

An Over View of Organic Farming in Indian Agricultural System



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Abstract

Now-a-days, organic farming practices are gaining importance as farmers have realized the benefits of organic farming in terms of soil fertility, soil health and sustainable productivity. Farmers are well aware with the use of organic liquid manures in organic farming. These organic manures play a key role in promoting growth and providing immunity to plant system. The principle of organic cultivation is attracting the farmers' world over due to its various advantages over modern agricultural practices. Essentially, it is a farming system which supports and strengthens biological processes without recourse to inorganic remedies such as chemicals or genetically modified organisms. Furthermore, the organic agriculture is more productive and highly sustainable one.

Keywords: Modern Agriculture; Organic Farming; Organic Manures and Crop Response

Introduction

Green Revolution (GR) technologies are known to have enhanced agricultural production and productivity. The technologies greatly helped to address the food security of India, farmers using these technologies have to depend upon the purchased inputs. The small farmers, who by cash flow definition are short of cash, are therefore found to lag behind large farmers in the adoption of technologies. The manufactures of fertilizers and pesticides, the two major inputs of GR technologies, need fossil fuels and/or expensive energy, and are associated with serious environmental and health problems [1]. Modern agricultural farming practices, along with irrational use of chemical inputs over the past four decades have resulted in not only loss of natural habitat balance and soil health but have also caused many hazards like soil erosion, decreased groundwater level, soil salinization, pollution due to fertilizers and pesticides, genetic erosion, ill effects on environment, reduced food quality and increased the cost of cultivation, rendering the farmer poorer year by year [2].

In India, cropping system involves the usage of inorganic and organic fertilizers to improve soil health and soil fertility. However, the mismanagement and excessive use of inorganic fertilizers creates problems in soil fertility and the environment. Hence, a widespread need has arisen to go in for organic farming and cultivation. The efficiency of sole organic inputs in nutrient management was studied through the use of different types of organic manures. Organic farming is a productive system, which reduces or avoids entirely the use of chemical fertilizers and

pesticides, growth regulators and other agricultural chemicals. The system relies on crop rotation, organic manure and biofertilizers for nutrient supply, biopesticides and biocontrol for pest and disease control and innovative crop husbandry practices for maintaining soil productivity.

Organic Farming

Organic farming is an approach to producing food products that is intended to overcome the negative impacts of the Green Revolution on soil, air, water, landscape, and humans worldwide. Organic farming methods are continuously being developed by farmers, scientists and concerned people all over the world. A central element of the organic farming approach is the efficient use of on-farm and local resources such as farmyard manure, indirect crop protection and local seeds. It pursues a course of promoting the powers of self-regulation and resistance which plants and animals possess naturally [3].

Organic farming is not based exclusively on short term economics, but also considers ecological concepts. It utilizes appropriate technology and appropriate traditional farming methods. This form of farming can also be called sustainable form of farming or sustainable agriculture. The principles of this method are: organize the production of crops and livestock and the management of farm resources so that they harmonize rather than conflict with natural system; use and develop appropriate technologies based upon an understanding of biological systems;

achieve and maintain soil fertility for optimum production by relying primarily on renewable resources; use diversification to pursue optimum production use for optimum nutritional value of staple food; use decentralized structures for processing, distributing and marketing of products; strive for equitable relationship between those who work and live on the land and maintain and preserve wildlife and their habitats [4,5].

Nature Of Organic Manures/Fertilizers

Compost is one of the less concentrated organic manures, but it is extremely valuable in adding extra body to soils especially the sandy ones. Compost can also help to lighten heavy clay soils. The application of organic manure helps in increasing the organic matter content of the soil, in maintaining soil natural productivity [6]. According to the application of organic manures not only produced the highest and sustainable crop yield, but also improved the soil fertility and productivity of land [7]. A combination of organic and inorganic sources of nutrients might be helpful to obtain a good economic return with good soil health for the subsequent crop yield [8,9]. 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 have several advantages: they supply plant nutrients including micronutrients; improve soil physical properties like structure, water holding capacity; increase the availability of nutrients; plant parasitic nematodes and fungi are controlled to some extent by altering the balance of microorganisms in the soil.

