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Eco-friendly organic resources utilization for enhancing soil fertility and crop productivity: A review

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Abstract
The crop productivity and soil fertility were enhanced by ecofriendly utilizing organic wastes for efficient ecosystem management and chemical free food production for the people. The organic waste tissues are introduced to soil, they decompose and produce a massive heterogeneous body of carbonaceous substances, as well as microbial organisms. The accessible portions of soil organic matter depend on the various stages of decomposition. Due to their low contents of major nutrients, farm yard manures made from cow dung, other animals' excrement, animal tissues, and excretory products, as well as compost made from rural and urban wastes, crop residues, and green manure are collectively referred to as bulky organic manures. Materials like oil cakes, fish meal, animal meal, poultry manures, and slaughter house wastes, which have relatively higher contents of plant nutrients, are grouped under concentrated organic manures. In general, bulky organic manures are those that include up to two percent nitrogen, while concentrated manures are those that contain more than two percent nitrogen. Organic material, regardless of source or composition, undergoes microbial decomposition when added to the soil and becomes food for microflora and fauna. Even the microbial cells provide future generations of microscopic organisms with carbon. Soil is home to a wide range of microorganisms, including bacteria, actinomycetes, fungus, algae, and protozoa. Bacteria are found in higher concentrations programme of soil than actinomycetes, fungus, algae, and protozoa.

Keywords: Farm yard manure, vermicompost, bulky organic manures, oil cakes, green manures etc.

Introduction
Indian soils are poor in organic matter and in major plant nutrients. Soil organic matter is the key to soil fertility and productivity. Organic matter induces life into this inert mixture and promotes biological activities. The regular recycling of organic wastes in the soil is the most efficient method of maintaining optimum levels of soil organic matter. Organic manure provides all the nutrients that are required by plants but in limited quantities. It helps in maintaining C:N ratio in the soil and also increases the fertility and productivity of the soil. It improves the physical, chemical and biological properties of the soil. It improves both the structure and texture of the soils. It increases the water holding capacity of the soil. Due to increase in the biological activity, the nutrients that are in the lower depths are made available to the plants.

Municipal Solid Waste Compost
Big size non – biodegradable wastes like plastics, rubber metals etc. are manually removed at composting yard prior to compost (termed as partially segregated waste compost). Individual households deliver segregated biodegradable wastes separately driving door – to – collection by municipal organization, which are formed into heaps. The organic materials mainly vegetable, fruit and kitchen waste were separated manually and subjected to turn windows composting process. Aeration typically in the heap was provided by manually turning of waste. A heap of manually separated mixed municipal solid waste of 4' height, 8' breadth was placed on paved ground on composting window type and was watered regularly to maintain moisture level between 50 – 60 % and turned manually every 3-5 days for first 6 weeks of composting cycle. From the seventh week, the moisture was allowed to drop when optimum bio solids decomposition was archived. The process was completed in about 8-9 weeks. After this period the compost was allowed to cure for additional 3 weeks without turning. The finished compost was then screened out and weighed. The physical and chemical properties of municipal solid waste (MSWC) used is furnished in Table 1.

Table 1: Physic Chemical Properties of Municipal Solid Waste Compost (MSWC)

S. No	Properties	Content
1	Bulk density (Mg m^{-3})	0.86
2	pH (1:10 MSWC : Water ratio)	7.5
3	Organic carbon (%)	11.9
4	Total nitrogen (%)	0.63
5	Total phosphorus (%)	0.16
6	Total potassium (%)	0.46

Farm Yard Manure (FYM)

To prepare FYM a trench size of 6.9m x 1.5m x 1.0m was formed under shade. Urine soaked refuses along with dung was collected and placed in the trench. From one end of the trench filling was done with daily collections of dung when the trench was filled up to a height of 0.45m above ground level, the top of the heap was made in to dome shape and plastered with cowdung slurry. The manure became ready to use as FYM in about four months period after plastering (Table 2.)

Table 2: Composition of Farm Yard Manure (FYM)

S. No.	Nutrients	Content (%)
1	Organic carbon	18.30
2	Nitrogen	0.79
3	Phosphorus	0.42
4	Potassium	0.80

Bagasse ash

Bagasse ash is a type of organic wastes which obtained from sugar industry during the period of sugar production. It is a by – product generated at industrial plants using biomass as energy source. The resulting bagasse ash is an alkaline material namely of nitrogen (N), that containing other elements such as potassium (K), and phosphorus (P), which are required for plants. The properties and composition of bagasse ash used is furnished in Table3.

