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Recycling Of Crop Residues for Soil Quality and Crop Productivity Improvement

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ARTICLE ID: 076

Abstract:-

Soil, like air and water, is a fundamental natural resource supporting a variety of ecosystem goods and services to the benefit of the mankind. Soil quality can be defined as the fitness of a specific kind of soil, to function within its capacity and within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation *(Karlen et al.,1997).* Therefore, maintenance of soil quality should be must to sustain and to enhance the crop production. Adoption of the rational cropping practices, such as crop residue recycling, manure application, conservation tillage and farmland fallow would be a country need for improving the soil quality and ecosystem function. Retention of crop residues in a field after crop harvest can supply essential plant nutrients, accumulate Soil organic carbon, and thereby maintain or improve soil fertility status. Effects of crop residue addition are often observed when it was integrated with reduced- tillage systems or with improved nutrient management ***(Pervaiz et al.2009***) observed that mulch increased soil organic matter (1.32g kg-1) and soil moisture contents (17%), but decreased bulk density (1.35 Mg m-3) and soil strength (464kPa) compared to control. crop residues have numerous competing uses, such as removal for biofuel production, animal feed, industrial raw material or returned to soil as an amendment. Crop residues as amendment is necessary to enhance or maintain the soil quality and sustain agronomic productivity.

Keywords: - Crop residue, Ecosystem, Productivity, Soil quality, Soil organic matter

Introduction:-

Crop residues, also referred to as "agricultural wastes", non- photosynthetic vegetation or "farm residue" and are comprised of stalks, cobs, and other plant parts left behind after harvesting the crop/ crops on the farm they were grown at. According to the U.S. department of agricultural, crop residues are important because when they are left over on the

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soil surface, crop residues; protect the soil from wind and water erosion, reduces evaporation by acting as a mulch. Their breakdown helps sequester carbon emissions into soil. This recycles the nutrients present in the soil. Improves the soil's structure and its water retention capacities. Crop residues at the soil surface act as shade; serve as a vapor barrier against moisture losses from the soil, causing slow surface runoff. Among combined use of organic manure, FYM+ phosphocompost and pigeon stalk + phosphocompost resulted in improvement of physical, chemical and biological properties of soil over recommended dose of fertilizers (RDF) application *(Nagar et al., 2016). Chen et al.(2017)* studied that effect of no straw return(N) and straw return (S) at three experimental sites and observed that Sulphur treatment significantly increased concentrations of total organic carbon (TOC, except for Qujialing site), dissolved organic carbon (DOC) and microbial biomass carbon (MBC) ,but did not significantly affect the easily oxidizable carbon content in the three sites. In recent past, biochar and crop residues have attracted lots of attention as a viable strategy for maintaining the soil health. Biochar application in soil has been shown to change soil biological community composition and abundance (*O'Neil et al.,2009; Liang et al.,2010).* The process of straw decomposition is mainly mediated by soil microorganisms, and is affected by many factors including soil texture, straw quality and climate *(Chen etal.,2014).* Straw mulch significantly increased the amount and biomass of earthworms. Grass mulch positively influenced the amount (significantly compared with un-mulched plots) and biomass of earthworms (*Darija et al.,2010).* Since recycling of crop residues not only improves the physical, chemical, biological properties of soil but also increases crop production. Therefore. Use of crop residues through proper recycling in the soil rather than burning unnecessarily, shall be promoted.

Effect of crop residues on Soil Quality:-

As , we all know that healthy soil produces a good crop . Soil is also known as soul of Infinite life. Soil quality is a capacity of a soil to function within a ecosystem and land use to sustain in biological productivity maintain environmental quality and sustain plant, animal, human health *(Doran and Parkin; 1994).* Crop residue is a tremendous natural resource for improving the soil quality. They are the excellent source of organic matter and plant nutrients. Crop residue benefits the soil physically, chemically as well as biologically. Increasing prices of the chemical fertilizers increasing prices of the chemical fertilizers and