The bulk density, total porosity and aggregate stability of surface soil improve by the hugger organic matter levels of the organic farming soil. It is an excellent organic fertilizer is concentrated source of nitrogen and other essential nutrients. It has direct effect on plant growth. It has high K and C:N ratio values and wood ash had high K and C:N ratio [10]. Earthworms can serve as tools to facilitate several functions. They serve as "nature's plowman" and form nature's gift to produce good humans, which is the most precious material to fulfill the nutritional needs of crops. The utilization of vermicompost results in several benefits to farmers, industries, environment and overall national economy. They are finely-divided mature peat-like materials with a high porosity, aeration, drainage and water-holding capacity and microbial activity which are stabilized by interactions between earthworms and microorganisms in a non-thermophilic process. Vermicompost treated soils have lower pH and increased levels of organic matter, primary nutrients and soluble salts.

Vermi compost is rich in N, P, K, Ca, Mg and vermicompost when used improve the water holding capacity. Supplementing N through inorganic sources, thus play a vital role in increasing the yield of the crop [11]. Neem cake consists of neem seed along with natural nutrients which is required for the growth of plants. Every part of tree i.e. leaves, flowers, fruits, bark, seed are utilized

as a pesticides, insecticides, medicine, diabetic food, mosquito repellent. It is potentially one of most valuable and least exploited of all tropical trees. It has adequate quantity of NPK in organic form for plant growth. Being totally botanical product it contains 100% natural NPK content and other essential micro nutrients [12,13]. Wood ash is a residual material produced during the conversion of biomass to electrical energy by wood-burning power plants.

It is obtained from the combustion of wood. It can be related to fly ash since fly ash is obtained from coal, which is a fossilized wood. An estimated 1.5 to 3.0 million dry tons of It is generated annually in the United States with 90% of the ash being land filled. Land spreading is an alternative disposal method which is 33%-66% less costly than land filling due to the drastic rise of prices for commercial fertilizers, the search for alternative fertilizer resources becomes increasingly important [14]. The reutilization of residues from bio energy processes for plant nutrition is an important factor to save fertilizers and to realize nutrient cycling in agriculture [15]. The ashes remaining from combustion of biomass are the oldest man-produced mineral fertilizers in the world. They contain nearly all nutrients except of nitrogen (N) and can help to improve plant nutrition regarding phosphorus (P), the fertilizer effect of biomass ashes and the solubility of P in ashes are evaluated differently.

Crop Response to Organic Manures

Vermi compost: Vermicompost was found to be richer on P, K, Ca and Mg and enrichment of trace elements like Fe, Cu, and Mn. The application of vermicompost to plant resulted in increased root length and shoots length and plant biomass. The application of nitrogen through urea and vermicompost significantly increased the nitrogen and protein content in okra fruit over control. The number of fruits per plant, fruit length and fruit yield increased significantly due to application of 100 % N (90 kg/ ha) through urea and vermicompost over control. Vermicompost has been used in flowering plants like balsam, zinnia, celosia and marigold; Vegetable crops like tomato, carrot, and brinjal and fruit crops such as grape and banana [16,17]. Earthworm casts promote root initiation and root biomass and increase root percentage. Earthworm casts have hormone-like effect, influencing the development and precociousness of plants. Vermicomposted larval litter significantly increased the length and weight of shoot and root, shoot: root ratio and N, P, K uptake. Application of recommended doses of NPK fertilizers, earthworm and cow dung has much significantly increased the chlorophyll and protein contents of mulberry leaves. Rice grown on worm casts produced higher shoot fresh weight and dry weight and showed higher nutrient uptake, lower fertilizer response than rice grown on surface soils [18].

The application of vermin compost had a significant effect on root and fruit weight of tomatoes. In 100 % vermicompost treatment, fruit, shoot, and root weights were three, five, and nine times, respectively more than control. Where vermicompost

was applied at 5 t/ha or at 10 t/ha, increased shoot weight and leaf area of pepper plants (*Capsicum annuum* L) compared to inorganic fertilizers [19]. The application of vermicompost 3 t/h to chickpea improved dry matter accumulation, grain yield, and grain protein content in chickpea, soil nitrogen and phosphorus and bacterial count, dry fodder yield of succeeding maize (*Zea mays* L) and total nitrogen and phosphorus uptake by the ropping system over vermicompost [20] and increased the vegetative growth and yield of *Hibiscus esculentus* [21].

Farmyard Manure (FYM): Farm yard manure is an important source of plant nutrients. It is composed of dung, urine of bedding and straws. Application of FYM at 10 t/ha and poultry manure at 5 t/ha significantly increased number of branches per plant, leaf area index and dry weight per plant. The fresh and dry weight per plant was higher in the vermicompost and FYM treated tomato. The highest protein content in okra fruit was recorded with application of N (90 kg/ha) through FYM, vermicompost, poultry manure and urea over control [22,23]. The application of 100 per cent RDF and FYM at 20 t/ha significantly increased growth attributes viz. plant height at harvest, number of branches per plant, leaf area and chlorophyll content in okra [24].

