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Dr. S NatarajanAssistant Professor in Agronomy
Department of Agronomy Tamil
Nadu Agricultural University,
Coimbatore, Tamil Nadu, India

Organic manure enhanced in soil health and productivity - A review

Dr. S NatarajanDOI: <https://doi.org/10.22271/chemi.2020.v8.i4w.9940>**Abstract**

Application of organic manures help in mitigating multiple nutrient deficiencies at the same time provides better environment for growth and development by improving in physical, chemical and biological properties of soil. In this content use of organic manures such as vermicompost, farmyard manure, Goat manures, Poultry manure, Pressmud and green manure, etc., may supply sufficient amount of micronutrients in available form to crops and improve the quality of the agricultural produces. Natural resources *viz.*, land and water available for agricultural production is limited in most of the regions in world. So, increasing yields from current limited available land is the only solution in order to feed the increasing population. Integrated plant nutrient supply system is the only possible way, which can reduce the dependency on chemical fertilizers to attain the sustainable and profitable production without causing detrimental effects on soil and environment. The increasing cost of commercial fertilizer day by day is a serious matter of concern and their frequent application is deteriorating bio-physical, chemical properties of soil. As a result, soil fertility is being diminished gradually. This in turn is leading to reduction in crop per unit area. Besides fertilizer there are several sources of plant nutrients like organic manures and biofertilizers.

Keywords: Soil fertility, green manure, FYM, pressmud, yield.**Introduction**

The high cost of fertilizers and unstable crop production call for substituting part of the inorganic fertilizers by locally available low cost organic sources like FYM, Vermicompost, Goat manure, Sheep manure, Poultry and Green manure in an integrated manner for sustainable production and to maintain soil health. Addition of organic fertilizers improve soil structure and enhances activities of useful soil organism. Organic farming is one of the practices to make the production system more sustainable without adverse effect on the natural resources and the environment (Stock date *et al.* 2001: Ram *et al.* 2011) ^[42, 33] over the past decade India has exhibited a rapid uptake of organic farming (Paul, 2011) ^[28]. The application of ample amounts of organic manure is the key for sources of organic farming (Swift and Woomer, 1993) ^[45]. The role of bio fertilizers for enhancing the productivity of soil by fixing atmospheric nitrogen, or by solubilizing soil phosphorus by stimulating plant growth through synthesis of growth promoting substances has special importance in organic farming. Therefore, it is envisaged that for sustainable agriculture production in the country, integrated nutrient management appears to be more promising such system would also reduce the cost of farming in addition to maintaining the soil productivity, improve the eco-system and ultimately resulting in improved soil-plant health in sustainable agricultural eco-system (Dudley, 1986) ^[4].

Effect of organic manures on soil fertility: effect on organic carbon

Application of organic manures increased the organic carbon status of soil (Subha 200). Incubation studies in different Indian soils for about six months have indicated that application of FYM @ 44+ ha-1 effectively build up the organic matter content of different soils, whereas in the control plot, there was a loss of 15 to 40% of organic carbon (Gaur *et al.*,1994) ^[5]. Increase in the organic carbon content of soil due to combined application of inorganic and organics simultaneously for period of 10 years was observed in the long term fertilizer,

Corresponding Author:**Dr. S Natarajan**Assistant Professor in Agronomy
Department of Agronomy Tamil
Nadu Agricultural University,
Coimbatore, Tamil Nadu, India

experiment (Hedge, 1996)^[9]. Mishra and Sharma (1997)^[22] observed an increase in organic content with application of FYM @ 10t ha⁻¹ before transplanting of rice and BGA @ 13kg algal crust ha⁻¹ one week after transplanting of crop Yadav (1995) observed an improvement of organic carbon content in clay loam soil due to the application of pressmud. Application of poultry manure increased the soil organic carbon content of residual wheat crop in rice – wheat cropping system (Maskina *et al.*, 1996)^[20]. Jagadesh *et al.*, (1994)^[10] reported that application of FYM improved the total carbon and nitrogen content of soil in rice crop. According to Rajrathinam (2002)^[32] the availability of nutrient like P, K and Zn were depleted, whereas available N and organic carbon content increased compared with the initial status of the soil due to continuous cropping system in rice fallow, According to Raju and Reddy (2000)^[29] continuous incorporation of sesbania rostrata over a period of time improved the organic carbon content of the soil. Addition of green foliage of glyricidi increase organic soil carbon was also noticed (Chaphale *et al.*, 2000)^[2]. Havlin *et al.* (1999)^[7] found that adding organic matter into soil has positive effect on soil micro organisms.

Effect of organic on soil physical properties

Application of organic manures after decomposition, release acids which act as binding agents for soil aggregates, decrease the bulk density, favour the water holding capacity of soil and reduce the leaching loss in textures soils (Dhiman *et al.*, 1998)^[3]. Incorporation of organic residues showed significantly higher infiltration rate and water holding capacity in rice-rice system (Mahadkar *et al.*, 1998)^[19]. Azolla in combination with other organics like pressmud and pig manure have higher influence on the Organomineral complex of the soil (Sen *et al.*, 1994, Nguyen, 1996)^[36, 25] and in general application of organics had a favourable effect in building up of the soil structure (Singh *et al.*, 1992, Hariharane *et al.*, 2002)^[40, 8]. Continues application of FYM significantly reduced the bulk density and increased the water holding capacity due to improvement in porosity and soil aggregation (Kenchaiyah, 1997)^[17].

