MARUMEGH

Kisaan E- Patrika
Available online at www.marumegh.com

ISSN:2456-2904

DEGRADED SOIL AND ITS MANAGEMENT

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Introduction

Soil degradation is the decline in soil quality caused by its improper use, usually for agricultural, postural, industrial or urban purposes. Soil degradation is a serious global environmental problem and may be exacerbated by climate change. It encompasses physical, chemical and biological deterioration. Examples of soil degradation cited by Charman and Murphy (2005) are loss of organic matter, decline in soil fertility, decline in structural condition, erosion, adverse changes in salinity, acidity or alkalinity, and the effects of toxic chemicals, pollutants or excessive flooding. Approximately 50% of worlds irrigated lands are affected by salinity. Soil salinity can produce as result of use of salt containing irrigation water, presence of high amount of salt in the soil and high level of ground water table (Horney *et al*, 2005). India has total geographical area of 329.00 million hectare out of which only 140.22 mha was under agriculture and forestry use. In India nearly 9.38 million ha area is occupied by salt-affected soils out of which 5.5 million ha are saline soils (including coastal) and 3.88 million ha alkali soils (IAB 2000). Soils host the majority of the world's biodiversity and healthy soils are essential to securing food and fiber production and providing an adequate water supply over the long term. Ecosystem services provided by soils are integral to the carbon and water cycles and include cultural functions. There are strong links between climate change and soil condition. Salinity is considered as one of the most important abiotic stresses, limiting crop production in arid and semi-arid regions, where soil salt content is naturally high and precipitation can be insufficient for leaching (Zhao *et al.*, 2007). Soil salinity, erosion and land degradation problems not only deteriorate the quality and quantity of crop production but also severely affect the lands and it can’t be further used for cultivation.

Objectives

- To define the scientific basis for degraded soils and their management in India.
- To improve the understanding of soil conservation practices in agriculture and their links with other environmental protection.

Methodology

Management of degraded soils can be accomplished through several methods. Selection of an appropriate site specific method depends on several soil properties and other considerations such as depth of soil to be ameliorated, soil erosion and salinity impact on soil, presence of compacted layer(s) in subsoil, content and type of salts present, composition and quantity of water available for leaching, quality and depth of groundwater, desired rate of replacement of excessive exchangeable Na^+, occurrence of lime or gypsum in soil, content and mineralogy of clay fraction, availability and cost of amendments, topographic features of the land, nature of the crop(s) to be grown or the land use during and after amelioration, climatic conditions, and time available for amelioration. Adequate water application and soil drainage with deep groundwater are essential prerequisites for sustainable amelioration. For surface irrigation systems, land leveling is necessary to facilitate uniform water and amendment application and infiltration, thereby increasing the uniformity in amelioration.

Results and discussion

Soil erosion and soil salinity its impact: In India water erosion is the major cause of topsoil loss and terrain deformation. Wind erosion is dominant in the western part of the country causing a loss of top soil and terrain deformation (Sehgal and Abrol 1994). India's total crop production, environment, economy, have recorded continuous degradation due to the continuous escalation in soil salinity, land degradation and erosion which needs imperative actions to control these degradation processes. In the present paper a review and analysis of the problems caused by soil salinity, soil erosion, land degradation and its overall impact on crop production in India has been presented along with the most possible remedial measures to these problems.Soil salinity, land degradation and erosion reduce the crop quantity and quality and increase the food inflation. In India the problem of soil erosion is prevalent, over about 53 % of the total land area. Approximately 9.38 million hectare area of the country is affected with soilsalinity problems. Saline soils lose their productivity and possibility of turning them again productive. Results of the present investigation are in similar line with those of (Mishra and Dave, 2013).

Management of salt affected soil: Salt-affected soils deteriorate as a result of changes in soil reaction (pH) and in the proportions of certain cations and anions present in the soil solution and on the exchange sites. These changes lead to osmotic and ion-specific effects as well as to imbalances in plant nutrition, which may range from deficiencies in several nutrients to high levels of sodium. Such changes have a direct impact on the activities of plant roots and soil microbes and ultimately on crop growth and yield (Mengel and Kirkby, 2001).

