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RESEARCH ARTICLE

Prerequisites for Solving the Problems of Water Supply for Agriculture in the Mountain and Foothill Regions of Azerbaijan

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ABSTRACT

The territory of the Azerbaijan Republic consists of 60% mountain and 40% flat flap, and 85% from produced agricultural product in the republic basically get with irrigated lands located on the flat area. The republic is characterized as a few land country, where per capita happens to not more than 0.2 ha plowed fields. The problems of the water deficit exist in the republic. At present, the republic disposes before 32.3 mlrd. m^3 water resource per annum. However, at arid years, she falls before 23.16 mlrd. m^3 that does not satisfy the need irrigated by flap. All this is obviously from Table 1.[1,3,4] Necessary to note that in relationship with difficulty physics-geographical conditions and anthropogenic influence, 43.28% of lands are subject to in one or another degree erosion process. Existing 1400 thou. ha irrigated areas basically cover the foothill and flat lands of Kaspiy and Kura-Araks lowlands.[3,9]

Key words: Mountainous and foothill regions, water supply, soil erosion, summer and winter pastures, livestock grazing, etc.

Until 1990, Azerbaijan, among the Union Republics, acted as one of the largest producers of agricultural products and the main exporter of raw products, tobacco, grapes, wine and cognac products, fruits and vegetables and canned goods.

However, after turning to market, economies have occurred the changes to structure of the sowing areas.

It is necessary also to say that after disintegration of the former alliance conditions, agricultural production and activity of the husbandry several have weakened that negatively told on productivities of the agricultural product, but with transition to market relations and issue of the lands peasant-farming facilities, agricultural production develops the speed rate.

Thus, it is believed that by carrying out appropriate land reclamation measures, it is possible to achieve an increase in the gross yield of agricultural crops due to the expansion of sown areas and on expanded irrigated lands. Hence, for instance, from 34.8 thou. ha lands, suitable to agricultural production, Yardimli region irrigated is whole 0.9 thou. ha, but sowing area forms 8.3 thou. Ha.[10-12]

For decision of the problem of the provision by drinking water population mountain sowed, sown and irrigation homestead area, promoting rendering the assistance in increasing of the productivities can serve to bore a sub artesian boreholes.

Consequently, on 9600 ha of irrigated lands by way to reconstructions irrigation networks, using the progressive technology and technologies (including sprinkling, dropper of the irrigation, and others) to possible liquidations of the loss of water and formation to erosions, improvements of the condition to supplies of the plants in water.

Follows also to note that Azerbaijan is traditionally grown water capacious of the culture, and water consumption on 1 ha of the irrigated lands lags behind because of deficit of water with the result that instead of 6–7 irrigation of the plant get whole only 2 irrigation.

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Table 1: Factors water facilities mountain region Azerbaijan

Region	Total square, thou. ha	Including:				Need for construct small water reservoirs	Irrigated helps small water reservoirs, ha	Irrigation action		
		Available for agriculture	Irrigated land	Sowings	Many years sowings			Necessary to deliver in usage newly irrigated soil	Reconstruction of the systems of irrigation and improvements water supply	Boring sub-artesian of the boreholes
1. Lerik	133472	68110	406	11231	1347	11	120	1100	2006	-
2. Yardimli	72527	34686	929	8332	459	3	35	1200	200	-
3. Dashkesen	90323	42751	321	3290	66	7	80	700	200	-
4. Kedabek	144247	95701	984	10889	-	12	135	900	-	60
5. Shahbuz	80894	23513	1881	1016	143	3	35	1500	-	40
6.Khizi	171112	87661	2047	10698	12	2	25	1200	800	-
7. Lachin	166488	75781	1240	11344	245	3	45	4500	-	-
8. Kelbeger	124300	48183	1266	3952	10	12	115	500	-	-
9. Kubadli	79812	33629	5061	14956	850	10	110	12500	800	100
10. Zangilan	72550	33548	5166	7704	2667	11	120	3000	-	50
11. Gulfa	99407	24539	3489	3627	61	6	65	4000	3000	40
12. Ordubad	91284	15762	3791	942	910	15	180	5400	3500	55
13. Shusha	36644	20936	277	207	11	3	35	-	-	23
14. Khogavend	83136	54222	714	208	269	8	90	-	-	8
15. Mountain Part Goranboy	57615	26202	3072	1530	985	12	140	-	900	2
16. Oguz	121613	46649	10250	19564	2838	-	-	-	-	-
Total	1625424	732073	40894	109490	10873	118	1330	36500	9600	378

