The Effects of Goorab on Physical and Chemical Specifications of Soil

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Abstract

This research has been done to identify the effects of goorab construction on some physical and chemical features of soil in the region of Rastagh. In order to study two regions (goorab construction region and control region) have been selected. After that, sampling was done by drilling profiles with the depth of 0-30 centimeter in goorab construction region. Samples of soils were collected from control region as well. The specifications of soil contains: Acidity(PH), Electric Conductivity(EC), Organic Matter(OM), Phosphor, Potassium, Nitrogen, soil texture(sand percentage, silt percentage, clay percentage) was measured and then analyses in SPSSS 16 by T-test.The results have shown that the amount of phosphor, potassium, nitrogen and organic matter was more in goorab construction region that control region.However there was not a significant difference in EC, PH, clay, silt and sand percentage between samples from different regions.

Key words: Goorab, Organic Matter, Potassium, Nitrogen, Phosphor.

Introduction

Ground water management by artificial feeding and appropriate usage is the best solution to enrich aquifers and ensure sufficient water provision of wells and drainpipes. Artificial feeding (shedding of water into a permeable construction to protect, enhance and stock of aquifers and ground water) optimum usage of water by management approaches and protect water resources particularly in arid regions (Kiaheirati, 1379).

Goorab construction enables distract the flood from the main direction and spread it on adjacent lands. This performance can effect on vegetation and aquifer feeding and protect from wasting of water.

The importance of goorab construction is enrichment the lands and agricultural boom. Using seasonal floods can enrich the aquifers and enhance the vegetation quantitively and qualitatively, and modify soil specifications.

Rangeland reparation is the acts due to increase the efficiency of production with considering the ecologic condition of each region. Rangeland modifications can cause qualitative and quantitative increase of forage production and maximize animal reproductions.

The main aim of riparian performance is providing proper vegetation for livestock and protecting from water and wind erosion [11] working on nature and its compound is so exquisite and needs a lot precision. Hence, a inappropriate interfere can destroy all parts of this enormous chain [18].

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If the rangelands forages have been exploited without an appropriate progreamm, vegetation will destroy and soil will lose its fertility and decrease the canopy cover.

Decrease of canopy cover may cause direct hit of rain with soil and increase soil erosion. Consequently, the surface stream increase and this leads to soil washing and less permeability of soils.

The continuity of this trend may leads to indigence of soil and it needs to modify the soil [12]. Many researchers have studied on the modification effects of rangeland on vegetation and soil features. As an example, the study of spreading of floods in Zanjan region showed that the permeability of soil and the amount of carbon increased in soils [9].

Shariati(1379) concluded that the spread of flood on soil can change some soil specifications. So that PH and EC changes was not noticeable while the amount of Calcium and magnesium cations was increased whereas Sodium cations increased.

Flooding control and distribution of it on different lands protects from flood damages and increase some element in soils. The aim of this research is evaluation the impacts of goorab construction on the soil features of Rastagh of region.

1-1- Statement of aims

Limited soil and water resources and environment degradation have been become one of the greatest concerns in the world. T

Water streams on the earth is the result of precipitation. In some cases the each has not enough time to absorb the water so the noticeable amount of water wastes in many different regions. We can control this water and protect from flooding and soil erosion by some activities. One of the solution have been developed is goorab construction (Beheshti, 1389)

Because of lacking appropriate management in arid and semiarid regions, the great amount of water has been lost and it converts to a natural catastrophic events. Floodingdamage human being life's and jeopardize natural resources. Floods damage dramatically constructions, road and leads to soil erosion and wasting rich sediments.

In arid regions, experts are seeking to find solution to feed aquifers artificially, and using floods to improve water resources. In Iran the history of aquifer artificial feeding started from 3000 years before(Sarreshte daray, 1382)

The importance of goorab and flood spreading is mainly because of rich sediments on lands and convert them into productive lands and develop agriculture. Sedimentation has a great impact on enrichment of groundwater resources and the type of vegetation (Kamali, 1384).

Using of seasonal floods in goorab projects, can enrich ground water and improve soil and vegetation features. Although several projects have been done in Kerman regions, but the profits of goorab have not clarified yet.

