ganats in the Goygol region was 92,5 L/sec, or 2,917 million.m^3 in a pervod of research. According to the calculations, it is possible to rise water 1,703 million.m^3, considering a state of 6 ganats.

So, a quantity of the using water can be reached from 2,917 million.m^3 to 4,620 million.m^3.

Table 23

Aghdam region (non-occupied)

Village	Name of the ganat	Coordinates (exit wells)			Length of the ganat gallery	Water expense (l/sec)		Increase probability
		X	Y	H(m)		1938	2016	
	Shams ganat	40°07'30.2"	47°02'57.1"	188	305	30	15	15
	Chinarli ganat	40°07'21.7"	47°02'06.3"	195	420	20	10	10
	Khanahmad ganat	40°07'15.8"	47°03'12.3"	190	520	30	18	12
Baharli massive		40°05'40.6"	47°04'52.2"	168		-	-	-
Kolgishlag village	Heyvali ganat	40°06' 50.1"	47° 03' 34"	184	420	12	3	8
	Ahmadaghali ganat				-	-	-	-
	Eshg Abdalli ganat				-	-	-	-
Total						129	53	34

At the same time it is possible to fulfil a new ganat project in these regions because there is river-bed in the Goshgarchay, in the Low parts of the Ganja-Shamkir railway in the Goygol region.

Table 24

Goygol region

Village	Name of the ganat	Coordinates (exit wells)			Length of the ganat gallery L(m)	Water expense (L/sec)		Increase probability
		X	Y	H(m)		1938	2016	
Goygol town	Haji Asgar ganat	40° 40' 39"	46°12'45.6"	665	900	20	0.5	15
	Balchilar massive	40° 07' 49.6"	46°16'35.8"	450		55	42	10
	2 nd ganat the second arm	40° 36' 18.5"	46°21'51.2"	592		-	-	-
Balchili	Ganat	40° 40' 49.6"	46°16'35.8"	450	840	54	42	10
	Alman ganat-1	40° 35' 52.8"	46°19'47.8"	650		12	8	4
	Alman ganat-2	40° 36' 18.5"	46°21'51.2"	592		20	-	15
	Ganat eyes	40° 33' 49.1"	46°21'09.3"	605		-	-	-
Total								

The results of the chemical analyses of the water samples taken from ganats are given on Table 10 and 11. As it is shown from the table the highest coarseness in the ganat water (23 mg/l) is registered in the Khatai ganat of the Aghstafa region, the lowest index (4,2 mg/l) in the Chayli ganat of the Gazakh region.

The water coarseness was 6,0 mg/l in the Girikhli, Yukhari Oysuzlu, Alibayli of the Tovuz district.

CO_3 indices weren't observed in any ganat water.

A high index of the total number of salts in water is observed (2457,5 mg/l) in the Khatai ganat of the Aghstafa region, the lowest index (382,7 mg/l) is in the Chayli ganat of the Gazakh region.

It was determened 424,7 and 556,3 mg/l of this index in the Girili and Hasansu ganats of the Aghstafa region. The salts sum in the ganat waters of the Tovuz district is 542,2 - 968,4 mg/l.

Hydrocarbonates (HCO_3) dominate among the salts. Their highest index (70,8,0 mg/l) in the Khatai Khatai ganat of the Aghstafa region, the lowest index (256,2 mg/l) in the Chayli ganat of the Gazakh district are registered. A quantity of hydrocarbonates is 290 mg/l in the Hasansu ganat, but it is 289 mg/l in the Girigli ganat of the Aghstafa district.

These indicators rise in the Tovuz district: 426,8 mg/l in the Alibayli ganat, 329,4 mg/l in Yukari Oysuzli, 329,0 mg/l in Girigli, but 317,0 mg/l in the well wter, 390 mg/l is in 384 well water of the Shamkir region, the highest index is 476 mg/l in Tatar, minimum is 394 mg/l the scores rise and become 880 mg/l in Ballar 2 ganat of the Aghdam region.

It should be noted that sulphate ions (SO_4) wasn't registered in the Chayli ganat of the Gazakh district. Its highest values in the water of the Khatai ganat of the Aghstafa region. Was 626,2 mg/l, the lowest indices were 30,4 mg/l in the well water of the Tovuz region, but it was 32,4/mg/l in the Hasansu ganat of the Aghstafa district. Sulphat ions (SO_4) were 120,0 mg/l in the Alibayli ganat of the Tovuz region, 194,6 mg/l in the Yukhari Oysuzluda, 254,6 mg/l in Girikhli. It was 98,4 mg/l in the Irmashli ganat of the Shamkir region, 88,0 mg/l in Shahar (city) 1, 108,4 mg/l in the Mamirli ganat of Tatar, 256 mg/l in the ground water.

Chlorine (CL) ions was 432,0 mg/l in the Khatai ganat of the Aghstafa region, 33,0 mg/l in the Chayli ganat of the Gazakh region. This index was 39,4 mg/l in the water of the Alibayli ganat in the Tovuz region, 73,4 mg/l in Yukhari Oyluslu, 118,0 mg/l in Girigli. So, it quantity was 168,7 mg/l in the Tazakand ganat of the Shamkir region 228,0 mg/l in the well water, but 36,0 – 54,8 mg/l in Aghdam. (Table 25)/

Ca ions vibrate by 274,0 – 48,1 mg/l in the ganat waters of the regions. This index was 88,0 mg/l in the Alibayli ganat in the Tovuz region; 82,16 mg/l in Oysuzlu, 64,13 mg/l in well This index is high in the ganats of the Shamkir and Aghdam regions: 86,0 mg/l and 118,0 mg/l. It was 196,0 mg/l in the ground water.

Magnesium ions (Mg) in the Khatai ganat waters of the Aghstafa region possess the highest indices (124,6 mg/l), the lowe indices are (19,5 mg/l) in the Chayli ganat of the Gazakh region. Mg ions are 24,2 mg/l in the Girli ganat of the Aghstafa region, 26,75 mg/l in the Hasansu ganat, 39,0 mg/l in the Alibayli ganat of the Tovuz region, 45,0 mg/l in the Yukhari Oysuzlu, 46,0 mg/l in Girigli. The magnesium index is 39,0 mg/l and 35,4 mg/l in the Shamkir and Aghdam regions.

Table 25

Information about chemical composition of the water samples taken from the ganats and wells in the Ganja-Gazakh and Garabagh plains

	Number №	Name of the region	Name of the ganat	Mg/l								Salts number	Dry residue 105^0C
				Coarseness	CO_3	HCO_3	SO_4	CL	Ca	Mg	Na+K		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
2	**1**	Gazakh	Chayli ganat		no	256.2	no	33.0	48.1	19.5	25.91		
				4.2		4.2		0.93	2.4	1.6	1.13	382.7	398
	2	Aghstafa	Girli ganat		no	2.89	no	34.0	52.0	24.2	24.84		
				5.0		4.73		0.95	2.6	2.0	1.08	424.7	432
	3	Aghstafa	Hasansu ganat		no	290	32.4	72.2	56.1	26.75	62.7		
				6.0		4.75	0.67	2.03	2.8	2.2	2.73	556.3	573
	4	Aghstafa	Khatai ganat		no	708.0	626.2	432.0	274	124.6	292.9		
				23.0		11.6	13.04	12.16	13.7	10.38	12.73	2457.5	247
3	**5**	Tovuz	Alibayli ganat		no	426.8	120.0	39.4	88.0	39.0	67.85		
				7.2		7.0	2.5	1.11	4.4	3.25	2.95	780.3	798
	6	Tovuz	Yukhari Oysuzlu		no	329.4	194.6	73.4	82.16	45.0	85.1		
				7.8		5.4	4.05	2.06	4.1	3.7	3.7	809.6	818
	7	Tovuz	Girikhli ganat		no	329.0	254.6	118.0	92.2	46.0	128.6		
				8.5		5.4	5.3	3.32	4.6	3.83	5.59	968.4	974
	8	Tovuz	Well water		no	317.0	30.4	62.34	64.13	36.5	31.6	542.2	563
				6.0		5.2	0.63	1.75	3.2	3.0	1.38		
4	**9**	Shamkir	Tazakand ganat		no	317.0	244.6	168.7	64.1	26.7	222.0		
				4.7		5.2	5.1	4.75	3.2	2.2	9.65	1043.0	1054
	10	Shamkir	Irmashli ganat		no	384	98.4	39.5	86.0	39.0	36.11	683.0	702.0
	11	Shamkir	Sharar ganat		no	286	88.0	64.0	82.0	24.9	49.7	594.6	628.0
				4.4		4.68	1.83	1.8	4.1	2.05	2.16	1270	1300
	12	Shamkir	Well water		no	390	307	228.0	202.4	74.2	69.0		
				6.4		6.4	6.4	6.4	10.1	6.1	3.0		

1	**2**	**3**	**4**	5	6	7	8	9	10	11	12	13	14
	13	Tatar	Eloghlu ganat		no	394	188	86.0	122	47.4	64	901.4	923.0
				10.0		6.5	3.91	2.42	6.1	3.95	2.78		
			Mamırılı ganat		no	442.0	278	108.4	136	62.4	94.9	1121.7	1172.0
				11.5		7.25	5.79	3.09	6.8	5.2	4.12		
	14	Tatar	Ground water		no	476	372	256	214	74.4	134.9		
				13.6		7.8	7.75	7.21	10.7	6.2	5.86	1527.3	1584.0
5	**15**	**Aghdam**	Kolgishlaq ganat		no	420.5	no	36.0	90.2	24.0	32.2	602.9	628.0
				6.0		6.89		1.02	4.51	2.0	1.4		
	16		Baharli		no	496.0	no	38.0	108.0	21.0	47.1	710.1	728.0
				8.0		8.13		1.07	5.4	1.75	2.05		
	17		Ballar ganat		no	560.0	no	54.8	118.0	34.6	44.63	812.03	832.0
				8.8		9.18		1.54	5.9	2.88	1.94		
6	**18**		Ballar 2 ganat		no	880	no	38.8	110.5	35.4	162.0	122.67	1248.0
				8.2		14.42		1.09	5.52	2.95	7.04		
	19		Kolgishlag ganat 2		no	884	no	32.4	108.0	40.2	153.0	1217.6	1240
				8.3		14.5		0.91	5.4	3.35	6.65		
	20		Kolgishlag ganat 3		no	442.0	yox	38.0	80.2	43.5	15.67	619.4	648.0
				7.4		7.24		1.07	4.01	3.62	0.68		
	21		Kolgishlag ganat 4		no	490	no	70.4	78.2	40.1	63.4	742.14	767.0
				7.2		8.03		1.98	3.9	3.34	2.75		
	22		Ground water		no	690	68.8	96.0	164.0	54.0	63.02	1158.2	1180
	23		Ground water	11.8		11.31	1.43	2.7	8.2	4.5	2.74	1253.7	1274.0
					no	700.0	62.8	106.0	172.1	52.2	65.09		
	24		Ground water		no	746.0	74.2	120.0	196.0	56.0	61.3	1041.6	1020.0
				14.2		12.2	1.54	3.38	9.8	4.66	2.66		
	25		Ground water		no	585.6	84.0	80.68	132.3	51.07	64.63		
				11.0		9.6	1.75	2.26	6.6	4.2	2.81	1120.0	1128.0
			Spring water									608.7	628.0

Table 26

Information about subsoil water use in the Ganja-Gazakh foothill plain at the beginning of the XX century

Administrative region	Kind of the water intake	Quantity in numbers	Use of the subsoil water		
			min. m^3/day	m^3/sec	Quantity of the using subsoil water
Gazakh	Subartesian wells, ganats, Springs, Horizontal drainage	277 8 459 2	62,59 11,43 3,53 2,21	0,12 0,13 0,04 0,03	
	Total	**746**	**19,16**	**0,92**	**4,92%**
Tovuz	Subartezian wells, ganats horizontal drain age	201 7 1	185,49 3,15 3,57	2,15 0,04 0,04	
	Total	**209**	**192,81**	**2,23**	**11,90%**
Shamkir	Subartezian wells, ganat, springs horizontal drainage	273 9 3 1	212,0 13,88 0,10 2,19	2,45 0,30 0,001 0,03	
	Total	**296**	**227,67**	**2,63**	**14,06%**
Ganja (Q)	Subartezian wells, ganats, horizontal drainage	241 23 2	251,61 25,88 9,1	2,91 0,30 0,11	
	Total	**266**	**286,67**	**3,32**	**17,69%**
Goranboy	Subartezian wells, ganats, springs	322 10 6	522,32 304,8 3,64	3,53 0,02 0,04	
	Total	**524**	**832,84**	**3,64**	**51,43**
On all the sloping plain	Subartezian wells, springs, ganats? horizontal drainage	1503 54 478 6	1538,9 60,01 3,69 17,07	17,81 0,69 0,24 0,20	
	Total		**1619,67**	**18,74**	**100%**

Na+K quantity was 292,9 mg/l in the Khatai ganat of the Aghstafa region, 25,91 mg/l in the Chayli ganat waters of the Gazakh region. This index was 24,84 mg/l in the Girli ganat of the Aghstafa region, but 62.7 mg/l in the Hasansu ganat, 67.85 mg/l in the Alibayli ganat, but 85.1 mg/l in Yukhari Oysuzlu.

Ganats in the Ganja town and surrounding zones

An abundance of the gardens in Ganja in the Xlll century played an exclusive role in prevention of the cold winds in the winter, scorching sun in the summer, purtiy of the climate – are of the town, a perfect irrigative system was built in Ganja for the ditches were constructed in all the streets.