Table 3: Composition of Bagasse ash (BA)

S. No	Parameter	Content
1	pH (1:10 BA:water)	9.1
2	EC (dSm $^{-1}$)	7.2
3	Organic Carbon (%)	0.71
4	N (%)	0.015
5	P (%)	0.0048
6	K (%)	0.022

Rice husk ash

Rice husk ash (RHA) also called husk char or black ash is the resultant product of burning rice husk in fired furnace of conventional and modern rice mills. The chemical composition is provided in Table 4.

Table 4: Composition of Rice husk ash (RHA)

S. No.	Nutrients	Content
1	pH (1:10 RHA : water)	8.0
2	Total phosphorus (%)	0.09
3	Total potassium (%)	0.92
4	Total calcium (%)	0.25
5	Total magnesium (%)	0.23
6	Total sulphur (%)	1.13

The amount of organic matter strongly influences the health, productivity, and resilience of cropland soils. Building and maintaining the level of organic matter in your soil offers many benefits (Table 7). Higher soil organic matter improves a soil's physical properties, such as water retention, permeability, water infiltration, drainage, aeration and structure. Ultimately it provides a better growing environment for crop roots. One of the most effective ways to build and maintain levels of your soil's organic matter is by adding suitable organic amendments. This factsheet describes the nature and function of soil organic matter, sources of organic amendments, and best management practices (BMPs) for adding organic amendments to soil.

Soil microbes produce and add to the soil a glue-like substance known as polysaccharides as organic matter and added soil organic amendments decompose. Polysaccharides are complex sugars that bind soil and organic matter particles together into aggregates. Well-aggregated topsoil is often referred to as having a crumbly structure. Aggregation makes for better infiltration, water retention, and aeration.

Addition of organic materials to the soil ecosystem were improved soil structure and tilth, improved aeration, improved soil moisture features, increased infiltration rates, percolation rates and higher water holding capacity, added nutrients and improved nutrient cycling, improved soil life, reduced levels of greenhouse gas emissions and a sink for carbon.

Manure and Sewage Biosolids

Manure and biosolids come in a range of forms and can have a wide range of nutrient and carbon levels. For example, adding 20 tonnes/ ac/yr of solid cattle manure will increase the organic matter level of a loamy soil by 1% in approximately 10 years. It would take about 25 years to make the same increase if liquid hog manure was applied at a rate of 3000 gal/ac (33 m 3 /ha) every year. Application of manure and sewage biosolids using BMPs will ensure the effectiveness of adding organic matter to the soil and will help meet crop nutrient requirements.

Bulky organic manures

Bulky organic manures contain small percentage of nutrients and they are applied in large quantities. Farmyard manure (FYM), compost and green-manure are the most important and widely used bulky organic manures. Use of bulky organic manures has several advantages:

- They supply plant nutrients including micronutrients
- They improve soil physical properties like structure, water holding capacity etc.,
- They increase the availability of nutrients
- Carbon dioxide released during decomposition acts as a CO_2 fertilizer and
- Plant parasitic nematodes and fungi are controlled to some extent by altering the balance of microorganisms in the soil.

Sheep and Goat Manure

The droppings of sheep and goats contain higher nutrients than farmyard manure and compost. On an average, the manure contains 3 per cent N, 1 per cent P_2O_5 and 2 per cent K_2O. It is applied to the field in two ways. The sweeping of sheep or goat sheds are placed in pits for decomposition and it is applied later to the field. The nutrients present in the urine are *wasted* in this method. The second method is sheep penning, wherein sheep and goats are kept overnight in the field and urine and fecal matter added to the soil is incorporated to a shallow depth by working blade harrow or cultivator or cultivator.

Poultry Manure

The excreta of birds ferment very quickly. If left exposed, 50 percent of its nitrogen is lost within 30 days. Poultry manure contains higher nitrogen and phosphorus compared to other bulky organic manures. The average nutrient content is 3.03 per cent N; 2.63 per cent P_2O_5 and 1.4 per cent K_2O.

Concentrated organic manures

Concentrated organic manures have higher nutrient content than bulky organic manure. The important concentrated organic manures are oilcakes, blood meal, fish manure etc. These are also known as organic nitrogen fertilizer. Before their organic nitrogen is used by the crops, it is converted through bacterial action into readily usable ammoniacal nitrogen and nitrate nitrogen. These organic fertilizers are, therefore, relatively slow acting, but they supply available nitrogen for a longer period (Table 5).