The effect of organic manures on yield characters was significantly superior over inorganic fertilizer in brinjal. The maximum fruit yield was obtained with the treatment of FYM + vermicompost. The total potato (*Solanum tuberosum* L) tubers yield was significantly higher with the application of vermicompost and FYM [25]. The results indicated that the farmyard manure and higher doses of potassium proved best to increase the yield of potatoes. Organic manures such as cow dung, poultry manure and crop residues were used as alternatives for the inorganic fertilizers but no conclusive results were obtained to ascertain which among these organic sources of nutrition gave a higher yield of tomato [26,27]. Application of farm yard manure, which contained both mineral and organic N, was used to improve soil fertility and rice yield [28]. A good response of potatoes was observed in shape of increased yield with the application of potash fertilizers alone and even better with combined application of FYM. Response of potato was very clearly observed with increased levels of potassium supply along with organic manures [29,30]. The plant height, number of branches, leaf area, and total dry matter production in various plant parts of chilli recorded significantly higher values with combined application of NPK + FYM as compared to NPK alone [31].

Neem Cake: Neem cake is rich in plant nutrients and in addition to that it contains alkaloids like Nimbin and Nimbidin, which have nitrification inhibiting properties and release N slowly. The improved yield is due to neem cake application in brinjal. It is gaining popularity because it is environmental friendly and also the compounds found in it help to increase the nitrogen and phosphorous content in the soil. It is rich in sulphur, potassium, calcium, nitrogen, etc [32]. It is used to manufacture high quality organic or natural manure, which does not have any aftermaths

on plants, soil and other living organisms. The application of 25% nitrogen through neem cake and 75% through poultry manure was found superior in the enhancement of the growth, yield and quality parameters of bitter melon. The application of nutrients like neem cake, different nitrogen levels, and biofertilizers has a significant and vital effect on yield and quality attributes of chilli [33] and asserts the highest dry weight of root, dry weight of rhizome per plant and total dry matter yield from neem cake applied at 2.0 t/ha in turmeric [34].

Wood Ash: Wood ash increases soil pH and thus enhances the growth of neutrophilic microorganisms [35]. The higher pH increases the fraction of DOC which is the main resource for microbial growth [36]. Sludges are efficient N fertilizers, and thus the combination with wood ash should have increased plant growth as has been shown for corn [37] for poultry litter ash. An increase of extractable soil P after application of alfalfa stems ash. The positive effects of ashes on soil texture, aeration, water holding capacity and cation exchange capacity [38]. The application of ash promotes plant growth only if there is no N limitation. The high content of Ca, K and Mg in wood ash results in an immediate neutralization acid soils upon application. The ability of ashes to increase soil pH by oxides, hydroxides and carbonates of K, Mg and Ca is an advantage for the treatment of acidic soils [39].

It was found that increased in pod yield of okra with application of wood ash up to 8 t/ha. The burning of Sesbania wood and incorporation of the ash into soil increased grain yield of maize markedly, while the application of ash young maize plants had significantly increased the yield of maize [40,41]. The yield of vegetable crops and nutrient content were improved by wood ash [42] and reduced acidity and increased cation availability in soils amended with wood ash [43]. There was great potential of reducing fertilizer and lime bills in maize production of an acidic soil by replacing it with application of wood-ash, since it helps to increase soil pH, available cations and yield.

Conclusion

Organic farming system in India is not new and is being followed from ancient time. It is a method of farming system which primarily aimed at cultivating the land and raising crops in such a way, as to keep the soil alive and in good health by use of organic wastes (crop, animal and farm wastes, aquatic wastes) and other biological materials along with beneficial microbes (biofertilizers) to release nutrients to crops for increased sustainable production in an eco friendly pollution free environment. With the increase in population our compulsion would be not only to stabilize agricultural production but to increase it further in sustainable manner. The scientists have realized that the 'Green Revolution' with high input use has reached a plateau and is now sustained with diminishing return of falling dividends. Thus, a natural balance needs to be maintained at all cost for existence of life and property. The obvious choice for that would be more relevant in the present era, when these agrochemicals which are produced

from fossil fuel and are not renewable and are diminishing in availability. It may also cost heavily on our foreign exchange in future.

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