The trees in both streets and front gardens and gardens in the private yards have been irrigated, The water distribution among the massives and separate regions was under state contrd. The choice men divide the canal water which is considered a public property, but the man who violates the principle of water use and distribution is seriously punished. Till the 60^{th} years of the XlX century the elected person for every year subordinated to bureaucratic authorities and their authority term was delivered 3 years. (table 14).

The water is taken from 16 ditches from the Ganja river to the city and nerly 30 ganats from the near by mountains. The Kor aryk, Gizil Hajili aryk, Khan aryk, Lemsa aryk, Bala Baghman aryk, Karkhana aryk, Arazbar, Shatir aryk, Allahdad and Gara aryk were in the left bank. The gardens in the right bank are irrigated with the Khanliglar, Arably, Cholak, Topchu, Shin and Dinaraj aryks. According to the water capacity Karhana (0.240 m^3/sec). Gizil Hajili (0.357 m^3/sec), Khanliglar (0.368 m^3/sec), Arabli (0.245 m^3/sec), Khan aryk (0.372 m^3/sec), Cholak aryk (0.490 m^3/sec), were specially differ. Besides them the Bahrambey (0.153 m^3/sec), and Shahsoyan (0.330 m^3/sec), dikches from the Gushgara river have been used for irrigation of the sowing places and gardens near Guru Gobu and Boyuk Baghman region, 35 mills, nearly 30 bridges were on the canals in the town.

The water of these arayks isn't enough for the city covering an area of 14 square verst. Therefore the underground water canals network – ganat system was created to equip the city with the water. The strong ground water flows in the Ganja plain layers formed a source of the Ganja ganats.

According to the Xlll century historical Zakariyya Gazvin"s inscription, an excellent qualitative water of the Ganja ganats met the requirements of the population in the early Middle Ages. The Mascid ganat was firstly built after Shah Abbas transferred it to the present place. The same ganat is called Haji Baghir among the people, Apparently, the same man was a city inhabitant who led in ganat building or its financing. There were 97 ganats which are used by 25 villages in the Ganja circle, 30 from them were in the Ganja zone, it was possible to reveal the following ganats built in the different periods (their known output in the XX century was given in the bracket): Masjid ganat (30 l/sec), Juma (25 l/sec), Shakhsoyan (27 L/sec), Ozan (20 L/sec), Haji Mirgasim (30 L/sec), Haji Bilal, Sadilli ganat (30 L/sec), Zulular (15 L/sec), Haji Gadimli (28 L/sec), Javadkhan, Safarkhanli (37 L/sec), Gaymagli (32 L/sec), Galalilar Seyid ganat (22 L/sec), Chaharoghlu (20 L/sec), Tatoghlu (25 L/sec), Arzumanli (16 L/sec), Abuzarbayli (18 L/sec), Hajimammadli (26 L/sec), Orta ganat (18 L/sec), Shor ganat (20 L/sec), Dali Ali (15 L/sec), Guru Dara (42 L/sec), Jomard gassab ganat (18 L/sec), Kharaba yeri ganat (75 L/sec), Karbalayi Abish oghlu ganat, Kilsakand (20 L/sec), Kilsa ganat (7 L/sec), Nanasov (12 L/sec), Unlike large-small arches, the ganat water was pure and healthy, at the same time provided the population with the drinkable water, 103 ganats were active in the Ganja town and its surrounding in 1938. The length of the ganat galleries was 166.829 km, the eyes number – 7062, water flow in a total was 2500,0 L/sec, water bulk was 78.84 million.m^3 during a year.

The water flow was 0.428 m^3/sec and 8 ganats system provided the Ganja town with water in the 30 th years of the XX century.

Besides them, 50 water wells were used in the Ganja town.

It is not accidental neither subartezian wells nor horizontal drainage were active in any farm of the Ganja-Gazakh zone at the

beginning of the XX century. So, the population used from springs, wells and ganats.

This situation is distinctly seen in the following table.

It was clear from the investigations about a state of the subsoil waters in the Ganja foothill plain that these waters are useful for utilization in water supply and irrigation water networks. The extraordinary subartezian well and drainage waters were used in the years after the 2 nd half of the XX century.

At present the 6 ronze barrel of Haji Mirgasim agha who constructed this ganat in the Haji Mirgasim's ganat exit remains. The rest of the ganats were destroyed. We should regret that any ganat which was a water culture of Ganja wasn't investigated during the research.

Support from Azerbaijan National Academy of Sciences for research for of the water sources.

The ganats are valuable historical monuments notifying our people's past. We are shedding light on the dark pages of our history by studying ganats. The leadership of the ANAS approached this area investigation carefully. An agreement of intent "About together activity in the field of science and innovations pplication" was signed between "Azersu" Open Joint Stock Company and ANAS in April 22, 2015.

Speakining at the signing ceremony, President of ANAS Academician Akif Alizadeh talked about the care and attention shown by the leadership of the country to the development of Azerbaijan science and noted that the cooperation between the innovative scientific-research work, scientific and education institutions and industrial organisations fulfilled in the various areas is yielding results last years. Academician Akif Alizadeh highly appreciated the possibilities of cooperation in the field of water probe research, solutions and application of technologies in this country. "Last years great Work is fulfilled in improvement of the population's provision with drinkable water, establishment of the sewerage infrastructures. We intend to contribute this work by being ANAS. An agreement of intent about joint activity in the field of scientific and innovations application will service for enlargement of the together activity of Academy and "Azersu" ASC.

Chaiman of “Azersu” ASC Gorkhmaz Huseynov informed about the work in the field of the establishement of the water supply and sewrage systems again and he declared that the projects are executed in the Baku city and surrounding settlements, in the centers of the city and district. There is large perspectives of the cooperation with ANAS taking into account the utilization of the advanced technologies in this field: We intend to use potential of the Azerbaijan National Academy of sciences in our future activity. Today the technology rapidly develop and the scientific bases stand at the core of these technologies. I consider that joint cooperation will be important in performance of the scientific-research work, fulfillment of the innovative projects, application of the research work to the industry.

Then an agreement of intent “About joint activity in the field of the science and innovations application” was signed.

The agreement was signed by the president of ANAS, academician Akif Alizadeh and chairman of “Azersu” ASC Gorkhmaz Huseynov.

An agreement of intent “About joint activity in the field of the science and innovations application” considers definition of the actual scientific directions and strategical planning, building the water farming and sewerage systems, performing the scientific – research work in the field of establishement and exploitation again, application of the new technologies in this field, performing the research work with the purpose of prevention from an influence of the global climate changes on water supplies, ecdogy, increasing the theoretical and practical knowledge level of the cadre potential.

Within this cooperation preparation of the joint programs for the magisters, doctoral students and young specialists, holding of scientific events, publication ofscientific works, creation of the useful relations with the scientific centers of the foreign countries are planned.

Cooperation with ANAS in establishement of the Water Museum reflecting the water economy history will be great benefit.

Short essence of the work

To begin joint activity with the "Azersu" ASC and ANAS on the basis of the agreenebt of intent on 22 April 2015 a contract was signed between the institute of soil science and Agrochemistry of ANAS and "Azersu" ASC "Water canal" ETLI.

The contract was in a theme of "Investigation of the available ganat systems" and was fulfilled an the basis of the field research and cameral work. A one – month training course was held to study an available situation of the ganat, and also to prevent the problems which will be met and scientific knowledge on ganat before the research, then a consequence of the training of any research was controlled and the main lessons and trainings on the course were performed by participation of the correspondent member on ANAS, professor A.G.Guliyev's leadership and other hydrogeologists S.A.Huseynov, R.U.Abdulazimov, E.Rustamov and others.

The researches were complexly realized on the ganats in Gazakh, Tovuz, Shamkir, Ganja, Goygol, Samukh, Goranboy, Tartar, Aghdam, Barda, Yevlakh and Aghjabadi regions of Azerbaijan. Before the researches, where location of any ganat in the country, assessment of the place and state in an administrative rule was realized based on archive materials of the Minisrty of Ecology and Natural Resources of Azerbaijan Republic about 1938-40 y.

As a result, an exit of the determined ganat, the wells number was determined, water flow was measured, chemical analyses were performed by taken samples from water on the basis of the topographic plan:

The researches were performed on the basis of the new equipments (laser distance meter, GPS, mobile tods and tec), and new GIS technologies.

The regional exploitation resources of the underground waters is 23764.28000 m^3 according to the calculations performed in the Azerbaijan Republic in different years. From them 5689.6000 m^3/day were approved in state Resources Comission, 714.93000 m^3/day-in local Resources Comission.

According to the researches performed in the 40 th years of the last century 885 (according to informal sources till 1500) ganats were active in official registration of the Azerbaijan Republic. So, a length of 885 ganat blommeries was 721.008 km, a quantity of the review wells was 27850, water flow was 13.380 m^3/sec, the water bulk – 426.839 million.m^3during a year. The sloping foothill plains of Nakhchivan AR, Garabagh and Ganja-Gazakh are concerned the zones with the ganats of Azerbaijan. The main nourishment sources of the ganats in the Gazakh sloping plains are Aghstafachay, Hasansuchay, Tovuzchay, Zayamchay, Shamkirchay, Ganjachay and Kurakchay, natural and artificial water storages. These rivers formed debris cones in their flows. Since ancient times the population drilled ganats in debris cones and these waters were extracted. The number of the ganats used in the sloping foothill plains of Garagh and Ganja-Gazakh is 623, the lengths are 632.8 km, the wells number is 24776, water flow – 11.124 m^3/sec, water bulk – 350.806 million.m^3 during a year.

According to the agreement signed by "Azersu"ASC a main aim of the researches was to determine how much water is taken from them per second in a year, how many ganats were active at a time of water deficiency. The research group performed this mission and reported their observations, measurements and reported them to relevant authorities.

Economical evaluation of ganats. (as an example of Nakhchivan ganats)

The ganats value is appreciated for their water and cost of drilling. The labor cost spent for drilling of the ganat systems on Nakhchivan AR was appreciated by comparing with the available construction costs, consequently, the lowest value of the cost and bulk of the soil-boring work of the ganats inherited by our forefathers (11.689000 manats) was determined. The water number by today's values (that is, each 1000 m^3 of irrigative water is 0.50 manats, each 1 m^3 of the drinkable water is 0.14 manats), then we can see that the ganat water cost is 42.92000 manats, as irrigative water, but it is 12.01 million manats like drinkable water, we must protect and rationally use them. The information

reflecting an economical evaluation of the ganats in Nakhchivan AR was givenon in table 3.

If we take into account the monuments built on ganat systems, then a total cost of the resource remained from our forefathers can be more than 25-30 million manats. In this case why don't we own these monuments!

Table 27

Economical assessment of the ganats in Nakhchivan AR

Regions	Ganats number	Length of the ganat bloomeries,m	Wells number	Total drilling work bulk,m^3	Cost of the ganats, manat	Water supply ability mln.m^3	Unused water
Kangarli	181	55108	1869	73798	3763698	32.589	17.884
Ordubad	102	43708	1481	62691	3462855	17.878	11.019
Babak	68	44804	1586	63836	3064128	26.254	18.953
Julfa	31	12838	518	17500	875000	5.626	2.992
Sharur	15	5250	202	7472	358656	1.293	0.962
Shahbuz	10	2173	95	3313	165650	2.207	1.041
Total	**407**	**163881**	**5751**	**228610**	**1168998?**	**2930**	**3900**

Aaccording to the approximate calculations the costs quantity which will be spent for restoration and using of the ganat systems of Nakhchivan AR isn't more than 1.5-2 million. Then, the cost will be paid in a very short time, the changeability will be felt in the ecological system, an additional income source will be formed for tourism, the population will get an opportunity to use pure and clean water.