Goorab

Goorab is wells in crescent form with 1.5 meter radius and 30-40 centimeter and 40-50 cm elevation. Intake volume in each goorab is about 0.7 -1 cubic meters and constructed by both labors andmachines. Considering that goorabs are hydraulic-sandy structures, the design of them should be done attentively. Effective factors in goorab design includes: runoff volume, precipitation rate, slope of the region, the type of vegetation, soil texture(Azarnivand, et al, 1378)

Mechanical methods to store raining

Regarding arid and semi-arid climate in 90 per cent of the country, the evaporation rate is more than precipitation rate. This regions are covered by rangelands which all the precipitation is needed to grow forages. Hence it is clear that the

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precipitation should be stored and consumed by vegetation covers.

Storing rainfalls in rangelands, not only decrease runoff and soil erosion but also increase permeability and enrich aquifers.

Therefore, this situation provide more moisture for forages and increase forage productivity. If the soil loss its permeability and is not able to store water, in short time we can increase permeability.

During the time that extra amount of water adds into soil, this water can be used for vegetation enhancement. After a time that efficiency of mechanic activities decrease. The coverage of vegetation is responsible to protect soil and decrease runoffs(Azarnivand,et al, 1387). Mechanical methods to store water contains pitting, riper, uniform distribution of snow, flood spreading (Jangju,1388)

Aims of goorab construction:

Goorab projects has two main effects. First waters that is wasted from soil surface stores and its permeability increases and second protect from soil erosion [4].

In general goorab projects has three approaches: increase the volume of aquifers, improve vegetation covers and insure human life, constructions and man-made buildings [1] Jafari 1385).

Literature review

In a study by Mousavi(1390) concluded that goorab can increase soil fertility and enrich vegetation.

Regarding impacts of flood spread on soil featuresin Damghan aquifer shows that sediments can change some feature of soil. So that Ph and EC did not change noticeably but Calcium and magnesium increased two times(Shariati, 1379).

Mohamadi and Esmaeil nasab(1379) studied the impacts of goorab on physical specification of soil in Mihem-Ghorve city in Kordestan province and reportedincrease in moisture percentage and acidity and decrease in EC. In addition, the amount of organic carbon increased that leads to soil improvement, enrich water resources and increase vegetation cover.

Jafari, et al (1388) in a research studied on impacts of rangeland modification on vegetation and soil in Sirjan city.

In this study four modification actions have done that included: protection, goorab construction, alfalfa planting, wheatgrass planting. For each action a treatment was selected as a control. Sampling was done random-systematic method in 50 plots.

Khadem, et al (1391) on the best situation for planting optimum size of the goorab in edge part of the Mohamad abad in Ghaen city.

Peierson [15] described flood spread as a multifunctional actions that its main aim is moisture protection and other profits includes productivity increase, enrich ground water and improve wild life ecosystem [17] .

Naderi, et al [13] concluded that spread of rain and flood can increase production in farmlands. Furthermore, this action can ease forestry.

Forrestration and planting can be a solution to fight desertification. .

These techniques are quite reasonable and accessible. Flood spread can save energy and enrich water resources.

Naderi et al [13] found that the reason of organic matter and nitrogen increase is convey of surface soil.

Geographical location of study area

The studied area is part of Hlilrud area and located in the north of Baft city. This region is in 29/23/34 to 29/35/54 north latitude and 56/17/56 to 56/35/7 east longitude. From north it reached to Bandar and Bidkhun and Seifedin mountains, from east to Yascahman, Palangi and Khanei Mountain, from west to Mikhsefid, Kuhsefid and from south to Moladaran village and Ablaghabad.