Oil cakes

After oil is extracted from oilseeds, the remaining solid portion is dried as cake which can, be used as manure (Table 6). The oil cakes are of two types:

- Edible oil cakes which can be safely fed to livestock; e.g.: Groundnut cake, Coconut cake etc., and
- Non edible oil cakes which are not fit for feeding livestock; e.g.: Castor cake, Neem cake, Mahua cake etc.,

Both edible and non-edible oil cakes can be used as manures. However, edible oil cakes are fed to cattle and non-edible oil cakes are used as manures especially for horticultural crops. Nutrients present in oil cakes, after mineralization, are made available to crops 7 to 10 days after application. Oilcakes need to be well powdered before application for even distribution and quicker decomposition.

Table 5: Average nutrient content of animal based concentrated organic manures

Organic manures	Nutrient content (%)		
	N	P_2O_5	K_2O
Blood meal	10 - 12	1 - 2	1.0
Meat meal	10.5	2.5	0.5
Fish meal	4 - 10	3 - 9	0.3 - 1.5
Horn and Hoof meal	13.0	-	-
Raw bone meal	3 - 4	20 - 25	-
Steamed bone meal	1 - 2	25 - 30	-

Source: www.tnau.ac.in

Table 6: Average nutrient content of oil cakes

Oil-cakes	Nutrient content (%)		
	N	P_2O_5	K_2O
Non edible oil-cakes			
Castor cake	4.3	1.8	1.3
Cotton seed cake (undecorticated)	3.9	1.8	1.6
Karanj cake	3.9	0.9	1.2
Mahua cake	2.5	0.8	1.2
Safflower cake (undecorticated)	4.9	1.4	1.2
Edible oil-cakes			
Coconut cake	3.0	1.9	1.8
Cotton seed cake (decorticated)	6.4	2.9	2.2
Groundnut cake	7.3	1.5	1.3
Linseed cake	4.9	1.4	1.3
Niger cake	4.7	1.8	1.3
Rape seed cake	5.2	1.8	1.2
Safflower cake (decorticated)	7.9	2.2	1.9
Sesamum cake	6.2	2.0	1.2

Source: www.tnau.ac.in

Table 7: Chemical composition of organic matter

S. No.	Fractions	% (dry weight basis)
	Sugars, starches, amino acids, urea,	2-30
	Ammonium salts (hot/cold water solubles) Fats, oils, waxes, (ether / alcohol solubles)	1-15
	Proteins	5-40
	Hemicelluloses	10-30
	Cellulose	15-60
	Lignin	5-30
	Mineral matter (ash)	5-30

Source: FAO Soil Bulletin (1987)56

Vermicompost

Vermicompost is stable granular organic matter, when added to clay soils loosen the soil, provides the passage for the fast entry of air and water. The mucus, associated with earthworm cast being hygroscopic in nature absorbs water, prevents water logging and improves water- holding capacity too. There is abundant evidence that concentration of exchangeable calcium, sodium, magnesium, potassium, phosphorus and molybdenum are higher in earthworm casts then in surrounding soil.

In vegetable and plantation crops where mulching with organic debris is a common practice, application of vermicastings at the rate of 5 tonnes/ ha as the first layer is recommended. Vermicastings consisting of excreta of earthworms and the cocoons released by them are rich in organic matter and plant nutrients. In the presence of vermicasts the declay of orgnic refuses and the formation of compost is accelerated.

Green Manures

Green manuring can be defined as a practice of ploughing or turning into the soil undecomposed green plant tissues for improving physical structure as well as soil fertility. Green manuring, wherever feasible, is the principal supplementary means of adding organic matter to the soil. The green-manure crop supplies organic matter as well as additional nitrogen, particularly if it is a legume crop, due to its ability to fix nitrogen from the air with the help of its root nodule bacteria. The green-manure crops also exercise a protective action against erosion and leaching. Green manure to be incorporated in soil before flowering stage because they are grown for their green leafy material, which is high in nutrients and protects the soil. Green manures will not break down in to the soil so quickly, but gradually, add some nutrients to the soil for the next crop.