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Appendixes
Information of the ganats in the Azerbaijan Republic (1938-1941)

Number	Hydrogedogical region	Administrative region	Settlement	Ganat name	Absolute height in the ganat, m	Usage year	Covering of the ganat	Ganat length, m	Wells number	Depth of the head	Well, m	Kind of the watery horison	Age of the watery horisons QTV	Lithological content of the watery horisons	Depth of the low part in the watery horisons	Water expense, L/s.	Using of water	Technical state of the ganat
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Ganja-Gazakh	Aghstafa	Girili village, in the debris cone of the Hasansu river, near the secondary school	Girili		1938	Built in stone	2500	160	18,5	2,75	Without pressure	QTV	Pebble gravel	18,5	60,0	Drinkable water source and irrigation	A mouth of all the wells is covered, the ganat mouth is concreted, the around is boggy
2			Kalininkand south – west side, the left side of Baku Gazakh railway Vurghun	Kalininkand	370	1938	Built in stone	3500	150	28,0	2,08	Without pressure	QTV	Pebble gravel	28,0	15,0	Drinkable water source	A mouth of all the wells is covered
3	Ganja-Gazakh		In the west of Kirovka, in the vineyard, Baki-Gazakh rail-way, Hasansu	Kirovka	370	938	Built in stone	3850	102	24,0	2,5	Without pressure	QTV	Pebble gravel	24,0	23,0	Drinkable water source	A mouth of all the wells are covered, reservoir is built in the ganat exit, water is given to the settlements

4			In the south-west, in the debris cone of the Hasansu river	Goychali		1938	Built in stone	1800	26	100	2,8	Without pressure	QTV	Pebble gravel	10,0	35,0		A mouth of all the wells are covered, the surrounding is 250 x 150 x 5 of the ganat exit, boggy
5			In the west of Yukhari Goychali village, in the debris cone of the Hasansu river	Goychali		1938		650	15	8,5	2,1	Without pressure	QTV	Pebble gravel	8,5	12,0	Drinkable water source	Some wells of the ganat. The ganat flows to the Hasansu river. There is a need for repair
6			In the left side of Yovuz Boyuk Gishlag, in the right bank of the Asrikchay, at 6,0km distance from Ashaghi Gushchu village	Gushchu	480	1938	Built in stone	850	25	3,5	2,5	Without pressure	QTV	Chagil gravel	8,5	12,0	Irrigation	A mouth of the wells are covered, water flows into the Askirchay, there the water capacity is built, size is 250 x 150 x 5 meters
7	Ganja- Gazakh	Tovuz	In the northeast 6 km from Duz Girigli village, in the plce called Irami	Duz Girigli	260	1938	No capiage	800	-	-	-	Without pressure	Q_{TV}	Pebble gravel	26,0	-	Drinkable water source and irrigation	A mouth of all the wells in the ganat is open. The wells are bored with the excavator, wate is given by the canal for the various aim

8			On the left bank of the Tovuzchay, in the Yukhari Oksuzlu village	Nizami	550	1938		3500	100	12,0	1,8	Without pressure	Q_{TV}	Pebble gravel	12,0	20,0	Drinkable water source and LTV	A mouth of all the wells is closed. Water is gathered into the pool in the exit and is given to the wine plant and population by the pipe.
9	Ganja- Gazakh	Shamkir	Leninkand massive, Nizami street	Krant	460	1938	Is concreted	4000	70	25,0	2,75	Without pressure	Q_{TV}	Pebble gravel	25,0	m.y.	Drinkable water source	A mouth of the wells are covered with the concrete slabs. Water is gathered into the pool with the bulk of $6m^3$ and is given to the Leninkand massive
10			Leninkand massive, in the vineyard	Sadovaya	460	1938		4500	85	30,0	3,5	Without pressure	Q_{TV}	Sand	30,0	40,0	Irrigation	There is a pool with the size of 100 x 160 x 0.8m on the right bank of the Shamkir river on horizontal line o mouth of all the wells are closed
11	Ganja-Gazakh		In the west of the Kananli village	Dunyamalil r	170	1938		1500	45	10,5	2,3	Without pressure	Q_{TV}	Sand	10,5	18,0		A mouth of the wells are open

12			In the west of the Zayamjirdakhan village, in the west (3.0 km) from the village	Mukhtar	210	1938	Built in stone	2000	62	38,0	5,4	Without pressure	Q_{TV}		38,0	-		The ganat isn't active from 1985, some wells of the ganat are filled
13		Samukh	In the north-west of the Garabaghlar village	Behdud	20	1938		850	50	9,5	1,5	Without pressure		Sand	9,5	-	-	A mouth of all the wells are open, and population throw trash into them
14			In the vineyard between Ahmadbayli and Aghasibayli village	Dayirman	150	1938		2000	80	12,0	2,0	Without pressure		Sand	120	-	-	---- --
15	Ganja- Gazakh	Samukh	In the west of the Ahmadbayli village, near the forest	Uzun	150	1938		2000	101	35,0	2,8	Without pressure		Sand	35,0	-	-	
16			In the east of the lak village	Mammad Hasan	210	1938	Built in stone	1020	85	10,6	2,7	Without pressure			10,6	-	-	
17			Lak and Hajialili village (near the canteen)	Khara bash	220	1938		1109	72	7,8	2,4	Without pressure		Sand	7,8	-	-	
18			Between the Lak and Hajialilar village	Kalbala Allahverdi	220	1938		1869	100	8,5	4,5	Without pressure		Sand	8,5	-	-	Many wells of the ganat are filled, the ganat is inactive
19			In the south of the lak and Hajialili village	Aghbulag	220	1938		725	41	9,2	3,5	Without pressure		Sand	-	-	-	

20		Goranboy	In the west of the Balyand village	Khasta	650	m.y.	Built in stone	1000	15	30,0	3,9			Pebble sand	30,0	3,0	Drinkable water source	A mouth of the wells is closed
21	Garabagh, plain part of the Little Caucsus mountains	Jabrayil	In the west of Balyand village, foothill	Orta	440	m.y.	Built in stone	800	12	25,0	3,1			Pebble gravel	25,0	2,0		
22			Garajalli village, near the shop	Boyuk	400	m.y.	Built in stone	450	10	17,2	2,60	Without pressure	Q_{IV}	Pebble gravel	17,2	6,0		Many wells mouth is closed, a mouth of some wells is open and built in stone.
23			In the east of the Damulu village			m.y.		500	12	16,5		Without pressure			16,5	1,5		A mouth of all the wells is open. A sanitary zone is expected in the ganat exit.
24		Jabrayil	Suleymanli village, near the Department of Communication	Taza	290	1938	Built in stone	2500	45	40,0		Without pressure	Q_{IV}	Pebble gravel	40,0	12,0		A mouth of all the wells is closed
25			Suleymanli village, near the winter quarters	kekhiya	420	m.y.		2000	40	39,5		Without pressure		Pebble sand	39,5	0,5		A mouth of all the wells is closed, 18 wells are filled
26			Suleymanli village, in the zone with mulberry treets			m.y.	Built in stone	1200	2,5	23,0		Without pressure			23,0	6,0		A mouth of all the wells is closed
27			Suleymanli village, in the zone with mulberry treets (Aslan shah)	Gonulglar	600	m.y.	Built in stone	500	20	30,0		Without pressure		Pebble sand	30,0	10	Drinkable water source	A mouth of all the wells is closed.
28		Jabrayil	In the east of the Gishlag village	Boyuk	600	m.y.	Built in stone	1000	20	27,0		Without pressure		Pebble sand	27,0	12		a mouth of all the wells is closed

29			In the Gishlag village zone, in the north – west, in the vineyard	Taza	750	m.y.	Built in stone	600	15	8,0		Without pressure		Pebble sand	8,0	1,0		
30			in the north west, near the mubberry trees	Gosha Chinar	440	m.y.		1500	35	15,0		Without pressure		Pebble sand	15,0	4,0	Drinkabl water source and	a mouth of all the wells is closed
31			in the Guyjag village, in the grain area, near SMF	Horth	320	m.y.	Built in stone	2000	42	25,0		Without pressure		Pebble sand	25,0	23,0		a mouth of all the wells is closed
32			Guyjag village, in the vineyard, near the cemetery		330	m.y.		1500	30	18,0					18,0	7,0		
33	Garabagh, plain part of the little Caucasus mountains	Jabrayil	in the east of the Guyjag village	Sophular			Built in stone	10	11	12	13	Without pressure			17,2	3,0		
34			in the center of the Nuzgar village	Orta			Built in stone	1600	23	17,2		Without pressure		Pebble sand	16,5	6,0		
35			in the Nuzgar village, in the river	Ashaghi			Built in stone	850	15	16,5		Without pressure			20,0	5,0		a mouth of all the wells is closed there is a need for repair
36			in the west of the Shaybay village	Shaybay			Built in stone	800	12	20,0		Without pressure			15,0	5,0	Drinkable water source and irrigation	a mouth of the wells is closed
37			in the east of the Marjanli, in the vineyard near the poultry farm	Marjanli				850	15	15,0		Without pressure			18,0	25		a mouth of all the wells is closed. Water is given to the village and SMF by the pipe

38			in the east of the Amievarli village	Sulu dara			Built in stone	2000	43	18,0		Without pressure			20,0	15	Drinkable water source	
39	Garabagh, plain part of the little Caucasus mountains	Jabrayil	in the west Soltnli village	Jeyranpiyala			Built in stone	1650	26	20,0		Without pressure			20,0	5,0	Drinkable water source	a mouth of all the wells is closed
40			in the zone of Soltanli village near the Food supply Association	Topjag			Built in stone	2500	36	20,0		Without pressure		Pebble sand	18,5	1,5	Irrigation	
41			in the 6,0 km from Shahvalli village, in the vineyard	Chinarli			Built in stone	2500	35	18,5		Without pressure			15,7	15,0		
42			in the west of the Tinli village in the sowing area	Tinli			Built in stone	1500	30	15,7		Without pressure			17,6	20	Drinkable water source	
43			in the zone of Hovuslu village, near Chikhmagchay	Kolavat			Built in stone	1850	33	17,6		Without pressure			18,5	5,0	Drinkable water source	a mouth of all the wells is closed. A mouth of some is open and they are built with stone
44	Garabagh, plain part of the little Caucasus	Jabrayil	in the of zone Hovuslu village, in the vineyard	Khanbaghi	500		Built in stone	1200	25	20,0		Without pressure			20,0	15,0		a mouth of all the wells is closed

45			in the north-west of the Gushchular village				Built in stone	850	13	8,5	2,0	Without pressure			8,5	1,0		a mouth of all the wells is closed, a mouth of some wells is open and they are built with the stone
46			in the center of the Galajig village		400		Built in stone	500	12	15,0	2,4	Without pressure			15,0	6,0	Irrigation	
47			Jabrayil town, in the zone of the Guruchay	Chinar			Built in stone	3500	20	30,0	2,5	Without pressure			30,0	m.y.	Drinkable water source	Some wells mouth is closed. Some wells mouth is open and they are built with stone. Water is given to the town center by the pipe.
48	Garabagh, plain part of the little Caucasus mountains	Jabrayil	Jabrayil town, in the zone of Guruchay	Huseynagha	500		Built in stone	1250	28	40,0	3,6	Without pressure		Pebble sand	40,0	m.y.	Drinkable water source	The wells mouth is open, but they are built with stone
49			in the zone of Hajili village, in the memorial “Gorush”	Hajilar			Built in stone	2000	36	30,0	3,4	Without pressure		Pebble sand	30,0	4	Drinkable water source	a mouth of all the wells is closed.
50			in the east of the Hajili village	Najaflar	400		Built in stone	850	16	23,0	2,4	Without pressure		Pebble sand	23,0	3,0		
51			in the zone of the Hajili village, in the vineyard	Hesuynal			Built in stone	2500	45	40,0	2,5	Without pressure			40,0	8,0		

52			in the west of the Kavdar village, in the vineyard	Aghalar bay			Built in stone	900	17	18,5	3,2	Without pressure			18,5	-		a mouth of all the wells is open, built in stone
53			in the center of Kavdar	Balaca	380		Built in stone					Without pressure		Pebble sand	80,6	1,0		a mouth of a the wells is open, built in stone
54	Garabagh, plain part of the little Caucasus mountains	Jabrayil	in the zone of the Goyarchin Veysalli in the area of sowing				Built in stone	2000	38	17,3	2,8	Without pressure			17,3	-	Irrigation	a mouth of the wells is open, built in stone
55			in the north 1,5 km from Dajal village, in the vineyard				Built in stone	1200	30	-	-	Without pressure			-	-	Drinkable water source	all the wells are filled, water is given to the village by a pipe
56			in the west 1,0 km from Dajal village				Built in stone	400	5	-	2,4	Without pressure			-	-		a mouth of all the wells is open, the main is filled. Water is given to the village by the pipe
57			in the west of the Jafarabad village				Built in stone	1260	32	23,0	3,8	Without pressure			23,0	2,0	Drinkable water source	a mouth of the wells is open and they are built in stone
58	Garabagh, plain part of the little	Jabrayil	in the west of the Sharafsha village, near "Gosha Chinar"	Gosha chinar			Built in stone	1000	18	18,50	2,25	Without pressure			18,5	1,0	Drinkable water source	a mouth of all the wells is open,(4 wells work, the others are filled)

59			in the east of Balyand in the souring are				Built in stone	1000	22	20,0	2,4	Without pressure			20,0	1,0	-	a mouth of all the wells is closed
60			in the west of the Horovlu village	Horovlu valley			Built in stone	850	16	17,0	2,5	Without pressure			17,0	4,0	-	a mouth of all the wells is closed
61			in the zone of Horovlu village, in the mulberry trees	Orta			Built in stone	450	10	12,0	2,0	Without pressure			12,0	15,0	-	
62	Garabagh, plain part of the little Caucasus mountains	Jabrayil	in the zone of Horovlu village, near the Department of Communication	Galaba			Built in stone	500	13	16,0	2,5	Without pressure			16,0	6,0		The mouth of the wells is closed
63			in the south-west of Horovlu village	Gul Gasim			Built in stone	450	14	13,0	1,5	Without pressure			13,0	4,0	Irrigation	The mouth of is the wells open. Some wells re filled
64			in the zone of Horovlu village, in the sowing area	Bash			Built in stone	800	16	16,5	2,3	Without pressure			16,5	4,0	Drinkable water source and irrigation	The mouth of the wells is closed
65			in the zone of Horovlu village				Built in stone	1200	23	19,3	3,1	Without pressu			19,3	10,0		