The analysis agroclimatic factors 14 regions located in zone Tallish and Little Caucasus Mountains show that fair year temperature in these region forms 7°C to 14°C, providing possibility cultivate different agricultural cultures (potatoes, wheat, tobacco, etc.). However, reduction of the annual precipitation (300–600 mms) at period vegetation does not give the possibility of the reception greater harvest these cultures.

Necessary to note that flat and mountain of the land of the republic practically in their own entire climatic belt possess the firm waterproof by structure, condition their get prettier aeration, and high moisture capacity. However, insufficient supply them in row of the zones irrigation by water does not allow to use their natural fertility in full volume and limits efficient use the nutrients, contributed with mineral and organic fertilizers. Removal of these defects is disadvantage for growing and developing agriculture, possible on the base of the using progressive water protect technology and technologies irrigation. The use of this technology in our country was not spared due to attention though a deficit of water required their using.

On the other hand, the whole territory of Azerbaijan is found under ecological influence water collection valleys in Kaspiy. Here, in the study area in Azerbaijan, environmental problems are highly developed, the solution of which is interregional in nature and depends on interstate relations, and for this reason it becomes tense day by day.

On pasture on steep declivity with dead by vegetable cover intensive rain do not protect the surface of ground. The meadow zone is blazed in consequence of escalated non-standardization all out sewer, non-observances of the rules of the chopping wood sharply falls water protect and soil protect role to vegetation that leads to development erosion processes.

In pastures located on a steep slope with dead vegetation cover, intense rains are not retained and do not protect the soil surface.

Studies were conducted for long time on study of the manifestation irrigation erosions and designed ways of her prevention.

As can be seen from table, the most widespread is water erosion, which develops in mountain region more intensive.

Ground mountain region in this and the other degree are subjected to the erosions, which covers 51.0–92.4% area of the lands. Shahbuz and Ordubad regions of ground were subjected to the strong erosion and, accordingly, form 54.3–67.2%. Specified above mountain regions, due to collection flood water in small water reservoirs, more than 1300 ha humid, or un subject to husbandry of ground conduct the flight, which serve for protection flood and irrigation erosions on these areas.

Follows to note that with transition to market relations, abolition collective farms and state farms and creation farming and peasant facilities before agrarian sector of the republic to appeared the question of increasing to productivity of the agricultural cultures and adapting production to need market.

It is necessary to say that ground is subjected to the erosions, timber plantings, mountain groves, water sources, and others natural formation mortality.[10,12]

As a result, the whole this will appear the possibility a job placement much of the population of this region and improvement of the social conditions to life's of the population.

Intensification and rational use to plowed fields fight with erosion, rational use irrigation water, and atmospheric precipitation are most important question of the agricultural science when governing fertility ground and water use in zone of the irrigated husbandry and land uses in foothill and mountain region.

At the present research, institute is developed program and methods of conduct of the agriculture, answering market standard.

In the purpose of the rational use of ground and water in flat and foothill arid zone and on declivity lands, the Scientific Research Institute (Erosions and Irrigations) Agriculture Department of Azerbaijan provides performing the task under name "Fight with erosion (conservation and improvement of ground) and water use in flat and foothill and mountain zone and on declivity lands Azerbaijan" with following two tasks.

Develop and implement rational methods of combating water and wind erosion in the flat and foothill arid zone and on sloping lands.

On given task follows to note that territory of the republic is characterized complex physics-geographical condition and soil-plant cover. Here, the process degradation reveals itself mutually condition and is connected with natural condition and anthropogenic factor. Hence, if natural

factors promote the manifestation of the process degradation, that anthropogenic factor his intensify. Other important factors are methodological base of the decision of the task on determination degree correspondences to intensities irrigation and water consumption; the correlation of a parts irrigation, going on creation soil and air moisture; the correspondence to intensities irrigation and natural precipitation accumulate abilities layer active moisture change of ground.