Benefits of Green manures

Usage of green leaf manure is advantageous both for crops and soil. The advantages are, they decompose rapidly, it is easy to retain the organic matter in the soil. Green manures improve both physical and chemical properties of the soil. They provide energy to microbes. They provide nutrients to the standing crop and also to the next crop. Addition of green manure crops to the soil, acts as much and prevent soil erosion. Leaching of nutrients in light soils can be prevented by addition of green manure. Cultivating green manure crops can control weeds. Majority of green manure crops being legumes, use of nitrogenous fertilizers can be minimized. Cowpea is one of the important leguminous green leaf manure crops. As this plant is easily decomposable and very well suited for green manure purpose. June-July months are best suited for sowing of this manure. Even though it is being cultivated in summer months (March to April). Use of effective Rhizobium bacteria increase the fixation of nitrogen up to 40 kg/ha.

Dhaincha (*Sesbania aculeata*)

Dhaincha is suitable for loamy and clayey soils. It is fairly resistant to drought as well as stagnation of water. It grows well even in alkaline soils and corrects alkalinity if grown repeatedly for 4-5 years. The roots have plenty of nodules. It yields about 10-15 tonnes of green manure per ha and requires a seed rate of 30-40 kg/ha. Use of effective Rhizobium strain with seeds fixes the Nitrogen 1 kg / day.

Sesbania speciosa

It is a valuable green manure for wetlands and can be grown in a wide range of soils. Seed production is prolific however, pods are frequently attacked by insects. This green manure can be raised on the field borders. Sesbania seedling (21days) can be planted in a single line at 5-10 cm apart in the borders of the fields. In about 90 days it produces about 2-4 tonnes of green manure per ha. It does not affect the rice yield by shading or root effect. If second rice crop is planted immediately after the first crop, the manure can be incorporated into the field. About 300-400g of seeds are sufficient to raise nursery and plant the seedlings around the boundary of one hectare. To control insects *Verticillium lecanii* (Liquid) fungi is useful.

Sunnhemp (*Crotalaria juncea*)

It is a quick growing green manure crop and gets ready for incorporation in about 45 days after sowing. It does not withstand heavy irrigation leading to flooding. The crop is at times subject to complete damage by leaf eating caterpillars. The crop can produce about 8-12 tonnes of green biomass per ha. The seed requirement is 30 kg/ha.

Sesbania rostrata

One of the important features of this green manure is that in addition to the root nodules, it produces nodules in the stem. The stem nodulation is an adaptation for waterlogged situation since flooding limits growth of green manures and may reduce root nodulation. Under normal condition, both root and stem nodules are effective in N fixation. It has higher N content of 3.56% on dry weight basis. Biomass production is higher during summer (April – June) than in winter (Dec. – Jan.) season. This green manure can also be produced by raising seedlings (30 days old) and planted in the paddy field along the bunds or as intercrop with rice. Use of Rhizobium bacteria increase the nitrogen fixation about 60-100 kg/ha/year.

Wild Indigo (*Tephrosia purpurea*)

This is a slow growing green manure crop and cattle do not prefer to graze it. The green manure is suitable for light textured soils, particularly in single crop wetlands. It establishes itself as a self sown crop and the seeds remain viable till the harvest of rice. On an average about 3-4 tonnes of green manure is obtained in one ha. The seed rate is 30 kg/ha. The seeds have a waxy impermeable seed coat and hence scarification is required to induce germination. Soaking seeds in boiling water for 2-3 minutes is also equally effective in promoting germination.

Indigo (*Indigofera tinctoria*)

It resembles wild indigo and is along duration crop with more leafy growth. It comes up well in clayey soils with one or two irrigations.

Pillipesara (*Phaseolus trilobus*)

This is a dual purpose crop yielding good fodder for the cattle and green manure. Pillipesara comes up well in hot season with sufficient soil moisture. Loamy or clayey soils are best suited. After taking one or two cuttings for fodder or light grazing by animals, the crop can be incorporated into the soil. About 5-8 tonnes of manure can be obtained from one ha.

Gliricidia (*Gliricidia maculata*)

This is a shrubby plant that comes up well in moist situations. Under favourable conditions, it grows well like a tree. It can be easily grown in waste lands, farm road sides, field bunds, etc. The crop can be established by stem cuttings or seedlings planted in the field borders. It can be pruned for its tender loppings and compound leaves for green leaf manuring at the time of puddling rice. On an average, a well-established plant yields 12-15 kg green matter. About 400 plants on the peripheral bunds yields 5-6 tonnes green manure/ha.

Karanj (*Pongamia glabra*)

It is a leguminous tree grown in wastelands. On an average, a tree can yield 100-120kg of green matter. The leaves contain about 3.7% N (on dry weight basis).