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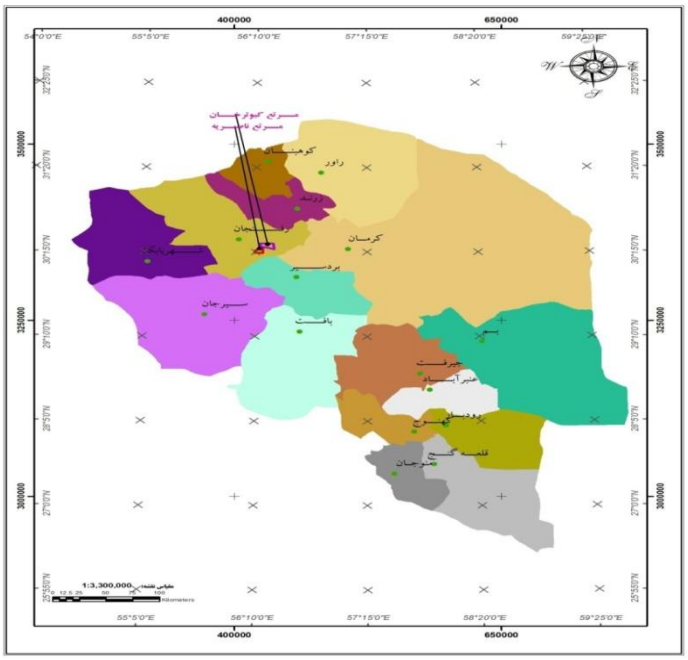

Figure1-2: location of studied area in Kerman province

The slope of region

To create slope map topography maps (1:50000) have been used with squares method (figure2-2 and table 1-2)

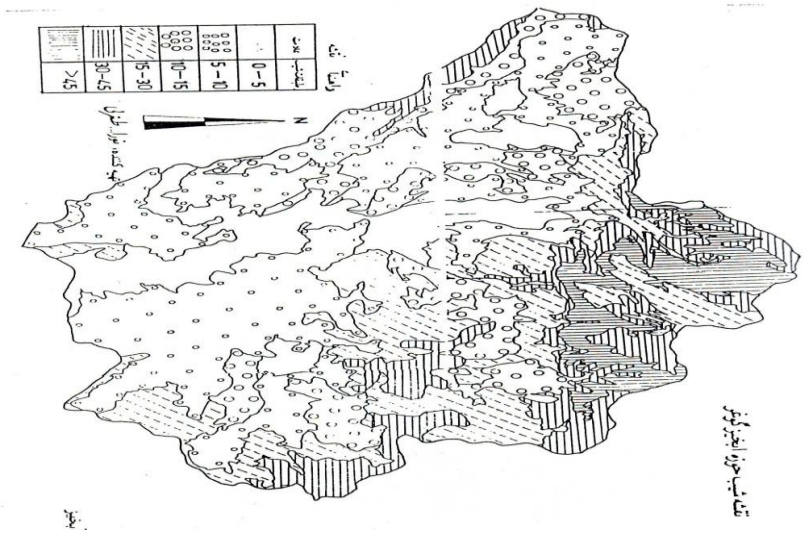

Figure2-2: the map of slope

Climatology

Precipitation rate is one of the most important parameters that depends on location. One of the effective factor is elevation and higher elevation, more precipitation.

In synoptic station of Baft city with 2280 height from sea, annual precipitation is about 263.7 millimeter. The details of precipitation is demonstrated in table 17. According to the rain

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falling statistics of station(Amirabad) has showed in table 18.

The maximum amount of precipitation is about 172.14 millimeter and the minimum is approximately9.8 millimeter in summer season.

The average maximum of monthly precipitationis in February (61.16 mm) and minimums in September (.9mm) effective precipitation happens from December to April.

To measure the annual precipitation we used gradient formula:

P=323/2logH-52/2

Vegetation cover of the region

Studied watershed has especial ecologic, topographic and hydrologic features. Slope and different directions of the region create an especial condition. In this region (table3-2) five main types was identified.

1- Accr persicus- Amigdalus elaeagniholia
2- Artemisia aucheri-Astragalus glau cacanthes
3- Ar.aucheri-Am. Elaeagniholia
4- Ar-aucheri-Hertia intermedia
5- Ar-aucheri-Am-elaeagnijolia

Two types of 3 and 5 are different with each other from the vegetation aspect.

Methodology

After field survey, region was chosen to construct goorab. In addition a same region was selected as control region.

Sampling was done from soil profile and 4 samples was gathered.

Four samples was carried out from control region using random-systematic method.

After that all samples was conveyed to laboratory and the amount of clay, silt, sand was measure using hydrometer method. Ph and EC of samples was measure by Ph meter and EC meter, respectively. Organic matter was tested by Valki-black method and nitrogen, phosphor and potassium density was measured by flume meter and spectrometer (Zarin Kafsh1372)

Data Analysis

The results from both project and control region was transferred into SPSS16, using t-test.

