Rangeland Use Changing Effect on Soil Infiltration in Northeastern of Iran

Hamid Mostafalou
Mazandaran University, Iran

Mohammadreza Tatian
Islamic Azad University, Iran

Reza Tamartash
University of Sari, Iran

Hamid Jalilvand
University of Sari, Iran

Safar Gholi Khajeh
University of Tehran, Iran

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Hamid Mostafalou[1], *Mohammadreza Tatian*[*2], *Reza Tamartash*[3], *Hamid Jalilvand*[3], *Safar Gholi Khajeh*[4]
[1] *M.sc. Graduated in the Field of Range Management, Mazandaran University*, [2] *Post Graduate Student of Range Management(PhD)Science and Research Unit of Islamic Azad University, Tehran*, [3] *Faculty Members of Agriculture and Natural Resources of Sari University*, , [4] *M.Sc. Graduated in the Field of Range Management, Tehran University*

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Introduction In Golestan province is created soil erosion and uncontrolled floods due to incorrect utilization of lands. Some studies showed that lands utilization management is affected on soil erosion (Tabatabaie, 2001). Small-scale natural heterogeneity of a particle of soil properties, is mainly dependent on the historically land use and the anthropogenic encroachments on site which influence the subsurface flow path (Koch et al., 2005). Different vegetation of land can significantly affect the eco-hydrological balance at a site, changing of the soil infiltration depth and access of plant to water (e.g., Huxman et al., 2005). The objective of this study was to evaluate effect of land use changing, on soil infiltration rate in northeastern of Iran.

Materials and methods Northern Golestan province is located in altitude between 55° 45′ to 56°10′ and, longitude between 37°20′ to 37°40′ and range of elevation 100 to 1500 m. Infiltration rate was measured by Kostiakov's equation as follow : $I = 60dD/dt$, (1) ; $D = ct^m$, (2) ; $I_{ave} = 60\ D/t$, (3) ; $t_f = 600\ n$, (4) ; $I_f = Kt_f^n$, (5) ; where D, accumulative infiltration (cm) ; I, instantaneous infiltration rate (cm h^{-1}) ; I_{ave}, average infiltration rate (cm h^{-1}) ; t_f, time to final infiltration (min) ; I_f, initial infiltration rate (cm h^{-1}) ; m and c, constant coefficients ; T, Time(min) ; dD/dt, ratio of differential infiltered water depths to time. The percentage of porosity in each of land use was calculated by : $P = [1-(BD/PP)] \times 100$, (6) ; where P, soil porosity ; BD, soil bulk density (g cm^{-3}) ; PP, soil particle density (g cm^{-3}). Because of determine of primary humid percentage in the 30 cm of soil depth (plants root development depth), 10 profile was drilled in each area and soil samples were taken and their primary humid percentage was obtained in lab. In order to compare the amount of infiltration rate in different areas, statistical index of relative error (% RE) was used as follows : $\%\ RE = [Ixi-Iyi/Ixi] \times 100$, (7) ; where Ixi, instantaneous infiltration rate in certain time at the x areas ; Iyi, instantaneous infiltration rate in certain time at the y areas.

Results and discussion The result of plant cover analysis identified the following cover types : cultivated lands included *Triticum* and *Hordeum* and rangelands at north skirt with grass type (*Poa Bulbosa & Hordeum vulgaris*) and rangelands at south skirt with *Artemisia herba-alba* and *Bromus tectorum* that they had 80 % and 40 % respectively. Final infiltration rate in use of rangeland with 9 cm h^{-1}, the most amounts and in use of cultivated land with 2.5 cm h^{-1} had the least amount. The comparison of instantaneous infiltration rate in two types of lands showed that instantaneous infiltration rate with use of rangeland at north skirt was $I = 4.2t^{-053}$ more than use of cultivated land in the same skirt with $I = 15.9t^{-0.43}$ (equation 1). Also, result of accumulated and instantaneous infiltration showed that accumulated infiltration with use of rangeland ($D = 1.64\ t^{0.84}$) was more than cultivated use with $D2 = 0.7t^{0.81}$ (equation 2). Asbjornsen et al. (2006) showed that lands with different vegetation such as agriculture and native plant communities had different water uptake rate and infiltration rate. Also agricultural communities had the lowest infiltration rate. Beggaries et al. (2006) showed that the hydrological response of two contrasting basins in the central Spanish Pyrenees is strongly depended on their land use. In our results percentage of porosity, primary soil humidity, instantaneous infiltration rate, also initial infiltration time, accumulative infiltration and final rate of final infiltration at the cultivated land were reduced strongly but soil texture was constant. Whereas rangeland use changing in this region is done by rangeland users, soil erosion and floods has increased (due to infiltration reduction and runoff increase) recently. This kind of rangeland management is versus government policies for water and soil conservation. Thus, attention to socio-economic problems of Golestan rangeland users is necessary in government planning.

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