To date for protection soil-vegetable cover is designed different zonal phytoameliorative of the action, covering high mountain, fair-bugle, low mountain, foothill, flat, and low-lying zone.

It should be noted that in the burnt grassland zone currently grazing-grazing defense actions, but grazing areas system is grazed here in an unsystematic way. Hence, sod layer is blazed-meadow ground widespread on steep declivity nearly completely dislodge; knock out, ground erosion in consequence of which soil-vegetable cover is subjected to the degradation. Consequently, only when carrying out anti-erosion measures is it possible to return them to agricultural circulation.

It is installed that regardless of degree degradation ground and steepness of the declivity top become acclimated 96–100% and annual increase 38–54 refer to possess xerophytes shrubberies: Amorphous, skumpium, dogwood, medlar, hawthorn, plum, grabber others. Best become acclimated and big annual increase differ pine common, ash common, beech east, and others.

In prospect on the prevention degradation (deserted), plane, vertical (linear), irrigation to erosions, and disinflations of ground must be designed actions, in connection with ecological situation and with provision for monitoring the ecological change.

The studies revealed that 3610 thou. ha or 41.8% soil fund of the republic was subjected to very strong erosion, changed in cast of the land, which impossible to use under pasture even and pasture. Here historically developed complexes of ecological problems.[10]

Many of them in nature, level consequence for public facilities and health of the population have middle republic and general Caucasus nature.

In most unsuccessful conditions find the land a facility republics, which nearly around the world, process degradation are subjected to in one or another degree, intensity of the manifestation which depending on morph metric parameter relief, climatic and soil-plant conditions, as well as activities economic degree, quite often reach the disastrous sizes.

As a result exists a sharp reduction of the fertility of ground, corresponding reduction to productivities of all agricultural cultures, which at first thought leveled overweening using the mineral fertilizers and pesticides (the chemical meanness of protection plants).

All this in final measure promotes escalated contamination water object these facilities, as well as heavy metal, which in it is enough high concentration exist in surface declivity sewer and product water and wind to erosions. This promotes the destabilization to ecological situation in the republic.

Degradation soil-plant cover of the republic in intensive form reveals itself on arid territory particularly, where lives beside 5 mln. or 60% populations. Arid territory covers the Kura-Araks and Kaspiy lowlands, as well as foothill dry steepness ecosystems.

In modern social-economic and public-political condition for all-round development of the agriculture and guard natural resource republics is required complex mechanization, chemization and as a whole general intensification agricultural production.

In this regard, in order to improve the culture of agriculture and improve soil fertility, it is necessary to immediately use the latest achievements of agrarian science and best practices. These actions will promote the prevention of the processes degradation and deserted lands, as well as water, wind, and irrigation to erosions.

The zonal actions on the prevention degradation of soil-plant cover consist of the following:

- An agricultural organization territory facilities
- An agro techniques, phytoameliorative (wood- and meadow land reclamation), and others.

The actions enter in economic organization on correct accommodation soil protect crop rotation, field protect forest band, undertaking the roads, channel, borders facilities, etc.

Hence, on declivity with gradient before 50 is recommended undertaking the crop rotation with plowed field culture, under which 20% area must

Table 2: Liability to erosions of ground mountain region Azerbaijan

Region	Total square, thou. ha	Degree to liability to erosions			
		No liability. thou. ha, %	Few	Medium	Strong
Dashkesen	90,3	23.3 25.8	18.3 20.3	25.6 28.3	23.1 25.6
Kedabek	150.3	73.6 49.0	20.1 13.4	29.8 29.8	26.8 27.8
Kelbeger	124.3	48.4 38.9	27.2 21.9	18.9 15.2	29.8 24.0
Lachin	166.5	56.7 34.1	26.3 15.8	36.7 22.0	46.8 28.1
Kubadli	79.8	25.7 33.5	6.9 8.6	28.7 36.0	17.5 21.9
Zangilan	72.5	24.6 33.9	16.4 22.6	14.6 20.2	16.9 23.3
Lerik	136.5	43.6 32.2	19.4 14.3	27.8 20.5	44.7 33.0
Yardimli	12.5	25.1 34.6	12.6 17.4	10.6 14.6	24.2 34.4
Mountain Part Goranboy	57.6 20.8 19.5	7.7 36.1	33.9	13.4	9.6 16.6
Gulfa	99.4	9.9 10.0	16.3 16.4	25.3 25.5	47.9 48.1
Shahbuz	81.4	61.1 19.8	5.4 6.6	15.7 19.3	14.2 54.3
Ordubad	92.4	7.0 7.6	9.5 10.6	13.5 14.6	62.1 67.2
Apsheron	535	57.5 10.7	116.8 21.8	165.5 30.9	195.5 36.6

