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The role of land use and slope in soil erosion coefficient at water farming

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ABSTRACT: Erosion is a complex factor of soil properties impacts and the interactions between them. Many efforts have been made in order to demonstrate the ability of soil based on soil measurable characteristics in laboratory with desert and soil reaction to rainfall a simple index of soil erosion. Water and wind erosions cause side effects such as degradation, soil fertility, environmental problems and quality and quantity reduction in agricultural products. Land use changes in the past and the present and future is one of the main causes of global changes that The changes in the physical form of earth is the most common and most important effect of it and this effect has left many complex results on ecosystem of any region. In developed countries, agriculture in the fertile lands is more lucrative than lands with less fertility. Estimation of soil erosion in each sample had been done by using Wischmeier's monograph and data analysis formula by using software Excel, SAS, and comparing soil erosion in different applications and different slope.
Keywords: water erosion, land use, slope, erosion coefficient

INTRODUCTION

Land use changes in the last few centuries has been amazing and surprising (Mildew Wally 1995) / long times ago people believed that as the forest lands are available, it is easy to turn them into farmland. Today this view has changed, since as the natural vegetation remove and land used for agriculture, environmental problems will come (Kouchaki 1996). In the last 300 years of the world, the extent of forest lands and rangelands are reduced respectively about ½ billion and 580 million hectares (Richards 1990).Miller and Wally studies showed that increasing of agricultural lands and decreasing of forests and lands between years 1950 up to 1985 it means during 35 years, was more than years 170 up to 1850 it means about 150 years. Changes in land usage from dense covering and permanent to thinning covering and temporary, always has been associated with increase of runoff and erosion and Sediment production.

Land use changes whether in the past or present or future is one of the main causes of global changes that The changes in the physical form of earth is the most common and most important effect of it and this effect has left many complex results on ecosystem of any region. In developed countries, agriculture in the fertile lands is more lucrative than lands with less fertility (Tarner., et al 1990). Water and wind erosions cause side effects such as degradation, soil fertility, environmental problems and quality and quantity reduction in agricultural products (David et al 2003).

The ability of erosion is soil characteristic that can be known as one of the characteristics of soil quality. Middleton 1930 in California at water erosion obtained Index of credibility by Integrating Two-Factor of runoff and the amount of sediment. Based on Wischmerer and Mannering studies (1969) on 55 different soil samples from Maize cultivation and lands, laboratory and statistically extensive analysis and using of Rainfall simulators by studying the 24 independent variables with their interaction such as particle size, organic matter, structure and an aggregate index of relations between the soil erosion was reduced that its amount depends on reflecting effects of organic matter and had index of aggregation and also by increasing silt percent the percentage of soil erodibility increased that the amount of these changes was dependent to organic matter, PH, clay, and sand (Refahi,1995).

MATERIALS AND METHODS OF RESEARCH

Zidasht following areas: the area of soil studies is 6486 based on Physiographic researches is located on the slopes facing north at Water-rich areas of Taleghan river this area is located in the coordinates of "46, '37, 50º to" 56, '44, 50 º and W '35, ‘5, 36 º to "46'11, 36 º. The average height of 2068 meters above sea level and the average annual rainfall is mm. 8 vegetation types found in the area, that each of this soil type has different characteristics in terms of geophology and geology and... .Density of vegetation in the region is at different positions.

So that in some areas due to aggression of animals and humans have a low percentage of it, and in some other areas, this is not true. Generally, vegetation density between 50-30% will change. Plant communities of this area are often shrub species, shrub of Astragals - Chubak - wild tomatoes – apple – Eglantine - Sagebrush and are in some areas is limited to Aras. Vegetation Landscape of area is mainly Shrubbery and Grassland. In studied area bedrock of most soils and basic materials are mostly limestone. And they usually consist of heavy to very heavy texture.

RESEARCH METHOD

Providing DEM (digital elevation model) and extracting slope maps, orientation, height, slope length and slop form Digital Elevation Model land , making a maps reference by system of universal Transverse Mercator UTM and, clip , making verily of Layer of slop and land use and determining homogenous units. Determining the User that included watery agriculture For determining usages and dividing them according to slop, providing and making basic information such as slope, usages, geology and road were necessary that had been provided .

Removing of organic matter or hydrogen peroxide samples to determine soil texture .Studying grading of samples and determining percentage of clay, silt (05/0 -002 / 0 mm) and very fine sand (05/0-1/0 mm) for 48 h using a hydrometer model. Determining of sand Percentage (1/0-2 mm) by using sieve model.