66			in the vineyard of the Charakan village, near the Jabrayil-Fuzuli highway	Tavara			Built in stone	1000	32	20,0	3,5	Without pressure			20,0	3,5		The mouth of all the wells is open
67	Garabagh, plain part of the little Caucasus mountains	Jabrayil	near the medical station in the zone of Charakan village				Built in stone	500	12	8,60	2,0	Without pressure			8,6	8,0	Drinkable water source and irrigation	The mouth of all the wells is closed
68			in the east of the Papi village, in the mulberry garden				Built in stone	650	14	18,0	2,75	Without pressure			18,0	9,0	Drinkable water source and irrigation	The mouth of the wells is is open
69			in the east of Dash- Veysalli, in the vineyard	Asgar			Built in stone	1800	43	25,0	2,35	Without pressure			25,0	10,0	Drinkable water source and irrigation	The mouth of the wells is closed
70			in the east of Dash-Veysalli, in the yard					1000	28	28,0	2,9	Wit hout pres			28,0	10,0		
71			in the south-east of Dash-Veysalli, in the vineyard					1000	28	23,0	2,9	Witho ut pressu			28,0	10,0		
72			in the north of Dash-Veysalli, “Guruchay” zone	Kichik			Built in stone	800	20	20,0	3,2	Witho ut pressu			20,0	-		The mouth of all the wells is open
73	Garabagh, plain part of the little	Jabrayil	in the north of Dash-Veysalli, in the mulberry wood	Orta			Built in stone	550	15	18,0	2,75	Without pressure			18,0	25,0		

74			in the zone of Hasangaydi village				one well is built with stone	50	20	-	1,95	Without pressure			-	0,3		The mouth of the well is open, one well is slosed.
75			in the north-west of Fuganli village, in the cornfield				Built in stone	2000	28	21,5	3,2	Witho ut pressu			21,5	3,0		all the wells are opened and are capiage
76			in the north-west of Fuganli village, in the corn-field	Fuganli				300	-	7,6	-	Without pressure			-	-		During the registration, the wells are cleaned and repaired.
77			in the Fuganli center				Built in stone	250	6	5,1	2,6	With out press			8,1	-		all the wells are open
78	Garabagh, plain part of the little Caucasus mountains	Jabrayil	in the zone of the Fuganli village, nea the poultry farm				Built in stone	600	12	18,1	3,2	Witho ut pressu			18,1	-		
79			in the west of Veysalli village, in the vineyard	Orta			Built in stone	1800	17	12,5	2,8	With out press			12,5	7,0	Drinkable water source	
80			in 2,0 km south-east from Ashaghi Veysalli	Soltanli	160		Built in stone	400	8	8,65	2,0	Without pressure		Pebble sand	8,65	5,0	Drinkable water source and irrigation	All the wells are open
81			in the east of the Dilagharda village, near the secondary school				Built in stone	500	10	10,75	108	Without pressure		Pebble sand	10,75	1,0	Drinkable water source	Some wells are closed, some wells are open
82			in the east of the Ishigli village	Ishig li	680		Built in stone	1000	20	6,5	2,3	With out press		Pebble sand	6,5	3,0	Drinkable water source	Some wells are closed

83	Garabagh,plain part of the little Caucasus mountains	Jabrayil	in the east of the Yukhari Abdurrahmanli village	Mashadi Sharif			Built in stone	400	14	11,5	3,5	Without pressure			11,5	1,5	Drinkable water source	all the wells are open, there is a need for closing and cpiage
84			in the west of the Kurdar village, in the sowing areas	Mehdi Bay	460			1800	39	24,0	7,0	Without pressure		Pebble sand	24,0	3,0	Drinkable water source	all the wells are open, there is a need for repair and cpiage
85			in the west 2,0 km from Ashaghi Abdulrahmanli	Ahmad Ali				2000	18	15,6	2,5	Without pressure			15,6	4,0		all the wells are open, there is a need for repair and cpiage
86	Garabagh, plain part of the little Caucasus mountains	Fuzuli	in the west of Horadiz vil	Namazli		m.y.		1500	25	12,0	2,5	Without pressure			12,0	3,0		
87			in the west of Horadiz vil, in the mulberry garden	Topa	260	m.y.		800	18	8,60	2,2	Without pressure		Pebble sand	8,60	10	Drinkable water source and irrigation	Some wells are open, there is a need for repair and capiage
88		Fuzuli	in the northwest, of Horadiz, near the “Dordchinar” garden	Khan		m.y.		600	12	6,5	2,5	Without pressure			8,5	7,0		

89			in the west of Horadiz, nea the cementry	Yenija		m.y.	Built in stone	850	2,0	11,0	2,5	Without pressure			11,0	3,5	Drinkable water source and irrigation	Some wells are open
90			in the center of Horadiz	Gurdlu		m.y.	Built in stone	150	3	6,0	0,80	Without press			6,0	1,0	Drinkable water source	all the wells are closed
91			in the west of Garamammadli	Garabulag	450	m.y.	Built in stone	250	5	-	4,0	Without pressure		Pebble sand	-	30,0	Drinkable water source	all the wells are closed, 4 wells are filled
92			in the north west of Yukhari Yaghlavand, near the Pump industry			m.y.	Built in stone	500	20	16,75	2,5	Without pressure			16,75	8,0	Drinkable water source	all the wells are open, there is no stone building
93	Garabagh, plain part of the little Caucasus mountains	Fuzuli	in the west of Garvand vil near the school	Garvand	300	m.y.	Built in stone	1200	12	12,0	3,25	Without pressure			12,0	15,0	Drinkable water source	Some wells are open, the mouth of the main wells is closed
94			in the west of Khalafisha, at foothil	Goruglar	600	m.y.	Built in stone	800	13	10,5	2,6	Without pressure		Pebble sand	10,5	1,0		all the wells are closed
95			in the south wst of Khalafisha	Ashaghi		m.y.	Built in stone	700	12	8,0	3,0	Without pressure			8,0	0,5		all the wells are closed. The sanitation isn't followed in the ganat exit

96			in the center of Garghabazari vil	Boyuk			Built in stone	1000	35	20,0	7,0	Without pressure			20,0	4,0	Drinkable water source	all the wells are closed, except one well, they are built in stone
97			in the west of Garghabazari, in the zone called “Juvrli”, near the old cementry	Najafli		m.y.	Built in stone	500	10	15,0	3,5	Without pressure			15,0	4,0		
98	Garabagh, plain part of the little Caucasus mountains	Fuzuli	in the west of Yal- Pirahmdli, in the place called “Argunash’	Boyuk		m.y.	Built in stone	980	30	22,0	3,5	Without pressure			22,0	10,0	Drinkable water source	all the wells are closed. Satitation isn’t foolowed in the ganat exit
99			in the west of Yal- Pirahmdli, in the place called “Argunash’	Bala		m.y.	Built in stone	1000	25	28,0	6,0	Without pressure			28,0	3,0	Drinkable water source	all the wells are closed
100			in the east of the Sardarli village	Islam Rzayev	500	m.y.	Built in stone	1000	36	-	-	Without pressure			-	-		all the wells are filled. The ganat isn’t factually active
101			in the center of Gochahmadli vil.	Chinarbulag	800	m.y.	Built in stone	300	20	16,0	6,2	Without pressure		Pebble sand	16,0	6,0	Drinkable water source and irrigation	all the wells are filled. The ganat isn’t factually active

102			in the west of Gochahmadli vil.	Shirlan	75	m.y.	Built in stone	650	18	12,0	6,5	Without press		Pebble sand	12,0	5,0	Drinkable wate	
103			in the west of Arash vil.	Alish		m.y.	Built in stone	500	15	12,8	5,1	Without press		Pebble sand	12,8	1,0		
104	Garabagh, plain part of the little Caucasus mountains	Fuzuli	Garakollu vil. “Saradja” place	Dali		m.y.	Built in stone	2500	50	13,5	2,75	Without pressure			13,5	12,0	Drinkable water source	all the wells are open, but the main wells are closed
105			in the west of “Saradja”			m.y.	Built in stone	600	30	12,0	2,3	Without pres			12,0	8,0		all the wells are closed
106			Yukhari Pirahmadli vil. foothill			m.y.	Built in stone	1350	25	12,5	2,5	Without press			12,5	11,0	Drinkable wate	all the wells are closed
107			in the center of Ashaghi Pirahmadli vil.	Kohna		m.y.	Built in stone	1500	23	2,87	11,5	Without pressu			11,5	8,0	Irrigation	al the wells are closed except some wells
108			in the east of Pirahmadli vil.			m.y.	Built in stone	1000	20	10,0	2,4	Without press			10,0	5,0	Drinkable wate	Many of the wells are open
109			in the east of Gorazilli, near the Fuzuli-Hadrud highwy, in the vineyard	Hajishukur	540	m.y.	Built in stone	1800	27	10,5	3,1	Without pressure			10,5	13,0	Drinkable water source	all the wells are closed
110		Fuzuli	in the east of Khatunbulag	Bash		m.y.	Built in stone	200	2	12,0	3,4	Without pres			12,0	1,0		
111			in the east of Khatunbulag	Orta		m.y.	Built in stone	60	2	9,0	2,1	Without pres			9,0	0,5		all the wells are closed
112	Garabagh	Yevlakh	in the zone of Malbinasi vil.	Kozu	540	m.y.	Built in stone	00	00	000	00				00	00	00	00

113			in the Samadabad vil.	Haji Bay	30	m.y.	Built in stone	709	50	4,1	-	Without pres		Pebble sand	-	-	-	-
114			in the Islamabad vil.	Mitt ishli		m.y.	Built in stone	-	-	-	-	Without pres			-	-	-	-
115			in the Islamabad vil.	Ism ayil	26	m.y.	Built in stone	1140	67	10,0		Without pres		Pebble sand	10,0		-	-
116			in the Kolun vil.	K ol	45	m.y.		513	32	m.y.		W ith ou		Pebble sand	m.y.		-	-
117		Yevlakh	in the Kolun vil.	K ol		m.y.		-	-	-		W ith ou					-	-
118			in the Goyunbinasi	H aji	50	m.y.		958	64	5,4		W ith ou		Pebble sand	-	-	-	-
119	Garabagh, plain part of the little Caucasus mountains	Tatar	in the north-east of Garagoyunlu vil	Gar ago	50	m.y.		730	45	8,0		Without pres		Pebble sand	8,0	-	-	-
120			in the south east of Eloghlu vil.	Sal man	100	m.y.		359	14	8,7		Without pres		Pebble sand	8,7	-	-	-
121			3,0 km south east from Gazakhlar vil	Shu kur	65	m.y.		1143	61	10,0		Without pres		Pebble sand	10,0	-	-	-
122	Garabagh, plain part of the little	Barda	in the south west of Yukhari Mammadli	Mammadli		m.y.		-	-	-		Without pressure			-	-	-	-

123			in the south west of Shirvanlikand	Gobu	65	m.y.		409	23	6,0		Without pressure		Pebble sand	6,0	-	-	-
124			in the north-east of Shirvanli vil	Bala	70	m.y.		392	24	4,0		Without pressure		Pebble sand	4,0	-	-	-
125			in the north west of Tazakand	Tulkuuzlu	70	m.y.		450	28	2,7		Without pressure		Pebble sand	2,7	-	-	-
126			in the south of Tazakand	Ughur bay		m.y.		-	-	-		Without pressure			-	-	-	-
127			in the Ughurbayli vil.	Jamaat	70	m.y.		880	49	45		Without pressure		Pebble sand	4,5	-	-	-
128	Garabagh, plain part	Barda	2,5 km south west from Tazakand vil	Jomgoni	-	m.y.		-	-	-		Without pressure			-	-	-	-

129			between the Lambaran and Hasili vil.	Haji Gara		m.y.		-	-	-		Without pressure			-	-	-	-
130			in the Hasili vil	Vali		m.y.		-	-	-		Without pressure						
131			in the south-west of Garadamirli	Fuatli		m.y.		-	-	-		Without pressure						
132			in the north east of Soghanverdilar vil	Soghanverdilar		m.y.		-	-	-		Without pressure			-	-	-	-
133			in the north west of garadamirli vil.	Muslum	80	m.y.		965	53	9,0		Without pressure		Pebble sand	-	-	-	-
134			in the south east of Garadamirli vil.	Zulfuqarli	30	m.y.		1669	87	6,5		Without pressure		Pebble sand		-	-	-
135			in the south west of Kovrak vil.	Asgar	50	m.y.		840	48	9,7		Without pressure		Pebble sand	9,0	-	-	-

136	Garabagh, plain part of the little Caucasus mountains	Barda	in the south west of Hasanli	Shaban		m.y.		-	-	-		Without pressure			6,5	-	-	-
137			in the south west of Hasanli	Bayram	50	m.y.		657	39	6,8		Without pressure		Pebble sand	9,7	-	-	-
138			in the Imirli vil.near the scholl	Mirza Ahmad	90	m.y.		1035	46	10,0		Without pressure		Pebble sand	-	-	-	-
139			in the Khanarab, vil	Nakhibli		m.y.		-	-	-		Without pressure			6,8	-	-	-
140			in the south west of Khanarab, vil.	Imirli-1	90	m.y.		818	40	7,0		Without pressure		Pebble sand	10,0	-	-	-
141			in the north east of Imirli vil	Seyidli	90	m.y.		863	34	9,0		Without pressure		Pebble sand		-	-	-
142			in the north east of Khanarab	Jamal	90	m.y.		1250	54	10,5		Without pressure		Pebble sand	7,0	-	-	-

143			in the north east of Khanarab	Amir Ali	90	m.y.		1356	49	8,8		Without pressure		Pebble sand	9,0	-	-	-
144	Garabagh, plain part of the little Caucasus mountains	Barda	in the north-west of Shafarli, vil.	Amir Ali		m.y.		-	-	-		Without pressure			10,5	-	-	-
145			in the Imirli vil.	Imirli		m.y.		-	-	-		Without pressure			8,8	-	-	-
146			in the north of Daymadaghli vil.	Musur Bay		m.y.		-	-	-		Without pressure			-	-	-	
147			in the north-east of Gahramanli vil	Gahramanli	210	1932		1333	80	11,5		Without pressure		Sand	-	-	-	-
148	Garabagh, plain part	Aghdam	in the Hasanli vil.		m.y.			-	-	-		Without pressure			-	-		

