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Review Article

Influence of Slope Variation on Northern Areas on Soil Physical Properties

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ABSTRACT

Many Soil physical properties like infiltration capacity, soil bulk density, and soil moisture percentage are affected by the variation in aspects. Generally greater slope angel more will be the erosion & runoff and also, more loss will occurs. But when seeks on the northern aspects and compares with medium and gentle slopes on other parts. The medium to the gentle sloppy area is facing the more and more pressure of degradation and also degraded by the overgrazing, mismanagement in the cultivation practices, faulty land uses, deforestation and stress for fuel or wood production. In many countries, zero tillage practices are organized to reduce the soil carbon losses and also a reduction in the oxidation of the Soil Organic Matter. Slope variation is very crucial for soil physical properties and also 1^{o} (One degree) change in slope cause millions of tons of soil loss. The soil loss and runoff are not only a problem but completely change the soil texture; the production will be reduced from many mounds to a few kilograms. But in northern aspects, the large number of naturally growing trees does not only help to retain the soil physical properties but also produce the more and more fertile soil by adding organic exudates, rotten leaves and their symbiotic relationship with microorganisms produces more bulked soil. Steep slope with natural vegetation retained more moisture, organic nutrients, and stability in their physical properties and, at last, more plant production power.

Keywords: *Soil organic matter, erosion, northern aspects, organic exudates, zero tillage.*

INTRODUCTION

Soil is one of the vital natural resources, and many soil physical properties can be affected by aspect. Soil is extremely important for forests and attains sustainability in natural agroecological system. A natural resource like soil has been extremely misused in the past many decades due to the many natural and physical factors like exclusive deforestation, unequal grazing and practices in agricultural systems resulted in soil erosion and affect the yields of water (Hameed et al., 1996).

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One of the most critical criteria is Aspect for the definition of Soil physical properties and vegetation.

Aspect and their importance

Valley or slope faces which direction is called Aspects. Among many environmental parameters such as slope, aspects, elevation, and many factors affects the soil physical properties and also aspects is one of the most important parameter (Enright et al., 2005). The slopes which face the equator are received more sun light and the other side of the valley is shaded by the mountain. Soil physical characteristics are mainly changes due to elevation changes (Sharma et al., 2009; & Mokhtari et al., 2012). May be aspects is in the one of the suitable factor formation of landforms, slopes that are much far from facing the equator may feel 6^{o}C colder than their opposition; the gradational processes are estimated that northern hemisphere are 2-3 times more active by northward-facing slopes.

Elevation above sea level is effective factors for the determination of plant species and plant diversity (Fisher & Fuel, 2004). Management Importance of Mountainous area on a commercial basis is rarely considered in northern aspects with respect to ecology. Similar management practices are currently being practiced to different ecological aspects either from plain or hilly area.

Relation of Aspects with Physical soil Properties

Generally, changes in environmental factors like aspects affect the soil's physicochemical properties and quality. The physiochemical properties plays a critical role in watershed management (Emami et al., 2014). Elevation, slope and aspects are the main topographic factors that influence soil development (Plaster, 2013). The Northern part of the country is mainly considered as the watershed areas of Pakistan. Northern areas of Pakistan are valuable and one of most important assets because they most indigenous in the production of Water & hydroelectric power, recreation & Tourism spot, medicinal herbs, timber & firewood, food as well as faunal and floral biodiversity. The beneficiary are not only the resident of catchments, but the beneficial impacts are also felt in the down populated areas. Scientifically these areas of the country have not been managed well due to a deficiency of scientific knowledge, which resulted in flooding in downstream areas, causing huge losses of soil health and special physical properties of soil. Erosion from productive areas cause silting up in the dams, reduction in electricity generation and per hectare yield observed. One the research is carried out in Brazil that correlates two different variables of environment i.e. the substrate (Soil and topography) and distribution of tree species. The differences in results showed that soil texture, fertility and change in soil water regimes are observed where the tree species are in forests are chief determining factor. One of the physical property Infiltration mainly depends upon soil physical characteristics, they also requires quite special attention for determining the soil runoff amount which results in precipitation (Imran, 2008).

This is observed that variation in physical properties of soils have different relation with changing in aspects but nothing is explored within an aspects. Advance study of the researchers reviews those different physical properties in the following manners.