Calotropis (*Calotropis gigantea*)

On roadsides and fallow lands, the plant grows wild under different soil and climatic conditions. The leaves are more succulent and a plant can produce about 4-5 kg of green matter. Besides it also helps in controlling soil born pests like termite.

Effect of organics on growth and yield of horticultural, agricultural crops and forest plant and soil properties

The FAO's revised projection, global food production should be 60% higher in 2050 than in 2005 and 2007 to feed the projected global population of 10 billion (Bruinsma, 2009 and

Alexandratos and Bruinsma, 2012) [4, 1]. To close this gap, total crop production needs to be increased even more from 2006 to 2050 than it did in the same number of years from 1962 to 2006 (Searchinger *et al.*, 2014) [29]. Though in the past green revolution technologies have increased crop yields and produced food to meet caloric requirements of the global population (Smil, 2000) [32], there are also increasing concerns about the environmental costs, such as increased soil erosion, surface and groundwater contamination, greenhouse gas emissions, increased pest resistance and reduced biodiversity and so forth, with use of such technologies (Pimentel, 1996 and Tilman *et al.*, 2002) [25, 34]. These concerns suggest that more sustainable methods of food production are essential to meet the food requirements of ever-increasing population now and into the future but at the same time such methods must maintain natural resource base by avoiding land degradation and mitigating climate change. The challenge now is to fine-tune the existing technologies or develop alternative technologies that can increase crop yields to meet global food demand of increasing population but without compromising with the natural resources or the environment.

Other common sources of organic nutrients include growing food and non-food legumes as intercrops or rotational crops for current or residual N contribution, surface or residue recycling and in situ or ex-situ N_2-fixing green manure crops and so forth (Mamaril *et al.*, 2009 and Mamaril, 2004) [23, 22]

Mahadeen (2009) [21] reported higher fruit yield (27.62 t ha^{-1}) of strawberry by application of 40 tonnes of organic fertilizer (FYM) + 60 kg ha^{-1} NPK fertilizers, while the lowest strawberry yield (21.76 t ha^{-1}) was obtained in untreated plot. Lakpale *et al*. (2003) [16] observed the maximum number of branches per plant and pod yield of pea with the application of FYM @ 2.5 t ha^{-1} in comparison to no FYM application. Rosati (2005) [28] reported application of large amount of organic manure may beneficial in improving soil parameters but in the presence of soil pathogen it is likely to cause them to proliferate.

Hidalgo *et al*. (2002) [11] reported that application of vermicompost increased percentage pore space and water holding capacity, while decreased the bulk density and percentage of air space. Arancon *et al*. (2004) [2] conducted an experiment on vermicompost processed form food waste and paper wastes in Ohio state conditions under high plastic hoop tunnel. The Vermicompost was applied at the rate 5-10 t ha^{-1} and supplemented by inorganic fertilizer only to equalize the initial fertilizer rates of 85-155-125 kg ha^{-1} NPK. They reported that vermicompost significantly increased leaf area (37%), number of plant runners (36%), and shoot biomass (37%) in strawberry cv. 'Chandler' as compared to other sources. This response could have been due to production of plant growth regulators by microorganism during vermicompost. Singh *et al*. (2008) [30] recorded increased plant spread, leaf area, dry matter and total fruit yield in strawberry with the application of vermicompost @ 2.5 to 10 t ha^{-1} in combination with inorganic fertilizers. Baviskar *et al*., (2011) [3] reported the maximum fruit weight, fruit length and fruit breadth in sapota with application of vermicompost @ 15 kg $plant^{-1.}$

In forest with year's long life cycle, litter is a major source of nutrient systematically enriching the soil. These forest tree leaf litters can be applied as an organic amendment for the production of agricultural crops. To meet the nutrient demand of the crops especially for the resource poor farmers, the use of organic materials would be an inevitable practice for a long time to come. Depending on the agro-ecological zone, leaf litters of broadleaf-deciduous, evergreen-conifers and mixed broadleaf-conifers are used. Yavari *et al*. (2008) [8] conducted a trial to investigate the interaction of organic substrates and fertilizers on productivity and quality of strawberry with four different organic media (S_1; Persian turpentine trees leaf mold (50%) + mineral soil (50%), S_2; oak leaf mold (50%) + mineral soil (50%), S_3; cypress leaf mold (50%) + mineral soil (50%) and S_4; liquorice processing wastes (50%) + mineral soil (50%) and three levels of complete fertilizer (0, 0.5 and 1 g L^{-1}). The results showed that plants grown in liquorice processing wastes (50%) + mineral soil (50%) had highest numbers of floral buds, fruit yield and shoot and root fresh and dry weights. While Vitamin C content was the greatest in cypress leaf mold (50%) + mineral soil (50%) substrate. The interaction of substrates with nutrient solution did not show considerable increase in productivity and quality of strawberry. Khatun *et al*. (2010) [15] reported that effect of different leaf litter on growth and yield of okra and resulted leaf litters had significant effect on the growth and yield of okra.