149			in the south-east of Bash-Garvand vil. In the right of Baki-Khankandi railway	210	1938		Built in stone	1300	27	24,0	4,0	Without pressure		sand	24,0	80		
150	Garabagh, plain part of the little Caucasus mountains	Aghdam	in the west of the Bash-Garvand vil, on the right bank of Khachinchay		m.y.		no capiage	800	17	14,0	3,0	Without pressure		Pebble sand	14,0	60		
151			in the south-east of Bash-Garvand vil. On the right of Baki-Khanhandi		m.y.		no capiage	1800	27	17,0	3,0	Without pressure			17,0	78		
152			in the east of Bash-Garvand vil.	170	m.y.			800	13	12,0	3,0			Pebble sand	12,6	30		
153			on the right of the Aghdam Shiragli soil way		m.y.			600	11	9,65	3,5	Without pressure			9,65	5,0		
154			in the Bash-Garvand vil, (in the east) in the sowing area of “Bayramlar”	170	m.y.			800	14	11,8	3,85	Without pressure		Pebble sand	11,8	2,0		
155	Garabagh, plain part of	Aghdam	in the Garvand zone, in the mulberry wood	175	m.y.			1153	35	17,6		Without pressure		Pebble sand	17,6	-		

156			in the Mirhasanlivil.	175	m.y.			1386	61	14,8		Without pressure		Pebble sand	14,8			
157			in the Orta Gishlaq vil.	175	m.y.			757	22	14,2		Without pressure		Pebble sand	14,2			
158			Ahmadaghali 1.5 km south-west		m.y.		Built in stone	350	9	15,6	4,0	Without pressure		Pebble sand	15,6	15,0		
159			aside the Ahmadaghali village	160	m.y.		Built in stone	800	15	17,0	4,0	Without pressure		Pebble sand	17,0	10,0		
160	Garabagh, plain part of the little Caucasus	Aghdam	aside the Ahmadaghali vil.	Khan Ahmad	160	m.y.	Built in stone	450	12	13,65	3,5	Without pressure		Pebble sand	13,65	8,0		
161			2,0 km east from Ahmadghali village	Gozlu		m.y.	Built in stone	500	12	15,85	4,35	Without pressu			15,85	8,0		

162			1,0 km south of the village	Sakhbay	150	m.y.		1047	44	11		Without pressure		Pebble sand	11,0			The ganat is dehydrated because the water intensively given to the subartesian vells
163			in the south west of Yuzbashi vil	Haydar	270	m.y.		2240	57	42,0		Without pressure		Pebble sand				The ganat is dehydrated because the water intensively given to the subartesian vells
164			in the south of Mirashanli	Shamsi	150	m.y.		406	16	9,5		Without pressure		Pebble sand				The ganat doesn't factually work, mny of the wells are filled
165			1,5 mk east of Khindiristan vil.	Gul Oghlan	150	m.y.		350	9	15,6	3,5	Without pressure		Pebble sand	15,6	10,0	irrigation	some wells are open, sanitation is followed, 6 of the wells are filled
166	Garabagh, plain part of the little	Aghdam	2,0 km south-east of Khindiristn	Hayvali	110	m.y.	Built in stone	500	10	12,8	3,5	Without pressure		Pebble sand	12,8	8,0	irrigation	some wells are open, sanitation is followed, 6 of the wells don't work

167			Mirashanli	Huseyn Khan	160	m.y.		1101	36	15,0		Without pressure		Pebble sand	10,0			This ganat doesn't factually work, many wells are filled
168			in the place called Pashabayli	Pashabayli	110	m.y.		1488	69	12,0		Without pressure		Pebble sand	8,0			The ganat is dehidrated, because the water is intensively given to the subartesian wells
169			1,5 km east of Bahadirli vil.	Chinar	180	m.y.	Built in stone	250	11	8,65	2,5	Without pressure		Pebble sand	8,65	6,0	irrigation	Som wells are closed, sanitation is followed
170			in the Uchoghlan village	Gara su	110	m.y.		300	-	-		Without pressure			-	8,0	Drinkable water source	Some wells are closed, some are filled
171			in the sovkhoz named after Former socialism	Alibayli	206	m.y.		1273	41	18,5		Without pressure		Pebble sand	-	-	-	-
172	Garabagh, plain part of the little Caucasus	Aghdam	in the sovkhoz named after Former socialism	Jamaat	120	m.y.		1563	70	13,0		Without pressure		Pebble sand	-	-	-	-
173			Sari Janli	Farhad bay	170	m.y.		820	34	14,3		Without pressure		Pebble sand	-	-	-	-

174			in the north-west of Baharli vil	Valibay	180	m.y.		331	10	6,8		Without pressure		Pebble sand	-	-	-	-
175			in the east of Baharli vil	Islam	170	m.y.		453	17	10,8		Without pressure		Pebble sand	-	-	-	-
176			Boyuk bayli	Ibish bay	110	m.y.		408	19	7,4		Without pressure		Pebble sand	-	-	-	-
177			in the south-west of Boyukbayli	Boyuk Bina	110	m.y.		408	19	7,4		Without pressure		Pebble sand	-	-	-	-
178			in the zone of Baharli	Dayirma n	180	m.y.		615	29	9,0		Without pressure		Pebble sand	-	-		-
179			in the north-east of Yusifli vil	Eshg Abdal	145	m.y.		246	8	7,0		Without pressure		Pebble sand	-	-		-
180	Garabagh, plain part of the little Caucasus	Aghdam	in the east of Sarichoban (Sarijali)	Sari Chobn	60	m.y.		1951	73	120		Without pressure		Pebble sand	-	-	-	-
181			in the south of Eyvazli vil			m.y.		-	-	-		Without pressure			-	-	-	-

182			in the Guzanli 200 m east of Sarijali	Salehbay	70	m.y.		1106	45	8,6		Without pressure		Pebble sand	-	-	-	-
183			in the south-west of Guzanli vil	Salehbay	-	m.y.		-	-	-		Without pressure			-	-	-	-
184			in the south-west of Guzanli	Bala	170	m.y.		1409	51	14,0		Without pressure		Pebble sand	-	-		-
185			2,0 km south-west of Guzanli	Davud ushaghi	120	m.y.		1184	68	14,2		Without pressure		Pebble sand	-	-	-	-
186			in the north-west of Chinli vil. Near the school	Davud ushaghi	-	m.y.		-	-	-		Without pressure			-	-	-	-
187			200 m north of Chinli vil.	Davud ushaghi	-	m.y.		-	-	-		Without pressure			-	-	-	-
188	Garabagh, plain part of the little Caucasus	Aghdam	10,0 km west of Guzanli	Ahad bay	70	m.y.		2290	99	14,8		Without pressure		Pebble sand	-	-	-	-
189			in Guzanli	Garasu	120	m.y.		1781	73	8,6		Without pressure		Pebble sand	-	-	-	-

190			in Guzanli	Jamaat	70	m.y.		88	49	45		Without pressure		Pebble sand	-	-	-	-
191			in the south-west of Afatil vil	Huseyn Alibay	200	m.y.		1019	40	M.y.		Without pressure		Pebble sand	-	-	-	-
192			in the north west of Afatil vil.	Mammad Hasan	-	m.y.		-	-	-		Without pressure			-	-	-	-
193			in Mazrali	Jamaat	70	m.y.		571	30	5,0		Without pressure		Pebble sand	-	-	-	-
194			in Saybali vil.	Huseyn bay	210	m.y.		1962	67	25,0		Without pressure			-	-	-	-
195			Baghbanlar vil.	Muradbayli	260	m.y.		200	10	3,0		Without pressure		Pebble sand	-	-	-	-
196	Garabagh, plain part of	Aghdam	in the south of Muradbayli	Muradbayli	-	m.y.		-	-	-		Without pressure		Pebble gravel	-	-	-	-

197			in the north-east of Novruzlu vil.	Mashadi Abbas	340	m.y.		1971	73	9,7		Without pressure		Pebble gravel	-	-	-	-
198 199			800 m north-west of № section, in the Former natavan sovkhoz	Khuday bay	180	m.y.		1917	75	16,3		Without pressure		Pebble gravel	-	-	-	-
200			in the south of Gulabli	Bala ganat	260	m.y.	Built in stone	1899	43	18		Without pressure			-	-		-
201			in Gulabli vil.	Povlu		m.y.	Built in stone	800	21	19,5	3,5	Without pressure		Pebble gravel	19,5	3,0	Drinkable water source	all the wells are closed, sanitation is followed
202			in Gulabli vil.	Boyuk	1000	m.y.	Built in stone	750	19	23,0	4,6	Without pressure		Pebble gravel	23,0	23,0	Drinkable water source	all the wells are closed, sanitation is followed

203	Garabagh, plain part of the little Caucasus mountains	Aghdam	in the east of Abdal Gulabli	Gara dash	1000	m.y.	Built in stone	750	19	23,0	4,6	Without pressure		Pebble gravel	23,0	23,0	Drinkable water source	all the wells are closed, sanitation is followed
204			in the east of Abdal Gulabli	Boyuk	750	m.y.	Built in stone	600	13	18,75	3,0	Without pressure			18,75	6,0	Drinkable water source	all the wells are closed
205			Abdal-Gulabli village	Garun bulag		m.y.	Built in stone	600	15	16,8	3,0	Without pressure		Pebble gravel	16,2	20,0	Drinkable water source	all the wells are open
206			in the east of Abdal Gulabli	Jamaat	750	m.y.	Built in stone	307	13	9,4		Without pressure			12,0	4,0	Drinkable water source	all the wells are open
207			Abdal Gulabli	Salmanlar		m.y.	Built in stone	800	23	21,75	4,0	Without pressure		Pebble gravel	21,75	5,0	Drinkable water source	all the wells are open, sanitation is followed

208			Gulyasli vil.	Novlu		m.y.	Built in stone	550	12	20,65	3,75	Without pressure		Pebble gravel	20,65	3,0	Drinkable water source	all the wells are open
209	Garabagh, plain part of the little Caucasus mountains	Aghdam	Gulabli vil. near the Abdullayev Bayram's house	Bala		m.y.	Built in stone	850	12	19,5	2,0	Without pressure		Pebble gravel	19,5	3,0	Drinkable water source	all the wells are open
210			Gulabli village	Aghadijan	1050	m.y.	Built in stone	500	10	10,0	5,5	Without pressure		Pebble gravel	10,0	3,0	Drinkable water source	all the wells are open
211			Abdal village near the school	Bala	1000	m.y.	Built in stone	650	16	12,0	1,5	Without pressure		Pebble gravel	12,0	4,0	Drinkable water source	all the wells are open
212			in the north of Gulabli	Baza	750	m.y.	Built in stone	300	7	15,0	2,0	Without pressure			15,0	1,0	Drinkable water source	all the wells are closed

213			in the east of Garabaghlar village	Dolayi bulag		m.y.	Built in stone	500	11	7,0	1,5	Without pressure			7,0	2,0	Drinkable water source	all the wells are open
214	Nakhchivan	Sharur	Garabaghlar village	Agh gol		m.y.	Built in stone	150	4	5,0	1,5	Without pressure			5,0	3,0	Drinkable water source	all the wells are open
215			Garabaghlar vil, near the cattle breeding complex	Gochagha		m.y.	Built in stone	200	5	7,0	2,8	Without pressure			7,0	4,0	Drinkable water source	all the wells are open
216			soil between Garabaghlar and Chalkhangala-Khok-near the road	Khirda gochagha-		m.y.	Built in stone	130	4	5,0	1,35	Without pressure			5,0	5,0	Drinkable water source	all the wells are open
217			Garabaghlar, soil between Chalkhangala-Khok villages, near the road	Khirda-Gochagha		m.y.	Built in stone	90	4	4,5	1,2	Without pressure			4,5	2,0	Drinkable water source	all the wells are open
218			2,0 km west of Garabaghlar at foothill of “Palang” mountain	Tahirl1		m.y.	Built in stone	150	5	7,0	1,8	Without pressure			7,0	4,0	Drinkable water source	all the wells are open
219	Nakhchivan	Sharur	2,0 km west of Garabaghlar at the foothill of “Palang” mountain	Tahirli-2		m.y.	Built in stone	70	4	3,5	2,0	Without pressure			3,5	3,0	Drinkable water source	all the wells are open

220			in Garabaghlar village	Aghagol		m.y.		120	6	7,0	2,1	Without pressure			7,0	5,0	-	-
221			in Garabaghlar village	Aghalig		m.y.		-	-	-		Without pressure			-	-	-	-
222			in Garabaghlar village	Mammad Hasan		m.y.						Without pressure			-	-	-	-
223			in Garabaghlar village	Gasim		m.y.						Without pressure			-	-	-	-
224			in Garabaghlar village	Aghbulag		m.y.						Without pressure			-	-	-	-
225			in Garabaghlar village	Haji Najaf		m.y.						Without pressure			-	-	-	-
226	Nakhchivan	Sharur	in Garabaghlar village	Javad		m.y.									-	-	-	-

227			in Garabaghlar village	Hali Karim boyuk		m.y.						Without pressure			-	-	-	-
228			Garabaghlar village	Haji Karim kichik		m.y.						Without pressure			-	-	-	-
229			Garabaghlar village	Aghabay		m.y.						Without pressure			-	-	-	-
230			Garabaghlar village	Huseyngulu		m.y.						Without pressure			-	-	-	-
231			Garabaghlar village	Panah		m.y.						Without pressure			-		-	-
232			Garabaghlar village	Mashadi Karim		m.y.						Without pressure			-	-	-	-