Determination of structure Classes of soil and the corresponding codes based on the classification of Wischmerer and colleagues. Measuring the amount of organic matter with method of Black alcoholic (1954).

Permeability measurements using a double cylinder twice and set the class of permeability based on Wischmerer and colleagues classification. Estimation of soil erosion in each sample by using Wischmerer nomograph and related data analysis formula by using Excel, SAS software and comparing soil erosion in different applications and different slope.

RESULTS

Erosion rate variability in watery agriculture

As it is shown in table 1 Erosion rate variability in watery agriculture of studied area, will increases by slop increasing. Same rate at slopes of 8-3 and 18-8 percent, respectively, are 0.431 and 0.462 as expected slop effect is observable in the increasing of the same rate. slop effect in changing soil texture is as follow that by increasing slop land, very fine Seat and sand particles easily and with minimal force will come out with high slop and in lower lands(low slope and level) will accumulates .

Table 1. show characteristics of soil and amount of erosion in pasture usage

amount of erosion	Level of Permeability	Level of structure	Very fine sand +clit%	%clay	Organic matter% %	Earth slop
.0431	5	4	35.64	20.88	.80	3-4
.0462	5	4	37.10	16.60	0./82	8-18
0.428	5	4	36.55	9.65	0.70	-40

In The slope of 18-8 percent, a significant increase in very fine sand silt and reduce of Permeability cause increases of soil erosion coefficient but in the slop of 8-3 and 40-18 percent due to the interaction of organic matter, silt percentage to very fine sand, and high permeability and erosion has been observed relatively similar in other hand permeability coefficient reduction in lands with high slop is increase of sand content of soil (0/1 to 2 mm) due to further weight, will shifts less .Clay particles came out of the land located in second steep class and in lands located in first steep class will have accumulate. The clay content in every three slope class respectively is measured 20/88, 16/60, 9/65 percent. These changes statistically are significant. In lands located at 18-40 slop the amount of erosion is obtained about equal to lands located at 3-8 percent slop.

Erosion at first and third class have not any differences with each other. Reduction of coefficient erosion at lands located at 18-40 percent can beexpressed prior occurrence of erosion due to the availability of suitable conditions (relatively steep gradient causing a lot of erosion) in these lands.

The impact of land usage type on coefficient erosion

The reasons oferosion in differentusers is referred toamounts oforganic matter, soil structure, soil texture, permeability, and other factors that willbeconcerned. Erosion in watery agriculture has shown that the amounts of watery agriculture erosion frequently have beenviewed. In comparison Irrigatederosion thathave the greatestamount than others, the followingresultswere found that: if a irrigatedpasture convertedto pasture, the amount of erosion will reducetolarge percentage .Similarly,if the user cantruthewatertorain fed pasture ,the amount of erosion will be decrease but as much as pasture. These results suggestgiving

priority tocreatingandmaintaininpasturesthanother usagesAnd finally should preferred therein fedthan irrigated agriculture.

Impact oflands slopeinerosionratechanges

Orientation ofslopeandslopedgereffect atsoilerosion.In this study, samples areas all is takeninslopefacing northgeographically. So wean make credibility coefficientsof different users that are same in slopes into an account of a group of results Andcompare them with each other andregardless to thetype ofland use, landswith slope of8.3percenthasthelowest erosion that byincreasingslopes, erosion average will increases. Comparing the average of erosion at slopes of 3-8 ,8-18 and 18-40 percent, indicating that the coefficient with slope increasing, will increase that statistically is significant .Average of erosion at slopes of 8-3, 18-8, and 40-18% the average is 9. The result of erosion amount increasing with land slop depends on increase of intensity and runoff amount, shifting of fine particles such as clay, very fine sand, and silt that gained results of soil tests confirm this result.

Analyzing of soil propertiesChange sat usages and different slope

In analyses of correlationcoefficientof erosion coefficienttoavailablefactors included in the erosion estimationformula, higher stcorrelationcoefficient was obtained fromtheclay. With increasing coefficient of clay, the coefficient of erosion reduces. In water agriculture user coefficient of correlation with 0/026 % was obtained because in comparison of human role in lands usages, dry cultivation and water cultivation, the role of human at making and managing water usage is more than other users. Wecannot trust on the result of available correlation coefficient at watery cultivation usage. By increasingSlope in all usage'sclay percent was reduced. Inwatery cultivation usage,managementeffects reduced organic matter and claychanges stresses inerosioncoefficient changes had impressed.

Table2.Average percent agesof clayandits correlation coefficient witherosion at users and differentslope

correlation Coefficient	18-40 % slop	8-18 % slop	3-8 % slop	Land slop
00.26	3.60	14.60	20.88	Irrigated

PermeabilityChangesinIrrigated agriculture

Permeability yet3-8percent slop inRice fieldwas measured0.48cminhours.

