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RESEARCH ARTICLE

CONSERVATION OF SOIL ECOSYSTEM BY ARRESTING LAND DEGRADATION, PREVENTING SOIL ERROSION AND MAINTAINING HEALTH OF SOIL FOR SUSTAINABLE AGRICULTURE CULTURE AND FOOD SECURITY

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ABSTRACT

Land and soil media are monopolistic and significant Agro-Eco system for Agriculture production. On the advent of green revolution, the information on natural resources is not utilized in true sense for intensification Agriculture. As result, the country has witnessed mass degradation of land resources. Present estimate indicates about 121 million Hectares Land (39% of total geographic area) is affected by various kinds of degradation (ICAR 2010), of the total degraded land 55 mh is waste land and 6.6 mh is salt affected area. 64 mh of net cultivable lands are prone to affected by one or the other kind of degradation (NBSS- LUP 2015). Deficiency of microflora and secondary nutrients is increasing rapidly, which results in bad health of soil and fertility. Different degradation process occurring alone or in combination are one of reason for declining total agriculture productivity particularly in irrigated lands. According to Agro – ecological survey (AES -2016), quantified that the area under semi aerid type of Bio-climate is increased and the area under Humid type of Bio climate is decreased.

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INTRODUCTION

Arresting Land Degradation: Few decades back growing interest on pollution, watershed management, integrated agriculture system, precision farming, sustainable land use, ecosystem restoration and preserving for arresting degradation and ensuring food security for executing such programme, there is necessarily need for developing knowledge based Agriculture, which includes information on soils, land use, data on climate, vegetation crop, socio economic conditions , existing infrastructure and marking facilities . Data on soils will be collected through systematic soil survey. ICAR, NBSS and Land Use Planning (LUP) has mapped soils in India on 1:1 m scale, states on 1:25000 scale, Dist. Level 1:50000 scales LRI.

Land Resources Inventory (Lri): LRI popularly recommended by ICAR, NBSS and LUP for knowledge based agriculture system.LRI helps nation wide survey to categorize for agriculture, non agriculture, forestry and waste land areas. Remote sensing Data and Digital information added new dimensions to LRI.

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LRI adequately provides execution of soil conservation measures, irrigation planning and precision farming. LRI Envisages scientific land we plan ,consisting Right land use, Right Technology, right crop pattern and potentiality of natural resources can blunt(discourage)influence of land Degradation. Soil and water conservation plans helps to address the issues of land degradation and water scarcity. IN Karnataka soil conservation is for 8 water shed programmes. Forestry will certainly arrest the land degradation out of flood and natural calamity. Forest soil is a rich in humus, which is nothing but rich organic content which could retain carbon in soil mass. Hence discouraging for deforestation certainly helps in arresting land degradation and preserves our terrestrial flora and fauna.LRI 1:10000 Scale is back bone for knowledge based agriculture. Thus LRI have great practical and scientifically applicable for soil based water shed programme, waste land developing, efficient cropping zones, fertilizer recommendations, soil health card and proactive advice to farmers. Remote sensing and digital data have further enhanced efficiency of LRI as agriculture data base. Deforestation and Inappropriate agriculture practices will ultimately results into soil degradation. So such human induced deforestation and inappropriate agriculture practices must be discouraged to arrest soil degradation. Disintegration of cultivating land results into low output of production and this must be discouraged as it is a socio revolution.

Saline or salt affected soil are prone to affect degradation / erosion of soil. Sustainable management option for curbing degradation were climate ready crops, changing plant date, water shed management, land use planning as per LRI and crop insurance. Water shed management purely influence on soil conservation and thus arresting of degradation and conserves soil eco system.

Soil erosion: It is the process of detachment of soil from parent soil body. Soil degradation is a major threat to agriculture sustainability in India.

Prevention of soil errosion: AS soil Errosion is a major threat for agriculture and food security, Hence measures like

- Mechanical Measures,
- Agronomic Measures,
- Agrostological Measures,
- Forestry Measures, these measures could certainly prevents soil Errosion for sustainable agriculture. Construction mechanical barriers across the direction of flow of rain water.IN Hills contour trenching and bench terracing for slope areas.Farms ponds like krishi Honda will also man made water conservation for recharging ground water and could maintainse soil moisture.GRASS lauwn is the best tool for arresting soil errosion and manages soil moisture in aerid zones.