Infiltration Rate

The movement of water into soil due to capillary or gravitational forces is known as infiltration. The infiltration capacity of soil is disturbed by the various factors such as soil physical condition, properties, vegetation cover and their condition and duration and intensity of rainfall. Therefore, various factors are combined cause differential effect. Aspect throughout affects the microclimate, soil moisture and have a significant impact on the ecosystem characteristics and control the pattern of vegetation (Clark et al., 1990). The infiltration rate on steppe slope is at a low rate because of the gravitational force and much more angel of steppe slope. Mu et al. (2015) described that increase in slope angel cause reduction in water storage capacity of soil. Water moves through the great erosive force

and causes loss in the soil volume. At last the different results tell that increase in steppe angel more will be the erosive force and less infiltration rate. If we seek in terms of Pakistan's northern areas, the large number of trees are naturally planted and changed general overview about the infiltration rate in steppe slope. These forests increase the infiltration to the exceptional level rather than barren lands. These are not only in favor of infiltration but also prevent the soil from the erosive power of water.

Bulk Density

Soil bulk density is a ratio between mass and volume. More soil will be bulked if more litter and humus are present in the soil. Soil bulk density is highest at top of slope and lowest at the bottom part of the slope. The steepness of soil causes the more erosive force, which results in the reduction of soil humus or litter contents. But on the other hand, planted lands with tree provide many reasons to bulk the soil, such as plant roots excludes different chemicals that soften the soil rhizosphere, microbes made symbiosis relation with plants roots and saprophytes play a role in the decomposition of dead plant parts that's favors the soil bulkiness.

Different plant species provide the sources of carbon and many other macro or micronutrients for the soil bacterial species or other decomposer in the form of the rotten leaves and root exudates, and in turn they provide the decomposed organic material which stabilized the soil structure, plays a key role in nutrients cycling, soil physical condition and nutrient improvement in soil (Porazinska et al., 2003).

Soil moisture contents (Percentage)

Soil moisture content is greatly is affected by the aspects and slope in the landscape (Butler et al., 1986; & Daniels et al., 1987). Wang, 2017 founded that higher moisture contents on shady side of slope where plants height is low while low moisture contents on sunny side. Soil moisture contents are higher on northern aspects due to vegetation and enrichment of soil with leaf litter. Large amount of leaf litter, plant decomposed parts, good infiltration rate, more soil bulkiness, more root penetration and hence more water entry. Tian et al. 2014 was observed that even plants have the ability to maintain soil moisture by adjusting the demand and supply of water in above and below ground part of soil. Soil moisture & nutrients plays a critical role in plant growth distribution (Xu et al., 2008). Human disturbances like tillage, leveling,

Vegetation removal, intensive cultivation, compactness and higher grazing pressure reduce the moisture content at the great level on the gentle slope. Soil elevations are greatly correlated with soil organic matter and nutrients, and there was an inverse correlation between soil organic matter content and soil slope (Jiang & Thelen, 2004; & Wu et al., 2008). Liu Xiaoli et al. 2021 founded that moisture contents of the northern soil is more than southern soil.

CONCLUSION

Pakistan is gifted by nature with lots of natural resources; the watershed is one of them. Many resources are misused due to lack of scientific knowledge or awareness. Natural pasture, vegetation and also natural water resources are mainly misused, the pastures are not grazed in a rotation manner, vegetation are illegally cutted off and water resources are not managed due to the lack of funds, awareness, management, control, provision of security and many other uncountable factors. The natural vegetation in northern areas of Pakistan has a lot of benefits in terms of watershed management, soil physical properties, ecological aspects, firewood & timber, water provision, hydroelectric power, recreational, tourism and medicinal herbs production.

The watersheds lie in the northern part of the country. The cutting off vegetation because of many losses like silting up in dams, decreases per hectare production of crops. The slope variation have adverse affects and these affects are not occurs in the sloppy areas but also in leveled areas.

For the conservation of soil and water, many things are suggested; some of the followings are discussed such as land utilized

with respect to their capability class, pasture are grazed in rotation or regulated through a proper utilized system, plantation and protection of locally well known as well as exotic or rare species should be carried out and soil conservation techniques should be adopted if lands are to be cultivated.

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