In this slop the amount of sand (0.1 to 2 mm) was 7.81 % that this factor at 8-18 % slop reduced strongly that in statistically analysis at level 1 is significant. Permeability at second class strongly had reduced and had fallen to 0.35 cm/h. At Irrigated landingthe study area,changesinthepermeabilityofclassic lands comparing to classicwas not significant. Poor Building ofsoil at this usage is the reason of permeability reducing in the third class. As in third slop class sand percentage (0.1 to 2 mm) is more but Due to the low amount of organic matter in this slope the permeability is low that soil structure at this usage at all three class is 3.

Sand Percentagechanges in watery cultivation

In this usage also sand percentage changes statistically is significant. The percentage of sand in this usage at slop of 8-18% is more than slop of 3-8% but at slop of 18-40 %, the amount of sand will reduced.Thus, inslopeof3-8percent,8-18% and 18-40%, these changesaresignificant . Differences in thevarying amountsofsandcommonlyare related to basic materials. An intensity increase of sand with slope increasing in this usage ismuch morethanotherusages.And this may bedew to provideconditionsforerosionbywater. These groups oflands are more sensitive to erosion. Sand Reductionatslop of 40-18 percent represents the withdrawal of large

quantities of sand from the farm. Table3 shows the variance decomposition of fine sand on different lopes of the irrigated land.

Percentagechange of organic matter in watery cultivation

Studies ontheyirrigated cultivation, was as follow that theaverage percentage nonorganicmaterial incultivationswith8-3percentslope, was 0.80 %, while the average percentageof organic matterincultivationwith a slopeof40-18% was0.70.Thiscouldbabecauseof Higdensityoperation in thefieldof lowslops(slope 8-3and18-8percent). Thustakeingadvantageof landswith low slopeis much greater. The reason of More organic matterofirrigated landwith slope of18-8per cent, compared tolands with slop of 8.3% canbe due to this fact that .lands withtheslope of 3-8 % the amount of cultivation is very greater than lands with the slop of 8-18 % thatIt requires, successivetillage and soiloperations so makingenough time togetcovered andincrease the amount oorganic matterto soilwillnot provide.Differences of organic matter amount at slops of 3-8 and 8-18 % statistically at level 5% was not significant. The amount of organic matter at slops of 18-40 % significantly reduced which was due to steepslope, low amount ofcultivation, poorsoilstructure.

Table 3.Variance decomposition percent of organic matter of watery cultivation of different slops

F test	Average sum of squares	Sum of squares	Degree of freedom	Change
23.84	2.76	5.53	2	their
	0.11	0.69	6	Error
	0.0	6.22	8	total

RESULT

Overall, the results suggest that by increasing the slope in Agricultural and non-agricultural usages the erosion rates goes high. Without slope Interference, average erosion at water cultivation usage was, 0.440. in comparison water cultivation usage that have the maximum amount of erosion to other usages, the results were found as following that if irrigated cultivation User shifts to pasture, the amount of soil erosion will be reduced a lot, if the user changes the usage of irrigated cultivation to dry land pasture, the amount of erosion will be reduce. But declined of pasture is more than dry land. These results suggest giving priority to establishing and maintaining pastures than other users of different farms. Finally, dry land farming should be preferred to irrigate cultivation. Also with increasing slop in each usage, degradation rate will increases. Comparing effect of slope and different usages are as follow.Without interference of slop factor, permeability comparison of usages indicates that irrigated lands under cultivation have the least amount of water. Comparisonof the organic matter content between different usages indicated that irrigated lands and pastures have less amount of organic matter in soil that this result show lack of management at desired study pastures. Agricultural land degradation at towns and villages borders is due to the sharp increase of human activity should be considered more. To control and prevent soil erosion, more attention paid to agricultural land, and this fact should not limit to basinwatershedsandsteepslope. Avoiding land use changes without scientific reviews of land capability and capacity is required. Detailed and comprehensive study of slope factor role in soil erosion with constructing numerous plots at different slopes.

In general, the corrective action to improve grades and degrees of ability and suitability of each land unit are necessary, including limitations that are impossible. Corrective action requirements for each types of applications will increase productivity and crop production. At Irrigated agriculture land units for those components that are recommended for those groups of irrigated agriculture, which suggested suitable, the land leveling operations, terracing, providing water supply ,field operations, collecting gravel of soil and land surface, avoiding soil erosion and borders erosion, improving irrigation methods and providing required facilities for maintaining agricultural products and natural resources are necessary .

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