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Review Article

Organic Farming Strategy for Sustainable Food Production

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Abstract

Organic farming was once way of life around the world especially in India. It was, however, altered by modern agriculture especially the green revolution. Indigenous knowledge and local wisdom was ignored in adopting scientific approach, particularly in applying fertilizers. The Green Revolution Technologies' led polluted ecosystems; depleted natural resources; lost biodiversity; less diverse diets; lost soil fertility/ soil fertility depletion; dependence on industrial inputs; imbalance/reduction in production; diminishing economic returns for farmers; increase in pesticide use; unscientific water management and distribution, and reduction in quality of the produce. All these problems of green revolution led to not only reduction in productivity but also deterioration of soil health as well as natural ecosystem.

In India the commercial organic farming is still at a very nascent stage. About 528, 171 hectare area is under organic farming with 44,926 number of certified organic farms. This accounts for about 0.3 % of total agricultural land. Indian organic farming industry is estimated at US$ 78 million and is almost entirely export oriented. In the present article an attempt has been made to analyze the impact of Green Revolution Technologies' on Indian agriculture, explore meaning, concept, importance and need of Organic Farming hence giving an impetus for adoption of an alternative farming system, may be the 'Organic Farming' for sustaining the productivity of the crop, disease resistance, maintaining the soil health and ensuring healthy ecosystems.

KEY WORDS: *Organic farming, green revolution technologies, agriculture, food production.*

INTRODUCTION

Global population is estimated to reach 11 billion by the end of 21st century (Alexandratos and Bruinsma, 2012) further escalating the multifariouschallenges ahead of current agricultural systems. In a scenario where nearly 1 billion people are currently undernourished (FAO, 2011) our agricultural system needs to ensure the provision of sufficient and affordable nutrition for everyone. About a billion hectares of additional cropland are needed by 2050 to meet the projected increase of 70–110% in global food demand using contemporary farming practices (Tilman et al., 2001; Bruinsma, 2009). Most of the additional land will come from developing countries mainly in the tropics, which will inhabit more than half of the world's

population by the middle of this century (Edelman et al., 2014).

In recent decades, fossil based input-intensive industrial agricultural technologies have been widely recognized as being unsustainable over the long-run (Pingali, 2012). Moreover, global food system has increasingly faced the impacts of escalating intensity of climatic extremes (Nelson et al., 2009) as well as economic uncertainties (Kastner et al., 2012). This has led to stronger calls for transformation of our agricultural system using holistic farming practices based on ecological principles. Several different alternative farming approaches have been put forward in different parts of the world from time to time with varying degree of success. Organic agriculture is one of the most widely known alternative agricultural production systems advocated for its benefits to soil, environment, health and economic condition of farming communities (Mäder et al., 2002; Badgley et al., 2007; Forster et al., 2013).

Agriculture in India is a livelihood practice, since Neolithic age dates back to 7500-6500 BC. In the due course of time, the human civilization has been transformed from a hunter and a gatherer of wild berries and roots to the cultivator of diaspora of agriculture produce (Surapala, 1000 BC). The farmers knew the methods of improving soil fertility through green manuring, composting with animal dung, and rotation of crops. Diversified farming with crops, animals and trees and mixed cropping with crop-mixtures were accepted system for raising crops (Varahamihir, 500AD). Animals were honoured and worshipped by celebrating festivals (Kashyap, 800 AD).

Science dominated agriculture from the middle of 18th century and reached its climax when Justus Von Liebig published his monograph on agricultural chemistry and formulated the famous “law of minimum”. Liebig’s work formed the basis of mineral approach to crop nutrition which resulted in use of synthetic fertilizers (Berghoff, 1954).

Use of synthetic fertilizers, and pesticides in agriculture increased gradually from 1950 onwards and reached its peak during various intensive agricultural programmes initiated by government under ‘GreenRevolution’ in sixties. ‘Green Revolution Technologies such as greater use of synthetic agrochemicals like fertilizers and pesticides, adoption of nutrient- responsive high-yielding varieties of crops, greater exploitation of irrigation potentials etc. has boosted the production output. ‘Green Revolution’ in the post-independence era has shown path to developing countries for self-sufficiency in foodgrain production. The foodgrain production of India raised from 50.8 million tones in1950 to 235.88 million tons in 2009-10 (Indiastat, 2010).

Indigenous knowledge and local wisdom was ignored in adopting scientific approach, particularly in applying fertilizers. The soils which receive high levels of nitrogenous fertilizers suffer from leaching and nitrate pollution (Hallberg*et al.*,1993). Too much nitrogen can cause plant to become too lush and tall and become more susceptible to damage from wind and pest (Rao, 2007). Regular use of phosphatic fertilizers in large quantities often causes the buildup of trace metal contaminants like arsenic, fluoride, cadmium etc. in the soil and plants

(Alloway, 1990). Excessive application of muriate of potash creates chloride toxicity in many crops (Wu *et al.*, 2001). Excessive application of potash also results in "luxury consumption" which is not reflected in yields, thus increasing the cost of the input (Hommels*et al.*, 1989).