233	Nakhchivan	Sharur	Garabaghlar village	Mashhadi Karim		m.y.						Without pressure			-	-		
234			Garabaghlar village	Gulmammad		m.y.						Without pressure	-		-	-	-	-
235			Garabaghlar village	Ulu		m.y.						Without pressure	-		-	-	-	-
236			Garabaghlar village	Boyuk gol		m.y.						Without pressure	-		-	-	-	-
237			Garabaghlar village	Baydilli		m.y.						Without pressure	-		-	-	-	-
238			Garabaghlar village	Soltan		m.y.						Without pressure	-		-	-	-	-

239			Garabaghlar village	Nalband		m.y.						Without pressure	-		-	-	-	-
240	Nakhchivan	Sharur	Garabaghlar village	Bostanlar		m.y.						Without pressure	-		-	-	-	-
241			Garabaghlar village	Boyuk Ala		m.y.						Without pressure	-		-	-	-	-
242			Garabaghlar village	Abbas gulu		m.y.		300	10	5,0	2,1	Without pressure	-		5,0	5,0	Suvarma	-
243			Garabaghlar village	M.Ibrahim		m.y.		350	11	6,5	2,3	Without pressure	-	-	6,5	4,0	Suvarma	-
244			Garabaghlar village	Suleymanli		m.y.		200	6	5,0	2,0	Without pressure	-	-	5,0	4,0	Suvarma	-

245			Garabaghlar village	Mashhadi Alasgar		m.y.		750	20	20,0	3,2	Without pressure	-	-	20,0	25,0	Suvarma	-
246			in the east of Givrag vil.	Sharl chiman		m.y.	Built in stone	800	22	20,5	3,5	Without pressure	-	-	20,5	7,0	Suvarma	-
247	Nakhchivan	Sharur	in the east of Givrag vil.	Sharur		m.y.	Built in stone	850	23	21,75	2,9	Without pressure			21,75	15,0	irrigation	
248			in the zone of Givrag village	Gazan-chikhan		m.y.	Built in stone	950				Without pressure			3,25		irrigation	
249			in Givrag village	Haji Hasan-1		m.y.	Built in stone					Without pressure					irrigation	
250			on the left of Givrag – Sharur higway	Haji Hasan-2		m.y.	Built in stone	-				Without pressure			-		irrigation	
251			on the left of Givrag – Sharur higway	Kalbi Mammad		m.y.	Built in stone	-				Without pressure			-		irrigation	

252			in the vineyard with Number 5 brigade on the right of Givrag-Pusyan highwa	Gara bulag		m.y.	Built in stone	-							-		irrigation	all the wells are open
253			in Givrag village	Dashli bulag		m.y.		-				Without pressure			-			
254	Nakhchivan	Sharur	in Givrag village	Abal		m.y.		-				Without pressure			-			
255			in Givrag village	Tikanli		m.y.		-				Without pressure			-			
256			in Givrag village	Khrida Abbas		m.y.		-				Without pressure			-			
257			in Givrag village	Kalbi Musa-2		m.y.		-				Without pressure			-			
258			in Givrag village	Kalbi Isak		m.y.		-				Without pressure			-			

259			in Givrag village	Alakbar oghlu		m.y.		-				Without pressure			-			
260			in Givrag village	Mashadi Ali		m.y.		-				Without pressure			-			
261	Nakhchivan	Sharur	in Givrag village	Shikali		m.y.		-				Without pressure			-			
262			in Givrag village	Kudaverdi		m.y.		-				Without pressure			-			
263			in Givrag village	Javid		m.y.		-				Without pressure			-			
264			in Givrag village	Kalbi Musa		m.y.		-				Without pressure			-			

265			in Givrag village	Boyuk Abbas		m.y.		-				Without pressure			-			
266			in Givrag village	Haji Yusif		m.y.		-				Without pressure			-			
267			in Givrag village	Khirda Khan-1		m.y.		-				Without pressure			-			
268	Nakhchivan	Sharur	in Givrag village	Khirda Khan-2		m.y.		-				Without pressure			-	-		
269			in Givrag village	Boyukchay		m.y.		200				Without pressure			3,5	-		
270			in Givrag village	Haji Jafar	t	m.y.		350				Without pressure			4,5	3,0		

271			in Givrag village	Aliagha		m.y.		300				Without pressure			3,45	4,0		
272			in Givrag village	Niftali		m.y.		150				Without pressure			3,5	2,0		
273			2,0 km east of Shahtakhi village	Bostanlar golu-1 (lake)		m.y.	Built in stone	400				Without pressure			7,8	12,0		
274			in the south-east of shahtakhti	Bashgol-1		m.y.						Without pressure				-	irrigation	the swamp with 6 x 8 m size is formed in the ganat exit
275	Nakhchivan	Sharur	in the south-east of shahtakhti	Pirbulag		m.y.		-	-	-	-	Without pressure			-	-	irrigation	the swamp with 6 x 8 m size is formed in the ganat exit
276			2,5 km east of Shahtakhti	Boyk gol-1		m.y.		-	-	-	-	Without pressure			-	-	irrigation	there is artificial water capacity in (100x80)m size in the ganat exit

277			in the sowing area of Shahtakhti village	Bostanlar golu-2		m.y.		-	-	-		Without pressure			-	-		
278			in the sowing area of Shahtakhti village	Boyuk gol-2		m.y.		-	-	-		Without pressure			-	-		
279			in the sowing area of Shahtakhti village	Boyuk chay		m.y.		-	-	-		Without pressure			-	-		
280			in the sowing area of Shahtakhti village	Sarin bulag		m.y.		-	-	-		Without pressure			-	-		
281			in the sowing area of Shahtakhti village	Kabla Ismayil		m.y.		-	-	-		Without pressure			-	-		
282	Nakhchivan	Sharur	in the sowing area of Shahtakhti village	Aghamaham mad		m.y.		-	-	-		Without pressure			-	-		
283			in the sowing area of Shahtakhti village	Molla Abdulla		m.y.		-	-	-		Without pressure			-	-		

284			in the sowing area of Shahtakhti vil.	Haji Gasim		m.y.		-	-	-		Without pressure			-	-		
285			in the sowing area of Shahtakhti vil.	Mehdi		m.y.		-	-	-		Without pressure			-	-		
286			in the sowing area of Shahtakhti vil.	Kand		m.y.		-	-	-		Without pressure			-	-		
287			in the sowing area of Shahtakhti vil.	Sarali		m.y.		-	-	-		Without pressure			-	-		
288			in the sowing area of Shahtakhti vil.	Haji Najaf-1		m.y.		-	-	-		Without pressure			-	-		
289	Nakhchivan	Sharur	in the sowing area of Shahtakhti vil.	Haji Najaf-2		m.y.		-	-	-		Without pressure			-	-		
290			in the sowing area of Shahtakhti vil.	Haji Najaf-3		m.y.		-	-	-		Without pressure			-	-		

291			in the sowing area of Shahtakhti vil.	Molla Farai	940	m.y.		79	3	8,0		Without pressure			-	-		
292			in the sowing area of Shahtakhti vil.	Gulam Ali		m.y.		-	-	-		Without pressure			-	-		
293			in the sowing area of Shahtakhti vil.	Abbas Ali		m.y.		-	-	-		Without pressure			-	-		
294			in the sowing area of Shahtakhti vil.	Shivli-1		m.y.		-	-	-		Without pressure		pebble gravel	-	-		
295			in the sowing area of Shahtakhti vil.	Ali Huseyn		m.y.		-	-	-		Without pressure			-	-		
296	Nakhchivan	Sharur	in the sowing area of Shahtakhti vil.	Haji Allahved	830	m.y.		450	10	8,0	1,1	Without pressure			8,0	8,0		
297			in the sowing area of Shahtakhti vil.	Molla Jafar-1		m.y.		600	18	8,5	1,3	Without pressure			8,5	3,0		

298			in the sowing area of Shahtakhti vil.	Molla Jafar-2		m.y.	built in stone	600	16	7,85	1,5	Without pressure			7,85	1,0		
299			Khok village	Kand bulag		m.y.	built in stone	750	20	9,0	1,75	Without pressure		Travertine	9,0	6,0	Drinkable water source	all the wells are open
300			Khok village, near the storehouse	Mirzalilar-2	1200	m.y.	built in stone	500	12	6,8	1,6	Without pressure			6,8	4,0	Drinkable water source	all the wells are open
301			Khok village, near the old mill	Isak		m.y.	built in stone	550	14	7,5	1,8	Without pressure			7,5	5,0	Drinkable water source	all the wells are open
302			in the east of Khok vil.	Majnun		m.y.	built in stone	600	17	7,8	1,4	Without pressure			7,8	6,0		all the wells are open
303	Nakhchivan	Sharur	Khok village, in the sowing area	Tulku		m.y.	built in stone	450	10	6,0	1,2	Without pressure			8,0	4,0	irrigation	all the wells are open
			Khok village, near the water capacity	Tatlilar		m.y.	built in stone	500	12	7,5	1,35	Without pressure		Travertine	7,5	3,0	Irrigation	all the wells are open

304			Khok village, in the sowing area	Aragol		m.y.	built in stone	550	15	7,85	1,5	Without pressure			7,85	5,0	Irrigation	all the wells are open
305			on the right side of Sadarak-Khok highway	Jin darasi		m.y.	built in stone	600	18	8,0	1,75	Without pressure			8,0	6,0	Irrigation	all the wells are open
306			on the left side of Sadarak-Khok highway	Narbatta golu		m.y.	built in stone	375	9	7,0	1,6	Without pressure			7,0	1,0	Irrigation	all the wells are open
307			on the left road of Nakhchivan - Sadarak	Yaghmur		m.y.	built in stone	250	6	6,75	1,3	Without pressure			6,75	3,0	Irrigation	all the wells are open
308			on the left road of Nakhchivan - Sadarak	Gir		m.y.	built in stone	200	5	6,5	1,2	Without pressure			6,5	3,0	Irrigation	all the wells are open
309	Nakhchivan	Sharur	on the right of Nakhchivan-Sadarak	Seyidlar		m.y.	built in stone	350	12	7,2	1,5	Without pressure			7,2	6,0	Drinkable water source	all the wells are open

310			Khok village in the mulberre wood	Huseyn		m.y.	built in stone	300	10	7,8	1,75	Without pressure			7,8	3,0	Drinkable water source	all the wells are open
311			in the west of khok vil	Haji golu		m.y.	built in stone	200	6	9,0	1,75	Without pressure			9,0	20,0	Drinkable water source	all the wells are open
312			Khok village	Haji Ali		m.y.	built in stone	150	4	8,3	1,5	Without pressure			8,3	1,0	Drinkable water source	all the wells are open
313			in the center of Khok vil	Akbar golu		m.y.	built in stone	120	4	8,0	1,25	Without pressure			8,0	1,0	Drinkable water source	all the wells are open
314			in the east of Gararam	Pir		m.y.	built in stone	350	12	10,0	1,5	Without pressure			10,0	3,0	Drinkable water source	all the wells are open
315			Gararam vil, near the village Council	Majid		m.y.	built in stone	250	11	10,0	1,3	Without pressure			10,0	20,0	Drinkable water source	all the wells are open

316	Nakhchivan	Babak	Nakhchivan town, near bus station	Mirza Badal		m.y.	built in stone	500	18	28,0	2,3	Without pressure			28,0	30,0	Drinkable water source	all the wells are closed
317			Nakhchivan Frontier-guards str	Tandir		1908	built in stone	3000	m.y.	25,0	2,6	Without pressure			25,0	M.y.	Drinkable water source	all the wells are closed
318			in the west of Nakhchivan	Galandar khan		m.y.	built in stone	500	m.y.	16,0	1,1	Without pressure			16,0	8,0	Drinkable water source	all the wells are closed
319			Nakhchivan near the Wine plant	Kalla Musa		m.y.	built in stone	150	m.y.	8,5	1,2	Without pressure			8,5	4,0	Drinkable water source	all the wells are closed
320			in the center of Nakhchivan			m.y.	built in stone	1000	21	16,0	1,85	Without pressure			16,0	5,0	Drinkable water source	all the wells are closed
321			Nakhchivan town in M.Gorki street	Sarvanlar		m.y.	built in stone	750	18	15,5	1,4	Without pressure			15,5	3,0	Drinkable water source	all the wells are closed

322			Nakhchivan town	Tutlug	810	m.y.	built in stone	m.y.	m.y.	m.y.	m.y.	Without pressure			m.y.	m.y.	Drinkable water source	all the wells are closed
323	Nakhchivan	Babak	Nakhchivan town near the brick plant	Mahmud agha	840	m.y.	built in stone	m.y.	m.y.	m.y.	m.y.	Without pressure			m.y.	m.y.	Drinkable water source	all the wells are closed
324			Tumbul village	Khan		m.y.		1200	26	14,5	2,1	Without pressure		Papple sand	14,5	5,0		
325			Tumbul village	Haji Niyat		m.y.		1500	m.y.	25,0	2,75	Without pressure		Papple sand	25,0	30,0		
326			in the north west of Tumbul village	Haji		m.y.	built in stone	500	m.y.	9,5	1,3	Without pressure			9,5	25,0	irrigation	all the wells are closed
327			Sovetabad vil, on the right of soil road in Sovetabad Zeynalabdin	Janan bay			built in stone					Without pressure					irrigation	all the wells are closed