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declining soil health has attention on the need of recycling of organic residues in crop production. The effective nutrient management on soil is involving available organic source including wastes and crop residue. The deficit of the nutrients to meet crop demand has to come from the source other than the chemical fertilizers. Crop residues influence soil pH through accumulation of Co_2 and organic acids during decomposition. A sharp decrease in soil pH of flooded soils due to application of rice straw. **.** Microbial biomass is a small 1-5% by weight but active fraction of soil organic matter. Soil microbial biomass acts as a reservoir of plant nutrients like N, P and S and its availability. After straw incorporation Microbial biomass carbon increase by 2-5 fold in 10 days and reached highest by 30 days. Microbial biomass carbon increase by 2-5 fold in 10 days and reached highest by 30 days. Microbial biomass carbon increased by 45% and N by 60% in residue retention over residue removal ***(Kushwaha et al;2000).***

Why we go for nutrient recycling through crop residues on the soil??

Crop residues are the remnants of crop plants left after harvest of crop, pruned or processed. Agricultural crop residues like wheat straw, rice straw. Sugarcane trash, etc . forest litter and aquatic weeds like water hyacinth contents serval nutrients that are benefit in growing of crops on the field or farm. Due to intensive agriculture, the soil resource is under increasing stress as there is a big gap between annual output of nutrients inputs from the external resources . so, filling this gap we go for non-conventional resources such as wind, tides, solar, biomass, etc. generates energy to form them. These kinds of resources are pollution free and hence, we can use these to produce a clean form of energy without any wastage. Solar energy is the most readily available and free source of energy since prehistoric times. According to a conservative estimate, every year, but most of it is not used properly. We must convert this waste into wealth by mobilizing all the biomass in bioenergy and supply nutrient to the soil. Total NPK assimilated in rice crop residue are estimated at about 25, 4, and 40 Tg in the world, equivalent to approximately 30%, 30%, and 200% of the amount of each nutrient respectively, contained in available chemical fertilizers ***(Zhang et al.,2012).*** The removal and burning of crop residues leads to low soil fertility and environmental which thereby hampers the crop production and soil quality as well. The efficiency of nutrient uptake by crops from fertilizers or crop residue release is generally thought to be similar. It has a great economic value, mineralogist nutrient uptake. Due the

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crop residue management the yield and quality will be good**.** ***Roper (1983)*** observed that a positive correlation between (r=+0.98) between nitrogenase activity and wheat straw decomposition.

Crop residue management: -

Crop residue management is for maintaining cover on 60% of the soil surface at the planting to protect the water quality. This management also provides the seasonal soil protection from the wind and rain erosion and also adds organic matter to the soil. It also conserves the soil moisture, improves the infiltration, soil aeration and tilth. Crop residue can be managed by the following methods as residue burning facilitate timely planting of the crops. It clears the land quickly of residues before the next crop. It also kills soil borne deleterious pests and pathogens and some other microorganisms too. Baling and removing the straw used for livestock feed, building materials, livestock bedding, bedding for vegetables cultivation, fuel and mulching for orchards and the other crops. Surface retention and mulching is a practice in which the leaves straw residues from previous crop on the soil surface without any form of incorporation. Helps to protect the soil surface fertile against the wind and water erosion. This method is prevalent in no- tillage or non-conservation tillage practice least 30% of soil surface is covered with crop residue. Incorporation of straw increases soil organic matter and soil N, P and K content as compared to other management option. Crop residue is incorporated completely or partially into soil mostly by ploughing. In this method of crop residue incorporation aboveground portion chopped into small size and can be incorporated by the power-tiller.

Conclusion:-

Crop residue must be used for conservation agriculture for sustainable agriculture and healthy soil. It improves soil physical, chemical and biological health. Crop residues improves the microbial activity in the soil. Crop residue management will increase the organic matter content in the soil. Reduces the cost of cultivation. Crop residue management also helps to reduce environmental pollution by reducing crop residue burning. It promote the utilization of agricultural raw material. In long – term incorporation of crop residue increased the productivity. Incorporation should be done at least 10 days and preferably before 30 days before the establishment of the succeeding. Overall concluded that incorporation of crop residues appears to be a better management option.

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