Subba Rao (1993) [33] reported that *Azotobacter* cells are not usually present on the rhizoplane (root surface) but are in abundant in the rhizosphere (the soil immediately surrounding roots.) Ranna and Chandel (2003) [27] used biofertilizer and nitrogen to strawberry cv. 'Chandler' and found that *Azotobacter* inoculated plants attained maximum plant height (24.92 cm more number of leaves per plant (26.29 cm), more leaf area (96.12 cm^2), number of runners per plant (18.70), heavier fruit (10.02gm), more fruit length (35.9mm), and more fruit breadth (22.91mm), as compared to all other treatment.

Yadav *et al*. (2011) [37] reported maximum plant height, fruit length and fruit width after combined application of vermicompost and Azotobacter with 100 per cent recommended NPK in papaya.

Chaudhary *et al*. (2003) [6] reported that the application of vermicompost at 200 g $plant^{-1}$ + FYM manure at 250 g $plant^{-1}$, enhanced sustainability and yield in cabbage and tomato.

Declines in organic matter content of soils due to cultivation and erosion have been a major concern related to sustainability of agriculture. Therefore, management practices that increase the organic matter content were deemed desirable to soil quality and productivity. Moreover, soil organic matter increases following repeated applications of solid cattle manure. The effect of manure on soil pH is variable. Repeated applications of N fertilizer may lead to soil acidification due to acidity produced in the nitrification process, while organic matter added as manure can act to help buffer the soil against a decrease in pH, manure that is low in organic matter and high in ammonium nitrogen may result in a decrease in pH due to acidity produced when the ammonium is oxidized to nitrate in the soil (Ukrainetz *et al.*, 1996) [35].

Moreover, Whalen *et al.*, 2000 [36] stated that an immediate increase in the pH of two acid soils following fresh cattle manure application and concluded that the effects of manure on soil pH would depend on the manure source and soil characteristics. Manures of high organic matter and carbonate content would be most effective in raising the pH of an acid soil and also buffering against changes in pH once in the soil. The content of organic matter was an essential indicator of soil quality and fertility (Haynes, 2005) [9]. Organic matter was one of the three soil components that are crucial for its physicochemical properties, such as its sportive and buffer abilities as well as its biodiversity and biological activity. Because of the positive influence of organic matter on soil functionality, it was imperative that its resources be maintained or improved (Lal, 2011) [17].

Soils that received repeated applications of cattle manure were more friable to the feel and less compacted under foot than those of the unmannered plots (Campbell *et al.*, 1986) [5]. Farmyard manure has long been known to improve soil structure, increase porosity and water holding capacity and decrease evaporation rates, that cattle feed manure applications to soils increased water infiltration into the soil while reported that additions of manure decreased crust strength. Improvements in physical soil quality characteristics were generally indicated by increases in water infiltration, macro porosity, aggregate size and stability, and soil organic matter.

The increased consumer demand appears to be driven primarily by the perception that organically grown produce was safer and more nutrients to eat than produce grown conventionally (Lockie, 2002) [19]. Similarly, the use of inorganic fertilizer has been observed to cause the destruction of soil texture and structure, which often leads to soil erosion and acidity as a result of the leaching effect of nutrients. All these give rise to reduced crop yields as a result of soil degradation and nutrients imbalance (Ojeniyi, 2000) [24]. Edmeades, 2003 concluded that manured soil had higher organic matter levels, lower bulk density, higher porosity and hydraulic conductivity, and greater aggregate stability than soils fertilized conventionally (Karlen and Stott, 1994) [14]. Improvements in all of these soil quality indicators would optimize crop growth. Thus, one of the most significant benefits of manure as an organic nutrient source was the potential to maintain or increase soil organic matter levels (Power and Doran, 1984) [26]

Microbial biomass and labile organic matter pools were often greater in organic than conventionally managed soils. Higher organic matter content, N mineralization potential, and microbial biomass were observed in organically farmed plots than in those receiving commercial fertilizers. Liebig and Doran, 1999 [18] found greater total C and N, microbial biomass, soil respiration, and mineralizable N in organically managed farms than in conventional farms. In general, tissue dry matter content was reported to be higher in organically grown leafy vegetables, but not in fruit (Magkos, 2003) [20]. Similarly, Heaton, 2001stated that dry matter produce from organic systems was higher than in conventionally grown produce.