328			Ahliabad vil, near the Military unit	Ahliabad	1000	m.y.	built in stone	600	m.y.	15,0	1,8	Without pressure			15,0	5,0	irrigation	all the wells are closed
329			in the east of Goshadiza, at the foothill	Kand		m.y.		800	m.y.	20,0	1,95	Without pressure		Pabble sand	20,0	1,0	Drinkable water source	all the wells are closed
330	Nakhchivan	Babak	2,0 km north of Gosha-diza vil,	Haji Pir		m.y.	built in stone	700	m.y.	15,0	1,75	Without pressure			15,0	5,0	irrigation	all the wells are closed
331			in the east of Gahab vil.	Kand		m.y.	built in stone	1000	m.y.	18,0	1,6	Without pressure			18,0	-	Drinkable water source	all the wells are closed
332			in the east of Sirab vil.	Kand		m.y.		600	m.y.	11,0	1,5	Without pressure			11,0	8,0		many of the wells are filled, the ganat doesn't factually work
333			on the left bank of the Nakhchivanchay in the west of Gultapa vil.	Agh-Gultapa		m.y.	built in stone	500	m.y.	6,0	0,85	Without pressure			6,0	30,0	irrigation	all the wells are closed

334			the left bank of the Nakhchivanchay	Girk Somar	930	m.y.	built in stone	480	m.y.	6,5	1,1	Without pressure			6,5	8,0	Drinkable water source	all the wells are closed
335			in the west of Yenigol village			m.y.		1000	m.y.	9,5	1,1				9,,5	10,0		
336	Nakhchivan	Babak	the left bank of the Nakhchivan in the north of Mazra vil.	Kand		m.y.	built in stone	500	m.y.	8,0	1,2	Without pressure			8,0	15,0		all the wells are closed
337			the left bank of Chahrichay Nazarabad village	Didvar	1100	m.y.	built in stone	400	m.y.	6,5	1,0	Without pressure			6,5	20,0		all the wells are closed
338			the right bank of Chahrichay, Chahru vil.	Chaman		m.y.	built in stone	500	m.y.	8,0	1,3	Without pressure			8,0	2,0	Drinkable water source is given to the users by irrigation	all the wells are closed

339			in the west of Chahri village	Alimran	930	m.y.	built in stone	350	m.y.	7,5	1,1	Without pressure			7,5	12,0	Drinkable water source	all the wells are closed
340			2,0 km north of Chahri village	Khor	1520	m.y.	built in stone	1200	m.y.	22,0	1,85	Without pressure			22,0	1,0	Drinkable water source	all the wells are closed
341			2,0 km north-west of the Payiz vil	Kand	1400	m.y.	built in stone	500	m.y.	10,0	1,15	Without pressure			10,0	1,0	Drinkable water source	all the wells are closed
342			in the east of Chalkhangala	Badambulag	740	m.y.	built in stone	450	m.y.	8,5	1,0	Without pressure		Pebble gravel	8,5	1,0	Drinkable water source	all the wells are closed
343	Nakhchivan	Babak	in the north of Chalkhangala vil.	Ordak bisan		m.y.	built in stone	580	m.y.	13,0	1,25	Without pressure		Pebble gravel	13,0	1,0	Drinkable water source	all the wells are closed
344			Chalkhangala village	Orta Azrgolu		m.y.	built in stone	m.y.	m.y.	m.y.	m.y.	Without pressure			m.y	2,0	Drinkable water source	all the wells are closed

345			Chalkhangala village, “Petrosgolu” lake	Petros golu		m.y.	built in stone	m.y.	m.y.	m.y.	m.y.	Without pressure			m.y.	1,0	irrigation	all the wells are closed
346			in the north of Chalkhangala	Siranos golu		m.y.	built in stone	m.y.	10	m.y.	m.y.	Without pressure			m.y	3,0	Drinkable water source	all the wells are closed
347			Chalkhangala vil.	Khirda gol	1600	m.y.	built in stone	m.y.	m.y.	m.y.	m.y.	Without pressure			m.y	1,0	Drinkable water source	all the wells are closed
348			Chalkhangala vil.	Gizil bulag		m.y.	built in stone	m.y.	m.y.	m.y.	m.y.	Without pressure		Pebble gravel	m.y	2,0	Drinkable water source	all the wells are closed
349			in the east of Chalkhangala vil.	Shamaghil		m.y.	built in stone	m.y.	m.y.	m.y.	m.y.	Without pressure		Pebble gravel	m.y	1,0	Drinkable water source	all the wells are closed
350	Nakhchivan	Babak	in the east of Chalkhangala vil.	Gala bulag		m.y.	built in stone	m.y.	m.y.	m.y.	m.y.	Without pressure			m.y	1,0	Drinkable water source	all the wells are closed

351			in the east of Chalkhangala vil.	Ufan bulag		m.y.	built in stone	m.y.	m.y.	m.y.	m.y.	Without pressure			m.y	1,0	Drinkable water source	all the wells are closed
352			Chalkhangala village	Pir	1400	m.y.	built in stone	500	m.y.	m.y.	m.y.	Without pressure			m.y	8,0	Drinkable water source	all the wells are closed
353			in the center of Chalkhangala	Simon bulag	1400	m.y.		600	15	m.y.	m.y.	Without pressure			m.y	4,0	Drinkable water source	all the wells are closed
354			in the west of Chalkhangala, in the vineyard	Bash bulag	1400	m.y.	built in stone	650	17	m.y.	m.y.	Without pressure		Pebble gravel	m.y	5,0	irrigation	all the wells are closed
355	Nakhchivan	Babak	in the west of Chalkhangala, in the vineyard	Pandan		m.y.	built in stone	750	18	25,0	2,1	Without pressure		Pebble gravel	25,0	6,0	Drinkable water source	all the wells are closed
356			in the north of Chalkhangala, in the vineyard	Danaghil		m.y.	built in stone	800	20	23,0	2,5			Pebble sand	23,0	5,0	Drinkable water source	all the wells are closed

357			Chalkhangala, in the vineyard	Gidishgolu		m.y.	built in stone	800	20	23,0	2,5	Without pressure			23,0	3,0	irrigation	all the wells are closed
358			Chalkhangala, in the vineyard	Gazigolu		m.y.	built in stone	880	20	12,0	1,15	Without pressure			12,0	6,0	irrigation	all the wells are closed
359			Chalkhangala, in the vineyard	Gundak		m.y.	built in stone	600	15	13,0	1,0	Without pres			13,0	4,0	irrigation	all the wells are closed
360			Chalkhangala, in the vineyard	Ando golu		m.y.	built in stone	750	18	21,5	2,3	Without pressure			21,5	5,0	irrigation	all the wells are closed
361			in the west of Chalkhangala	Baylar golu		m.y.	built in stone	850	20	18,0	1,5	Without pressure			18,0	4,0	irrigation	all the wells are closed
362	Nakhchivan	Babak	Chalkhangala, in the vineyard	Gundakhsaz -2	390	m.y.	built in stone	700	16	15,5	1,1	Without pressure			15,5	3,0	irrigation	all the wells are closed

363			Chalkhangala, in the tobacco area	Amijan		m.y.	built in stone	700	13	17,0	1,3	Without pressure			17,0	4,0	irrigation	all the wells are closed
364			Chalkhangala, in the tobacco area	Mashhadi Karim		m.y.	built in stone	-	-	-	-	Without pressure		Pebble gravel	-	-	irrigation	all the wells are closed
365			Chalkhangala, in the grain area	Pedi golu		m.y.	built in stone	-	-	-	-	Without pressure			-	-	irrigation	all the wells are closed
366			2,5 km east of the Chalkhangala	Khagan golu		m.y.		-	-	-	-	Without pressure			-	-	irrigation	many of the wells are filled, the ganat doesn't work
367			in the center of Chalkhangala	Agri golu	1050	m.y.		-	-	-	-	Without pressure			-	-	irrigation	many of the wells are filled, the ganat doesn't work
368	Nakhchivan	Babak	Chalkhangala village	Genish gol	1400	m.y.		850	22	15,5	1,6	Without pressure			15,5	6,0	irrigation	many of the wells are filled, the ganat doesn't work

369			in the north of Chalkhangala	El golu		m.y.		500	14	15,0	1,5	Without pressure			15,0	12,0	irrigation	many of the wells are filled, the ganat doesn't work
370			Chalkhangala berween Pandam and Bashbulag	Fantan		m.y.	built in stone	800	20	12,0	1,1	Without pressure		Pebble sand	12,0	10,0	irrigation	all the wells are closed
371			in the north west of Tazakand	Gasimbay		m.y.	built in stone	650	-	-	-	Without pressure		Pebble gravel	-	-	irrigation	all the wells are closed
372			in the east of Tazakand	Rustam golu	930	m.y.	built in stone	700	-	-	-	Without pressure			-	-	irrigation	all the wells are closed
373			Tazakand village in the grain area	Taza golu	1170	m.y.		675	15	9,5	1,0	Without pressure			9,5	2,0	irrigation	the wells are filled, the ganat doesn't work
374			Khinjab village	Bali golu	980	m.y.		500	12	10,0	1,5	Without pressure		Travertine	10,0	3,0	irrigation	the wells are filled, the ganat doesn't work

375	Nakhchivan	Babak	in the west of Khinjab village	Gara golu		m.y.	built in stone	450	10	8,5	1,3	Without pressure		Travertine	8,5	3,0	Drinkable water source	all the wells are covered
376			in the west of Khinjab	Huseyn	1170	m.y.	built in stone	600	14	11,0	1,6	Without pressure		Pebble gravel	11,0	3,0	Drinkable water source	all the wells are covered
377			in the north Khinjab vil.	Majnun golu	1520	m.y.	built in stone	600	20	40,0	3,5	Without pressure			40,0	3,0	Drinkable water source	all the wells are covered
378			in the north Khinjab vil.	Janishbatan		m.y.	built in stone	300	9	8,0	1,75	Without pressure		Travertine	8,0	8,0	Drinkable water source	all the wells are covered
379	Nakhchivan	Shahbuz	in the north of Badamli, 3,0 north-east of the Badamliplant (mineral water)	Badamli			built in stone					Without pressure		Pebble gravel			Drinkable water source	all the wells are covered
380			Tirkesh village	Tirkesh	1400	m.y.	built in stone	400	10	8,5	1,8	Without pressure			8,5	10,0	Drinkable water source	all the wells are covered

381			in the west of Tirkesh, on the Left bank of Tirkeshchay	Ashaghi kahriz	1000	m.y.	built in stone	1476	65	13,0	-	Without pressure		Travertine			Drinkable water source	all the wells are covered
382			in the zone of Shahbuzkand vil.	Jamat	930	m.y.		341	15	11,0	-	Without pressure		Pebble sand	-	-		
383			in the zone of Shahbuzkand vil.	Kand	1000	m.y.		850	14	3,5	1,2	Without pressure		Pebble sand	3,5	50,0		
384	Nakhchivan	Julfa	on the right bank of Alinjachay, in the east of Jugha village	Kand	1400	m.y.		900	18	4.75	1,35	Without pressure		Pebble sand	4,75	-	Drinkable water source	some wells a open, some a covere with stone Sanitar zone is followed
385			on the right bank of Alinjachay, Jugha village	Bash	440	m.y.		750	12	3,0	1,0	Without pressure		Pebble sand	3,0	1,0		The ganat doesn't work, some wells are filled, without water
386			on the right bank of the Alinjachay, in the Jugha village	Orta		m.y.		700	11	3,5	1,3	Without pressure			3,5	1,0		The ganat doesn't work, some wells are filled, without water

387			2,5 km east of Jamaladdin, on the Left bank of Alinjachay	Jamaladdin		m.y.	built in stone	650	10	3,0	1,1	Without pressure			3,0	3,0	Irrigation	some wells are covered with stone, but many of the wells are filled, there is a need for cleaning
388			on the right bank of Alinjachay, 1,5 km west of Abragumus vil.	Orta		m.y.	built in stone	250	5	4,0	1,75	Without pressure			4,0	10,0	Drinkable water source	all the wells are covered
389	Nakhchivan	Julfa	in the middle of Abragumus vil	Bash		m.y.	built in stone	800	12	4,5	2,0	Without pressure			4,5	M.y.	Drinkable water source	all the wells are covered with stone, water is given to Abragumus village, by the pipe
390			in the north-east of the Kima village	Kima		m.y.	built in stone	250	4	15,0	2,0	Without pressure			15,0	5,0	Drinkable water source	all the wells are covered, water is given to Gizilja vil, by the pipe
391			in the north-east of Khaanagh vil, at the foothill	Kand		m.y.	built in stone	350	10	7,5	1,5	Without pressure			7,5	0,5	Drinkable water source	all the wells are covered, water is given to Khanagah vil, by the pipe

392			in the north-east of the Gazanchi village	Kand		m.y.	built in stone	300	10	7,0	1,6	Without pressure			7,0	-	Drinkable water source	all the wells are closed, some are filled
393			in the east of Bananiyar vil	Bananiyar		m.y.		350	12	7,5	1,5	Without pressure			7,5	-	Drinkable water source	The ganat doesn't work, some wells are filled, without water
394			in the south-east of the Bananiyar village			m.y.		300	8	5,5	2,0	Without pressure			5,5	5,0	Drinkable water source	The ganat doesn't work, some wells are filled, without water
395	Nakhchivan	Julfa	2.5 km north west of the Yaychi village in the vineyard	Khan		m.y.	built in stone	600	15	6,0	1,85	Without pressure			6,0	30,0	Irrigation	all the wells are covered, there is a need for repair
396			on the right of Julfa-Diza highway, 3.0 km west of Diza vil, in the sowing area	Boyuk	750	m.y.	built in stone	500	12,0	7,5	1,8	Without pressure			7,5	8,0	Irrigation	all the wells are closed
397			in the north of Diza vil, near subartesian well with 36/03	Kand		m.y.	built in stone	550	13,0	5,5	1,5	Without pressure		Pebble sand	5,5	15,0	Drinkable water source	all the wells are closed, sanitation is followed