Organic Manures beside serving as a source of plant nutrients to crop was found to help in increasing the soil aeration, permeability, aggregation, water holding capacity, nutrient availability and biological properties of soil, when applied in conjunction with mineral fertilizers (Premsekhar, 1993)^[30]. Nahar and Karim (1996)^[23] reported that application of FYM not only improved the physio- chemical properties of the soil like bulk density, maximum water holding capacity and organic carbon content but also had little effect on residual phosphorus and potassium in the soil green manuring was found to increase the organic matter content of soils. Maintain and improve the soil structure, increase the water holding capacity, reduce the loss of nutrients, particularly N, provide N for the succeeding crop and reduce the soil erosion there by, increase production of crops (Battacharya and Mandal, 1997)^[1].

Addition of organic matter in the form of green manure balanced the physical condition and water retention capacity of the soil and reduced the leaching of nutrients through its impact on chemical and biological properties and the overall impact in increasing crop yield (Kalidurai, 1998)^[14]. Panneer selvam and Christopher Lourduraj (1998)^[27] and Khatik and Dikshit (2001)^[18] indicated that the application of organic manures helped to sustain crop productivity besides maintaining the soil health. Maskina *et al.*, (1996)^[20] reported

that the application of poultry manure @ 80kg N/ha increased organic carbon content of the soil. Pressmud a “by product” obtained during sugar manufacturing, on application it improved the soil properties besides reducing exchangeable sodium percentage. Pressmud enriches the soil with organic carbon, N and L other nutrients (Singaravel *et al.*, 2001)^[39].

The beneficial effects of FYM on Various physio-chemical properties of soil and to sustain high level of yield were reported by several workers (Sudhakar, 2000)^[43]. FYM application increased the root penetration due to reduced bulk density and increased moisture retention which resulted in increased grain yield of rice (Narayana Reddy *et al.*, 2001)^[24] Udayasooriyan (1988)^[46] also observed a positive influence of FYM on rice plant height, number of tillers per hill and dry matter production with increased plant height, LAI and higher DMP over other organics was observed in rice by kandasamy and Ramasamy (1998)^[15]. Higher grain and straw yields were obtained when FYM was applied on 30 days before sowing in rice wheat rotation (Gau, 1991). Shanmugam and Veerapthuran (2001)^[37], revealed that application of FYM @ 12.5+ ha⁻¹ + Azospisillum @ 2kg ha⁻¹ increased the productive tiller m⁻², filled grains per panicle, panicle length, finally grain yield and straw of rabi rice.

Effect of organic Manures in phylogical growth and yield

Application of green manure increased the plant height, tiller production, Leaf area index and dry matter production (Vaiyapuri *et al.*, 1998)^[47]. Application of green manures promotes the growth of rice by increasing plant height (Sudhakar, 2000)^[43]. Inter cropping of sesbania aculeata in rice and subsequent in situ incorporation produced higher growth components (Joseph, 1998)^[13]. Matiwade and sheelavantar (1994)^[21] observed that high yielding ability of rice with green manuring of sesbani rostrata alone. Incorporation of sesbania aculeata @5t ha⁻¹ increased the grain yield by 42.8 percent (Sharma and Kuhand, 1993)^[38]. Rao and Moorthy (1994)^[34] obtained higher grain yield in lowland rice applied with sesbania aculeate. Quillang (1981)^[31], however, reported that incorporation of 75kg ha ipil-ipil leaves 10 days before planting sorghum was the most effective for high sorghum yield. Incorporating 20 and 30 days before planting was less effective. Application of Poultry manure 12.5t ha⁻¹ improved the yield (Singh *et al.*, 1996)^[41]. Gupta *et al.*, (1995)^[6] concluded that there was a 55 percent increased over control. Application of pressmud @ 10t ha⁻¹ increased the plant height, number of tillers and drymatter production (Kenchaiyah, 1997)^[17] Sumathi (1998)^[44] also observed a positive influence of pressmud on rice in terms of dry weight, chlorophyll content and starch, beneficial effect of pressmud in increasing LAI, DMP, number of tillers per plant and 1000 grain weight in rice were reported by satheesh (1998)^[35]. According to Jain and Tiwari (1998)^[12] application of pressmud registered grain yield of 5.29 t ha⁻¹ than application of coirpith, Kaushik *et al.*, (2001)^[16] reported that a significant improvement in growth and yield attributes and yield of wheat by Azotobacter inoculation. Okorafor *et al* (2013)^[26] report that the application of organic manure highly increase plant height, number of maize leaves, stem girth, numbers of cobs and weight of fresh maize at harvest.

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