Conclusion

Organic fertilizers are fertilizers are originated from animal matter, human excreta or vegetable matter (compost, manure). The eco-friendly way of utilizing organic residue in crop production through organic farming is a major key for production system that avoids or largely excludes the use of synthetic fertilizers, pesticides, growth regulators and livestock feed additives and rely on crop rotation, crop residues, animal manures, legumes, green manures, off-farm organic wastes and mineral bearing rocks. Many organic materials serve as both fertilizers and soil boosters; they feed both soils and plants. Microbial biomass was often higher in organics applied ecosystem than conventionally managed soil ecosystem. The soil pollution can be minimized through organic manure application and simultaneously it increases the quality produces free from chemicals and it is valuable to health concern. The carbon is sequestered in various forms by the application of organic manures to all crops (horticultural and agricultural) and forest plants to improve the crop and soil productivity.

References

1. Alexandratos N, Bruinsma J. World Agriculture towards 2030/2050: The 2012 Revision; ESA Working Paper No. 12-03; Food and Agriculture Organization of the United Nations: Rome, Italy; c2012.
2. Arancon NQ, Edwards CA, Bierman P, James DM, Stephen L, Chirstie W. Effect of vermicompost on growth and marketable fruit of field grown tomatoes, peppers and strawberries. Pedobiologia. 2004;47:731-735
3. Baviskar MN, Bharad SG, Dod VN, Varsha GB. Effect of integrated nutrient management on yield and quality of sapota. Plant Archives. 2011;11(2):661-663.
4. Bruinsma, J. The Resource Outlook to 2050. By How Much Do Land, Water and Crop Yields Need to Increase by 2050? FAO Expert Meeting on How to Feed the World in 2050; FAO: Rome, Italy; c2009. p. 33.
5. Campbell CA, Schnitzer M, Stewart JWB, Biederbeck VO, Selles F. Effects of manure and P fertilizer on properties of Black Chernozem in southern Saskatchewan. Can J Soil Sci. 1986;66:601-61
6. Chaudhary RS, Anchal D, Patnaik US. Organic farming for vegetable production using vermicompost and FYM in Korkiguda watershed of Orissa. India J Soil Conservation. 2003;31(2):203-206.
7. Edmeades DC. The long-term effects of manures and fertilizers on soil productivity and quality: A review. Nutr Cycling Agroecosystems. 2003;66(4):165-180.
8. FAO Soils Bulletins. Soil management: compost production in tropical and subtropical environments (56), FAO, Via delle Terme di Caracalla, 00100 Rome, Italy; c1987.
9. Haynes RJ. Labile organic matter fractions as central components of the quality of agricultural soils: an overview. Adv Agron. 2005;85:221-268.
10. Heaton S. Organic farming, food quality and human health. Soil Assn. UK; c2001.
11. Hidalgo PR, Harkess RL. Earthworm casting as a substrate amendment for chrysanthemum production. Hort. Sci. 2002;3(7):1035-1039
12. http://www.omafra.gov.on.ca/english/environment/bmp/AF153.pdf
13. https://agritech.tnau.ac.in/org_farm/orgfarm_manure.html
14. Karlen DL, Stott DE. A framework for evaluating physical and chemical indicators of soil quality. Defining soil quality for a sustainable environment. Doran JW, Coleman DC, Bezdicek DF, Stewart BA Eds.) SSSA Special Publ 35 Soil Sci Soc Amer, Madison, WI; c1994. p. 53-72.
15. Khatun MF, Chowdhury MAH, Islam MS, Haider SMS, Talukder MZA. Effect of different tree leaf litter on growth and yield of okra in modhupur forest soil. Int. J Expt. Agric. 2010;1(1):5-11
16. Lakpale R, Srivastava GK, Choubey NK, Singh AP, Joshi BS, Pandey RL. Response of gram (*Cicer*