Reclamation of sodic soil: The reclamation for sodic soil is influenced by the level and depth to which sodicity needs to be reduced. There is no single post-amelioration value of ESP or SAR that can be specified for all situations. However, the objective of reclamation should be decrease soil sodicity to as low a level as possible and practical. The depth of soil amelioration varies with crop species to be grown and with associated soil properties.

Reclamation through leaching: Supply of water required to leach the salts beyond the root zone for maintaining the salt balance. Some sodic and alkali soils contain a source of Ca^{+2} gypsum or calcite at varying depths. Generally characterized by the presence of a gypsic horizon, gypsiferous soils contain gypsum in sufficient quantities to supply adequate levels of Ca^{+2}. Gypsum dissolution in water may reach to an extent of 2.5 g/l yielding a Ca^{+2} concentration of about 30 mmol/l. However, it takes longer time to dissolve in soils. The compositions of the soil solution and the exchange complex directly influences its solubility (Herrero *et al*. 2000).

Reclamation through organic materials: Application of organic materials to these soils enhances microbial activity that transforms the newly added organic material into polysaccharides and long chain aliphatic compounds capable of binding and stabilizing soil aggregates (Lado *et.al*. 2004). A variety of organic materials have been used to ameliorate sodic and alkali soils, including crop straw, cottage cheese whey and fly ash, synthetic organic polymers, farm manure, slaughter house wastes, poultry excreta and green manures of different crops.The present findings are in good accordance with the results of Ghai *et al.*, 1988.

Reclamation through inorganic materials: The use of chemical material use to ameliorate sodic and alkali soils is an old practice. The amendments that help in dissolution of native Ca^{+2} sources in these soils include gypsum, sulphuric acid, hydrochloric acid, sulphur, iron pyrite, lime sulphur, iron sulphate and aluminium sulphate. Several other amendments and by-products of certain industries may beeffective but their use is limited (Hoffman 1986).Gypsum is most commonly used as an external source of Ca^{+2} because of its comparatively low price, general availability and easy application in comparison to other chemicalamendments. Potentially achievable electrolyte concentrations in the soil solution saturated with gypsum range from 30 to 266 mmol/l when ESP ranges from 0 to 40 (Oster 1982).

Conclusion

Therefore, post-amelioration management of these degraded soils is as important as the amelioration process itself. We believe that the time has come to consider these soils as a useful economic resource rather than an environmental burden. Their use should therefore considered to be an opportunity to shift from subsistence farming to market oriented farming.

References

Ghai, S.K., Rao D.L.N., and Batra, L.1988. Nitrogen contribution to wet land rice by green manuring with Sesbania spp. in an alkaline soil. *Biology and Fertility of Soils*. **6**:22–5.

Herrero, J. and Porta J. 2000. The terminology and the concepts of gypsum-rich soils. *Geoderma*. **96**:47–61.

Hoffman, G.J. 1986. Guidelines for reclamation of salt-affected soils.*Applied Agricultural Research*. **1**:65–72.

Lado, M., Paz. A. and Ben-Hur, M. 2004. Organic matter and aggregate size interactions in saturated hydraulic conductivity. *Soil Science Society of America Journal* **68**:234–42.

Mengel K, and Kirkby, E.A. 2001. Principles of Plant Nutrition. *Kluwer Academic Publishers*: *Dordrecht.*

Mishra, A., K. & Dave, N. 2013. Impact of soil salinity and erosion and its overall impact on India. *International Journal of Innovative Research in Engineering & Science* **2**(3): 2319-5665.

Oster, J.D. 1982. Gypsum usage in irrigated agriculture: a review. Fertilizer Research **3**:73–89.

Qadir, M., Schubert, S., Badia, D., Sharma, R.B., Qureshi, S.A. and Murtaza, G. 2007. Amelioration and nutrient management strategies for sodic and alkali soils. CAB Reviews: *Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources* . **2**, No. 021.