Management of Salt Affected Soils and Waters: Salt affected areas are prone to susceptible for soil degradation and this will lead to serious agriculture production. Some important methods to manage salt affected soils are,

- Land development,
- Piercing impermeable strata,
- Tillage,
- Puddling,
- Mulching,
- Fallowing.

ALL these are agronomical measures and were recommended by LRI to discourage salt accumulation on soil surfaces and conserves soil moistures.

Soil Conditioners: Synthetic soil conditioners acts as a stabilizing agents. Synthetic soil conditioners play important role in adverse affect of the saline on plant growth and soil microbial population. Osmo regulation plays important role in salt tolerance of crops under saline environment. Osmoregulation maintains CO_2 concentration and thus photosynthesis frequency will be potentially enhanced.

Soil health: Soil Health is nothing but fertility of the soil and fertility of soil depends on abiotic and biotic factors of soil for sustainable development of crops. To maintain the health of soil, replenishment of micro nutrients, in the form of fertilizers will be necessarily applied for sustainable agriculture in following ways. 1) Nutrients of inorganic salts like ZNSO4, CUSO4, FE2SO4, MNSO4 which are readably soluble in water and easily absorbed by roots of the crops.2) Chelated micronutrients:chelated compounds refers to organo metaillic molecules and here organic part binds with nutrient of Cation(+vely charged).When chelated micronutrients comes in contact with soil,the organo part ie.,micronutrients(cation) releases into the root system of the crop. Chelated are like Cu+,Fe+,Mn+,ZN+ Cation nutrients.3) Fortified Fertilizers are special micronutrients Eg: zincated urea and boroneted urea.4)FRITS are powered salt micronutrient added with silica at high temp 1300c .PERENNIAL crops are were benefited by frits.

Nano Technology for Soil health: Bio remediation / Phyto remediation are the process where in bioagents were employed to decontaminate the pollutated and toxicated soil and acquatic media. Genetically applied of Phyto remediation has modified the crops for uptake of nutrients (Eg: Metal Chelators (MC), Metal Transporters (MT), Phyto Chelators(PC) genes have been transferred to various crops for efficient uptake of nutrients. Sun flower cultivation is a best example of Phyto remediation. Nano Bio Sensors : are widely used as herbicides, insecticides, pathogen detectors of soil pH maintenance of soil media. Nano particles and Nano fabricated materials containing plant micro nutrients employed for remediation of contaminated soil. Micro capsules and Nano formulation designed by FCI i.e, Quick release, Specific release, moisture release, pH release, Heat release and ultra sound magnetic release in soil media. for sustainable crop development.

RESULTS ON REVIEW BASED

- Inoculation of heat sterilized soil with micro organisms caused spectacular improvement of crop production.
- 117 Bacterial cultures isolated from detoxicated soils and were inoculated into heat stertilized soils, out of these 11 Bacterial cultures gave significant detoxification to soil. Main bacteria are Bacilus Spp(4) , Agrobacter Spp(2), Pseudomonos Spp (1), gram -ve non sporing rods (4).
- Fungi : 45 cultures of fungi out of these 13 spp reported their capability to detoxicate heat sterilized soils. Eg: Aspergillus tamaria, A.terreus, A.flavus, Pencillium Simplicissmum etc .
- Azospirillum Spp: were inoculated in Wheat crops, which alleviated water stress, saline stress under mitigation period and increased holding of the moisture in soil. Azospirillum biofertilizers could be stored even for 31 weeks, without disturbing the viability of the organism. After 31 weeks Azo-biofertilizers applied to the soil, the organism became alive and actively gave good results.
- Macro flora of the Soil media: Macro flora of the soil media plays an important role in enriching the soil fertility. Eg: Vermi Compost (Vermi Culture Technology): Vermi compost technology is scientific method of breeding and rising earthworms in controlled environment of soil. 1800 earthwarms in one square metre could able to feed 80 tones of Humus per year. (Humus is rich organic manure.) Earthworms are natural bioreactors carrying out various functions like taking organic wastes and excreting vermicastings into the soil. Earthworm maintains pH of the soil and isothermic to soil. Vermi compost absorbs moisture from the atmosphere and thus contributes moisture to soil media.
- Earth worm as biological indicators for soil fertility : Earthworm in soil media support healthy population for bacteria, fungi, actinomycetes and various symbiotic organisms for sustainable soil health and agriculture.

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