The results of analysis

All physical specifications was measured by different tools in laboratory. The density of clay, silt and sand was measures by hydrometer method, acidity by PHmeter, EC by ECmeter, and organic matter by valki-black method, nitrogen by Kajdal method, phosphor and potassium by spectrophotometer method. The results from control region and goorab sites was compared that the results are shown in table 1-4 and 204.

Table 1-4- the results of soil analysis in goorab site

Sample 4	*Sample3*	*Sample 2*	*Sample 1*	
1/1	1/4	1/5	1/3	*Organic matter (%)*
0/13	0/12	0/11	0/14	*Nitrogen (%)*
255	305	285	230	*Potassium (ppm)*
17/4	16/5	19	17/2	*Phosphor(ppm)*
0/25	0/24	0/22	0/21	*EC(mho/cm)*
7/3	7/1	7/3	7/2	*Acidity*
51	54	60	52	*sand*%

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22	20	21	23	*clay*%
27	26	19	25	*silt*%

Table2-4- the results of soil analysis in control site

Sample4	Sample3	Sample2	Sample1	
0/61	*0/58*	*0/66*	*0/54*	Organic matter (%)
0/03	*0/04*	*0/06*	*0/07*	Nitrogen (%)
162	*190*	*145*	*125*	Potassium(ppm)
7/3	*5/1*	*6/2*	*7/5*	Phosphor(ppm)
0/222	*0/24*	*0/23*	*0/21*	EC (mho/cm)
7/2	*7/2*	*7/1*	*7/3*	Acidity
59	*63*	*59*	*56*	sand*%*
20	*21*	*18*	*19*	clay*%*
21	*21*	*23*	*25*	silt*%*

4-3-The results of statistic comparison

The amount of acidity, nitrogen, potassium, phosphor, organic matter, clay, silt, sand and EC from two different samples were compared using independent t-test in SPSS16. The results have shown in 3-4 and 4-4 tables.

Table3-4- statistical analysis of different parameters using t-test

Significance level	Computational t	
0/000	*8/2***	Organic matter
0/001	*6/7***	nitrogen
0/002	*5/3***	potassium
0/000	*14/4***	phosphor
0/67	ns *0/45*	EC
0/7	ns *0/4*	PH
0/09	ns *2*	sand
0/86	ns *0/86*	silt
0/07	ns *2/1*	clay

*.*** significant in 99% ns .not significant

Table4-4- average of parameters

Significance level	Project average	Control average	
0/000	*1/3*	*0/59*	Organic matter

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0/001	*0/12*	*0/05*	Nitrogen
0/002	*269*	*155*	Potassium
0/000	*17/5*	*6/5*	phosphor
0/67	*0/23*	*0/22*	EC
0/7	*7/2*	*7/2*	PH
0/09	*54*	*59*	sand
0/86	*24*	*22*	silt
0/07	*21/5*	*19/5*	clay

Impacts of goorab project on physical and chemical specification of soil

Different projects based on restore vegetation are desined for different aims, but the general aim is return to the optimum ecologic condition(Yang et,al, 2003).the ultimate goal of many of the ecologic restore is return to natural ecosystem structures, performances and processes(Block et al.2001).

The amount of organic matter, potassium, phosphor and nitrogen in goorab site increase significantly (99% level). In control site because of weak vegetation cover organic matter decreased in soil(Frank et al, 1995, Javadi et al, 1384, Jalilvand et al. 1386). The results of this research has conformity with the results of Beheshtirad et al(1390), Baver et al(1987), Derner and Schuman(2007) Shahabi(1379), Sanadgol(1381), Javadi et al(1384), Heidarian and Aghakhani(1389).

The soils which are covered by plants with large roots have more organic matter and nitrogen (Javadi et al,1384, Jlilvand et al,1386, Heidarian et al 1390) hence, in goorab sites because of high density of vegetation the amount of nitrogen is higher than control site.

EC and Ph have not significant difference in two samples of goorab and control sites. In addition, the texture of soil did not differ after goorab construction. These findings are the same with the results of the research by Beheshti rad et al [5] They found that EC and ph did not show a different.

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