be conducted under perennial stern herbs. On slopes with a slope of 5–12^0 in a crop rotation systema management system containing prevalence of corn crops.

Azerbaijan Republic beside 25% territory occupies not powerful and few product of ground. Their follows to use under pasture.[11,12]

Follows to say that structured analysis of the putted problem allows predetermined in her row of the complex research tasks, which are required for making comfort of conditions for vital activity of the plants, as well as ecological possible level to moisture and aerations of ground.

Follows, note that in condition of the sharp deficit of irrigation water in Azerbaijan, using progressive water protect, ecological safe technology, and technical facilities irrigation, gains more important public economic importance. This particularly required for mountain and foothill region republics. Together with that, using the progressive technical facilities and technologies of the irrigation allows under minimum consumption moisture on the whole irrigated area to create microclimate, being guarantee of the intensive development of the plants and increasing to productivities different type agriculture.

Introduction given technologies allows realizing unceasing providing the plants by water on length whole vegetation period of their development in accordance with account their water consumption. It is particularly characteristic of conditions of the agrarian reform in agricultures Azerbaijan. It is assumed that in the region it can be successfully implemented in small, individual, cooperative and other farms that have already been created with the land user, growing melon crops, grape and tea plantations, pattern, network and other crops.[2,5,6]

As a whole, water protect technology has a satisfactory field-performance dates that allow vastly to spare irrigation water in contrast with traditional way of the irrigation.

At present in Scientific Research Institute “Erosions and Irrigations” is designed multiple, flexible automated systems, which allow act of concentration

irrigation current on an area and realize the principles of the unceasing providing the plants by water, in correspondence to them with water consumption during the whole vegetation period. To the pertains:

- A train of the pulsed action
- A system of the pulsed local irrigation
- A system of the slow sprinkling
- A system of the local irrigation for mountain conditions
- A module kit of the local irrigation for hothouses
- A pulsed sprinkling auto range actions
- A system irrigation for farming and lease facilities.

Irrigation technology allows:

- Supply the agricultural cultures by water in full correspondence to with move their water consumption
- Provide the long direction of the influence of artificial rain on the condition of the growing, developments of the plants, and external ambience, excluding negative influence weather factor on their growing, development, and productivity
- Support moisture active layer ground and under land layer air on optimum level without cutting the fluctuations
- At the most act of concentration irrigation current on the area and reduce the capital expenditures on construction of the network pressure pipeline;
- Reach the high degree to automations of the process irrigation the simplest technical facility
- Provide the possibility of the use at time and constancy of the boot the technological equipment.

Introduction in production of the specified technology and technologies irrigation in agricultural production will enable to get more high guaranteed harvest different type agriculture under significant reduction of the expenses irrigation water in contrast with earlier applicable methods irrigation.

Herewith to account with economies water possible vastly to increase the sowing area and get additional harvest agriculture on them.

The analytical estimation run for base stated theoretical premises and experiment allows in addition and elaborates the agrobiology of the requirement in composition of the whole complex agricultural production, rational nature use and technologies of the irrigation.[4,7-9] Agro biology requirements to technologies of the irrigation must include the group of the factors, characterizing correspondence to technological parameter to comfort condition sprout plants. To the last pertain:

- A presenting of water in necessary amount and in required for plants periods in accordance with biological phase of their development
- An few intensive unstressed influence of the process of the irrigation on plants to account of the reduction to intensities irrigation
- An even distribution of water on field and on soil horizon on depth of the sharing the root system of the plants
- An ensuring the plant comfort condition on moisture contain in the ground and under land layer air, corresponding to agrobiology ability of his development
- A protection of the plants from mechanical damages in the process of preparation and undertaking irrigation, as well as negative influence on plants of the current of water and raindrop
- An ensuring the possibility of the presenting of water to sheet of the plants directly and dissolved in her element of the mineral feeding and pesticides.