398			on the Left of Julfa-Diza highway, 3 km west of Diza vil.	Kichik		m.y.	built in stone	200	81,0	9,5	2,5	Without pressure			9,5	30,0	Irrigation	som wells are open, but some are covered
399			on the right of the Garakol river, 1.0 km north-east of Diza vil,	Kichik	1120	m.y.	built in stone	400	11,0	8,0	2,35	Without pressure			8,0	10,0	Drinkable water source	all the wells are closed
400			on the right of higway between Dizagal villages, 100m west of Garakol river	Cheshma		m.y.	built in stone	500	13,0	7,5	1,8	Without pressure			7,5	35,0	Irrigation	all the wells are closed
401	Nakhchivan	Julfa	on the right of the Garakol river, in the millet area of Diza village	Diza		m.y.	built in stone	120	3,0	12,3	3,0	Without pressure		Pebble sand	12,3	0,5	Irrigation	all the wells are closed
402			in the east of the Gal village			m.y.	built in stone	150	m.y.	-	-	Without pressure			-	0,05	Drinkable water source	all the wells are closed
403			1.5 km east of the Gal village	Gal		m.y.	built in stone	50	2	-	-	Without pressure			-	1,0	Drinkable water source	Some wells are closed, many of the wells are filled, there is a need for cleaning

404			in the north of Gal vil, near the mosque	Givrag		m.y.	built in stone	40	2	3,0	1,2	Without pressure			3,0	0,5	Drinkable water source	all the wells are covered
405			in the east of Gal vil.	Kichik		m.y.	built in stone	850	18	9,6	2,5	Without pressure			9,6	5,0	Drinkable water source	all the wells are covered
406		Ordubad	in the west of Ashaghi Aylis, in the apricot garden	Gandi		m.y.	built in stone	600	12	8,75	1,6	Without pressure			8,75	-	Irrigation	all the wells are covered
407			in the east of Ashaghi Aylis	Shilas		m.y.		500	15	12,0	2,75	Without pressure			12,0	8,0		many of the ganats are filled, the gnat is inactive is dry
408	Nakhchivan	Ordubad	on the right bank of Aylis river 400 m north-west of Nusrus in the sowing area	Gazi	660	m.y.	built in stone	600	25	20,0	3,0	Without pressure			20,0	8,0	Irrigation	all the wells are covered
409			in the north of Ashaghi Aylis, in the experiment area of “Academy”	Duman Tamavi	1200	m.y.	built in stone	650	32	22,0	3,75	Without pressure			22,0	10,0	Irrigation	all the wells are covered

410			in the north of Ashaghi Aylis	Dovlat		m.y.	built in stone	600	26	28,0	4,5	Without pressure			28,0	It is impossible to measure	Irrigation	all the wells are covered
411			in the north of Ashaghi Aylis near the scholl	Dava		m.y.	built in stone	700	30	40,0	4,75	Without pressure			40,0	It is impossible to measure	Drinkable water source	all the wells are closed, water is given to Ashaghi Aylis by the pipe
412			in the north-west of Ashaghi Aylis	Bazar		m.y.	built in stone	460	18	26,8	1,5	Without pressure			25,8	6,0		all the wells are covered, many of wells are filled, the ganat doesn't work
413			in the middle of Ashaghi Aylis	Darvaza		m.y.	built in stone	630	26	24,0	1,75	Without pressure			24,0	7,0	Drinkable water source	all the wells are closed, sanitation is followed
414	Nakhchivan	Ordubad	on the right bank of Aylis river	Aghamal		m.y.	built in stone	4350	18	14,5	1,1	Without pressure					Drinkable water source and irrigation	all the wells are closed, sanitation is followed

415			on the right of Aylis vil, in the north-east of Ashaghi Aylis	Uzun Cheshma		m.y.	built in stone	570	32	40,0	5,75	Without pressure			14,5	5,0	Drinkable water source	all the wells are closed, sanitation is followed
416			450 m north of “Uzun” Cheshma ganat, Ashaghi Aylis	Amrah		m.y.		500	21	18,5	2,0	Without pressure			40,0	45,0	Drinkable water source	all the wells are closed, sanitation is followed
417			in the middle of Ashaghi Aylis	Hasan place		m.y.		560	23	-	-	Without pressure			18,5	-		many of the wells are filled, the ganat doesn’t work dry
418			in the middle of Ashaghi Aylis	Gamishli		m.y.		475	19	-	-	Without pressure			-	-		many of the wells are filled, the ganat doesn’t work dry
419			in the middle of Ashaghi Aylis	Hasar		m.y.		450	18	-	-	Without pressure			-	-		many of the wells are filled, the ganat doesn’t work dry
420	Nakhchivan	Ordubad	in the west of Ashaghi Aylis	Gulbazar		m.y.	built in stone	525	19	30,0	2,1	Without pressure			-	-		many of the wells are filled, the ganat doesn’t work dry

421			on the right side of highway between Ashaghi Aylisli and Yukhari Aylisli	Sinag				m.y.		350	14	15,0	1,75	Without pressure			30,0	5,0		Irrigation	all the wells are closed
422			in the nut sovkhoz named after Yusif Mammadaliyev	Anoshg				m.y.		100	12	12,0	1,5	Without pressure			15,0	-			many of wells are filled, the ganat doesn't work dry
423			in the nut sovkhoz named after Yusif Mammadaliyev	Vank baghi				m.y.		700	25	16,0	1,8	Without pressure			12,0	-			many of wells are filled, the ganat doesn't work dry
424			in the nut sovkhoz named after Yusif Mammadaliyev	Diza					built in stone					Without pressure			16,0	-			many of wells are filled, the ganat doesn't work dry
425			in the north-west of Yukhari aylis, on the right of Aylisli river	Garabagh		m.y.						Without pressure						Drinkable water source		all the wells are closed
426	Nakhchivan	Ordubad	in the Meyva sovkhoz garden	Bala Minas		m.y.						Without pressure								many of wells the are filled, the ganat doesn't work dry

427			on the right bank of Aylis river	Chichak		m.y.						Without pressure						many of wells the are filled, the ganat doesn't work dry
428			in the east of Yukhari Aylis, near the Aylis river			m.y.	built in stone					Without pressure						many of wells the are filled, the ganat doesn't work dry
429			in the east of Yukhari Aylis, on the left bank of the Aylis river	Khoshkeshin		m.y.	built in stone					Without pressure					Drinkable water source	all the wells are closed
430			on the left bank of Aylis river	Bazar		m.y.	built in stone					Without pressure					Drinkable water source	all the wells are covered
431			on the right bank of Aylis river	Meydan		m.y.	built in stone					Without pressure					Drinkable water source	all the wells are covered
432	Nakhchivan	Ordubad	the left bank of Aylis, in the north of Yukhari Aylis	Varagird		m.y.	built in stone					Without pressure					Drinkable water source	all the wells are covered

433			on the right bank of Kanza river, near the Asphalt- concrete plant in Ordubad	Boyuk Ganli gol		m.y.	built in stone					Without pressure					Irrigation	many of the wells are closed, but some are open
434			in the west of “Boyuk” Ganligol ganat	Khirda Goshagol		m.y.						Without pressure						many of the wells are filled, the ganat doesn’t work dry
435			in the zone of kolkhoz nmed after Yusif Mammadaliyev	Chayanli		m.y.		350	16	15,0	1,1	Without pressure			15,0	-		many of the wells are filled, the ganat doesn’t work dry
436			in the zone of the secondary school in Ordubad	Uch bulag		m.y.		400	17	18,0	1,5	Without pressure			18,0	3,0		many of the wells are filled, the ganat doesn’t work dry
437			in the sowing area of kolkhoz named after Yusif Mammadliyev	Fuyana		m.y.	built in stone	420	19	20,0	2,2	Without pressure			20,0	1,0	Irrigation	all the wells are covered
438	Nakhchivan	Ordubad	Ordubad town	Hasan golu		m.y.	built in stone	530	22	18,0	1,75	Without pressure			18,0	4,0	Drinkable water source	all the wells are covered

439			in the east of Ordubad	Haji Ahmad		m.y.	built in stone	750	27	35,0	2,5	Without pressure			35,0	4,0	Drinkable water source	all the wells are covered
440			in the north of Ordubad	Meyramja		m.y.	built in stone	430	21	14,5	1,4	Without pressure			14,5	2,0	Drinkable water source	all the wells are covered
441			in the west of Ordubad town, nea the (Department of Internal Affairs)	Fugara		m.y.	built in stone	520	17	12,0	1,2	Without pressure			12,0	3,0	Drinkable water source	all the wells are closed
442			on the bank of the Ordubadchay	Mammad Sadiq		m.y.	built in stone	380	14	13,5	1,5	Without pressure			13,5	4,0	Drinkable water source	all the wells are closed
443			Ordubad town, near the fctory	Madrasa		m.y.	built in stone	400	15	16,0	1,9	Without pressure			16,0	3,0	Drinkable water source	all the wells are closed
444	Nakhchivan	Ordubad	in the north of Ordubad	Baylar		m.y.	built in stone	420	16	18,0	1,85	Without pressure			18,0	5,0	Drinkable water source	all the wells are closed

445			Ordubad “Chinardibi” place	Panji		m.y.	built in stone	375	15	22,0	2,6	Without pressure			22,0	2,0	Drinkable water source	all the wells are closed
446			Ordubad near the “Garahovuz” mosque	Gara Hovuz		m.y.	built in stone	560	16	25,0	2,85	Without pressure			25,0	6,0	Drinkable water source	all the wells are closed
447			near the “Sari Shahar” mosque	Sarshahar		m.y.	built in stone	600	25	15,0	1,4	Without pressure			15,0	4,0	Drinkable water source	all the wells are covered
448			on the right bnk of the Kanza river	Ankaj		m.y.	built in stone	350	16	13,5	1,2	Without pressure			13,5	3,0	Drinkable water source	all the wells are covered
449			on the right bnk of the Kanza river	Bilal		m.y.	built in stone					Without pressure					Drinkable water source	all the wells are covered
450			on the right bank of the Kanza river, in 8 March street	Chukhur-yurd		m.y.	built in stone	770	15	12,0	1,1	Without pressure			12,0	6,0	Drinkable water source	all the wells are covered

451	Nakhchivan	Ordubad	in the north of Ordubad town	Mahar Bashi		m.y.	built in stone	680	20	14,0	1,35	Without pressure			14,0	1,5	Drinkable water source	all the wells are covered
452			in the north of Ordubad town	Shora		m.y.	built in stone	500	16	13,5	1,25	Without pressure			13,5	4,0	Drinkable water source	all the wells are covered
453			near the Scientific Research Institute of Physics	Haji Fatt		m.y.	built in stone	430	16	12,0	1,1	Without			12,0	10,0	Drinkable water	all the wells are covered
454			in the north of Yukhari Andali near SMF.	Yukhari		m.y.	built in stone	625	26	6,0	1,0	Without pressure		Pebble sand	6,0	2,0	Drinkable water source	all the wells are covered
455			on the left bank of Ordubadchay	Orta		m.y.	built in stone	500	16	15,0	1,85	Without pressure			15,0	6,0	Drinkable water source	all the wells are closed
456			Yukhari Andamij vil.	Khanadan		m.y.	built in stone	685	27	16,0	1,9	Without pressure		Pebble sand	16,0	4,0	Drinkable water source	all the wells are closed
457			near the Anabad village, secondary school	Baba		m.y.	built in stone	480	14	11,0	1,2	Without pressure		Pebble sand	11,0	12,0	Drinkable water source	all the wells are closed

458	Nakhchivan	Ordubad	in the north of Anabad in the nut garden	Chollu		m.y.	built in stone	460	23	20,0	2,3	Without pressure			20,0	3,0	Drinkable water source	all the wells are closed
459			in the east of Kanza on the left bank of Kazanchay	Safigulu		m.y.	built in stone	250	8	6,0	1,0	Without pressure			6,0		Drinkable water source	all the wells are closed
460			in the north of Dasta, near the mill	Bayramli		m.y.		375	17	-	-	Without pressure			-			many of the wells are filled, since 1980 haven't worked
461			2.0 km north of Vanand in the nut garden	Naghdi		m.y.	built in stone	300	9	6,0	1,2	Without			6,0			all the wells are closed
462			in the north east of Vanand vil.	Chukhur		m.y.	built in stone	350	10	8,0	1,5	Without pressure			8,0			all the wells are covered
463			1.5 km south-west of Vanand village	Gasim			built in stone	350	9	7,5	1,45	Without pressure		Pebble sand	7,5			al the wells are closed, water is given to Diza village by a pipe
464			5.0 km north-east of Kotam village	Kand				100	8	-	-	Without pressure			-			all the wells are closed, some wells are filled the ganat doesn't work

465	Nakhchivan	Ordubad	in the zone of “Kilit’ village in the place of “Pir cheshma’	Pir Cheshma				800	4	-	-	Without pressure		Pebble sand	-			all the wells are closed, some wells are filled the ganat doesn’t work
466			in the east of Kilit vil.					120	6	-	-	Without pressure			-			all the wells are closed, some wells are filled the ganat doesn’t work