arietinum) to integrated nutrient management in vertisols of Chhattisgarh plains. Indian J Ag. Sci. 2003;73(3):162-163.
17. Lal R. Sequestering carbon in soils of agro-ecosystems. Lessons Learned and Good Practice Guidelines. Washington, DC: The World Bank. Food Policy. 2011;36:533-539.
18. Liebig MA, Doran JW. Impact of organic production practices on soil quality indicators. J Environ Qual. 1999;28(5):1601-1609.
19. Lockie S, Lyons K, Lawrence G, Mummery K. Eating 'Green': Motivations behind organic food consumption in Australia. Sociologia Ruralis. 2002;42(1):23-40.
20. Magkos F, Arvaniti F, Zampelas A. Organic food: Nutritious food or food for thought? A review of the evidence. Int J Food Sci Nutr. 2003;54(5):357-371.
21. Mahadeen AY. Influence of organic and chemical fertilization on fruit yield and quality of plastic house grown strawberry. Jordan J Agric. Sci. 2009;5(2):167-177.
22. Mamaril CP. Organic Fertilizers in Rice: Myths and Facts. FAO: Rome, Italy; Los Banos, Laguna, Philippines; c2004.
23. Mamaril CP, Castillo MB, Sebastian LS. Facts and Myths about Organic Fertilizers; Philippine Rice Research Institute (PhilRice): Muñoz, Nueva Ecija, Philippines; c2009.
24. Ojeniyi SO. Effect of Goat Manure on Soil Nutrients and Okra Yield in the Rain Forest Area of Nigeria. Applied Tropical Agriculture. 2000;5:20-23.
25. Pimentel, D. Green revolution agriculture and chemical hazards. Sci. Total. Environ. 1996, 188, S86–S98.
26. Power JF, Doran JW. N use in organic farming, Nitrogen in crop production. Hauck RD (Ed.) ASA, CSSASSSA, Madison, WI; c1984. p. 585-600.
27. Rana RK, Chandel JS. Effect of biofertilizer and nitrogen on growth, yield and fruit quality of strawberry. Prog. Hort. 2003;35(1):25-30.
28. Rosati A. Organic farming in Europe. Livestock Production Sci. 2005;90(1):41-51.
29. Searchinger T, Hanson C, Ranganathan J, Lipinski B, Waite R, Winterbottom R, *et al*. Creating a Sustainable Food Future. A Menu of Solutions to Sustainably Feed More Than 9 Billion People by 2050. World Resources Report 2013–14: Interim Findings; World Resources Institute: Washington, DC, USA; c2014.
30. Singh R, Sharma RR, Kumar SI, Gupta RK, Patil RT. Vermicompost substitution influence growth, physiological disorders, fruit yield and quality of strawberry. Biores. Technol. 2008;99:8507-8511.
31. Singh SR, Zargar MY, Najar GR, Ishaq MI, Hakeem SA. Effect of integrated nutrient supply on yield, fertility and quality of strawberry under rainfed temperate conditions. J Indian Soc. Soil Sci., 2012;60(1):79-82
32. Smil V. Feeding the World: A Challenge for the 21st Century; MIT Press: Cambridge, MA, USA; c2000.
33. Subba Rao NS. Biofertilizers in agriculture and forestry 3rd Rev. Ed. oxford publishing Co. Pvt. Ltd. Series New Delhi; c1993. p. 72-73.
34. Tilman D, Cassman KG, Matson PA, Naylor R, Polasky S. Agricultural sustainability and intensive production practices. Nature. 2002;418:671-677.
35. Ukrainetz H, Campbell CA, Biederbeck VO, Curtin D, Bouman OT. Yield and protein content of cereals and oilseeds as influenced by long-term use of urea and anhydrous ammonia. Can J Plant Sci. 1996;76(1):27-32.
36. Whalen JK, Chang C, Clayton GW, Care foot JP. Cattle manure amendments can increase the pH of acid soils. Soil Sci Soc Am J. 2000;64:962-966.
37. Yadav PK, Yadav AL, Yadav AS, Yadav HC. Effect of Integrated nutrient nourishment on vegetative growth and physicochemical attributes of papaya (*Carica papaya* L.) fruit cv. Pusa Dwarf. Plant Archives. 2011;11(1):327-329.
38. Yavari S, Eshghi S, Tafazoli1 E, Saba Y. Effect of various organic substrates and nutrient solution on production and fruit quality of strawberry. J Fruit Ornam. Plant Res. 2008;16:167-178.