For the provision of ecological safety of the process of irrigation necessary technology irrigation with optimum combination of artificial and natural precipitation.

As a result of wrong combination of the moistening of ground natural and artificial precipitation, entering on the surface of ground moisture not is completely used productive: a part her leaves on deep filtering, a part-on surface sewer. Except losses irrigation water, this brings about such undesirable consequence, as closed and compaction upper layer ground, migration of nourishing element within water, and others. To reduce the negative impact on the natural quality of the soil, it is necessary to take into account climatic, agronomic and hydrogeological factors when choosing irrigation technologies.

The large number of variant agro hydrogeology, climatic conditions, including amount of the possible atmospheric precipitation obstructs the

Table 3: Agrobiology requirements to technologies of the irrigation

Requirements	Taken factors for regulation of the requirements	Advisable importance's of the factor, borders of the measurement
Presenting of water in necessary amount and in required for plants periods in accordance with the biological phase of their development	Parameters of the mode of the irrigation (irrigation rate, middle irrigation period), degree of the correspondence to irrigation rates m and evapotranspiration E for controlled period T vegetation	$\frac{m}{E \cdot T} = 1 \pm 0.5$
Few intensive, unstressed influence of the process of irrigation on plants to account of the reduction in intensities irrigation	Intensity irrigation and degree of the correspondence to intensities irrigation and intensities water use	$\frac{И}{E} = (1–50)$
Even the distribution of water on field and on soil horizon at the depth sharing the root system of the plants	Factors efficient K_e, insufficient K_n, and surplus K_{iz} irrigations	Кэ ≥0.7 Кн 0.15 Киз 0.15
Ensuring the plant comfort condition on moisture contain in the ground and under land layer air, corresponding to agrobiology particularity of the development	Factor of the reduction to productivities beside (share of the unit) because of unevenness irrigation Optimum correlation for plant of the frequent irrigation rate, going on moistening under land layer of the air $m_в$ and soil layer $m_н$	ΔУ ≤0.05 $\frac{m_e}{m_n} = 01 – 10$
Protection of the plants from mechanical damages (breakage stalks, etc.,) in the process of preparation and undertaking irrigation, as well as prevention of the negative influence on plants of the current of water and raindrop	Factor of the damage of the plants in the process of preparation and undertaking irrigation PR, % Average diameter of the drop rain dm, mm and their kinetic energy	ПР ≤0.5–2.0 dcp ≤1.0
Ensuring the possibility of the presenting to sheet of the plants of water directly and dissolved in her element of the mineral feeding, pesticide	Degree of the moistening (share of the unit) to sheet surface in process of the contributing irrigation water by way of the sprinkling, including with dissolved in her chemical material	0.4–1.0

estimation to technologies irrigation.

Criteria breach to ecological safety to technologies irrigation herewith serves: Share of water, filtrated below layer active moisture change and surface sewer, soaking up the power of ground - as factor, defining salt carrying, etc.

For decision of one or another task necessary to give the analytical estimation. The failure device requires the additional expenses on the reconstruction of his capacity to work.

Follows to note that for study of the mode of irrigation agriculture is extremely necessary to know the agrobiology of the requirement, connected with ecological safety of technologies of the irrigation. It is inevitable that in order to solve a particular problem, it is necessary to give an analytical assessment. The analytical estimation runs for base-stated theoretical premises and experiment allows in addition and elaborate the group agrobiology requirements in composition of the whole complex of the requirements agricultural production and rational nature use and technologies of the irrigation.[2,6,7] At agrobiology of the requirement for technologies must include the group of the factors, characterizing correspondence to technological parameter comfort condition sprout plants specified in Table 3.

From the foregoing tables obvious that for ensuring the ecologically safe process of irrigation, necessary technology irrigation with optimum combination of artificial and natural precipitation and maximum uses lasts. As a result of combinations of the moistening of ground natural and artificial precipitation entering on the surface of ground moisture is not completely used productively.

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