Most of the agro-ecological regions now showing reduction in organic carbon with intensive cropping with improper crop management practices such as low biomass recycling, excessive tillage methods, burning of the existing residue in the field itself and virtually no return of any plant residue back to the soil, aggravate the process of soil degradation (Srinivasarao e*t al.*, 2006). As a result of several above mentioned reasons, soils encounter diversity of constraints broadly on account of physical, chemical and biological health and ultimately end up with poor soil quality (Srinivasarao, 2011)

This shows signs of reversing trend in production in several places, in spite of increased inputs. There was a quantum jump of 100 million tons from around 60 million tons in two decades (during 1960s and 1970s). But the last two decades could not witness such a long jump in production, in spite of successive good monsoons. These being the case, how are we going to reach the target of around 350 million tons in 2030 that is the minimum quantity needed for growing population of the country (ICAR, 2011).To meet the food, fiber, fuel, fodder and other needs of the growing population, the productivity of agricultural land and soil health needs to be improved. Now, the nutrient management practices should be shifted from the"resource degrading" chemical agriculture to a "resource protective" biological or organic agriculture.

In recent decades, fossil based input-intensive industrial agricultural technologies have been widely recognized as being unsustainable over the long-run (Pingali, 2012). Moreover, global food system has increasingly faced the impacts of escalating intensity of climatic extremes (Nelson et al., 2009) as well as economic uncertainties (Kastner et al., 2012). This has led to stronger calls for transformation of our agricultural system using holistic farming practices based on ecological principles. Several different alternative farming approaches have been put forward in different parts of the world from time to time with varying degree of success. Organic agriculture is one of the most widely known alternative agricultural production systems advocated for its benefits to soil, environment, health and economic condition of farming communities (Mäder et al., 2002; Badgley et al., 2007; Forster et al., 2013).

Organic farming system in India is not new and is being practiced 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. The organic farming today is not traditional agriculture. The principles governing organic farming are more scientific than even the principles followed in modern agriculture.

In this context, many of the scientists and activists believed that agriculture in general and organic farming in particular is more specific with respect to local than global level due to vide variations in soil, climate and captive water resources. Since

it is site specific farmer's knowledge and identification of local practices is important to create new approaches to achieve sustainability. (Shroff, 1994 and Deshpande, 2009).

Organic farming is gaining gradual momentum across the world. In India the commercial organic farming is still at a very nascent stage. In India, about 528,171 hectare area is under organic farming (certified and area under organic conversion) with 44,926 number of certified organic farms. This accounts for about 0.3 % of total agricultural land. Indian organic farming industry is estimated at US$ 78 million and is almost entirely export oriented. According to Agricultural and Processed Food Products Export Development Authority (APEDA, 2010), a nodal agency involved in promoting Indian organic agriculture, about 585,970 tonnes of organic products worth of Rs 301 million are being exported from India.

Meaning and Concept of Organic Farming

Organic farming system in India is being practiced from ancient time. It was primarily aimed at cultivating the land and raising crops in such a way, as to keep the soil alive and in good health. The great Indian civilization thrived on organic farming gracing the nation as one of the most prosperous countries in the world, till the British ruled it. In traditional India, the entire agriculture was practiced using organic techniques, where the inputs like fertilizers, pesticides, etc., were obtained from plant and animal products. Organic farming use to be the backbone of the Indian economy and cow was worshipped (and is still done so) as a god.

Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs (FAO, 1999).

The National program for organic production of Government of India defined organic farming as a holistic system which can achieve sustainable productivity without the use of artificial inputs such as chemicals fertilizer and pesticides. Organic agriculture is one among the broad spectrum of production methods that are supportive of the environment. Organic production systems are based on specific standards precisely formulated for food production and aim at achieving agro ecosystems, which are socially and ecologically sustainable. It is based on minimizing the use of external inputs through use of on-farm resources efficiently compared to industrial agriculture. Thus the use of synthetic fertilizers and pesticides is avoided (FAO, 1999).

'Organic' in organic agriculture is a labeling term that denotes products that have been produced in accordance with certain standards during food production, handling, processing and marketing stages, and certified by a duly constituted certification body or authority. The organic label is therefore, a process claim rather than a product claim. It should not necessarily be interpreted to mean that the foods produced are healthier, safer or all natural. It simply means that the products follow the defined standard of production

and handling, although surveys indicate that consumers consider the organic label as an indication of purity and careful handling. Organic standard will not exempt producers and processors from compliance with general regularity requirements such as food safety regulations, pesticide registrations, general food and nutrition labeling rules, etc. (FAO, 2000). Many definitions have been proposed for organic agriculture. Ethical issues such as fair labour practices and animal ethics have also been included in organic agriculture definitions (IFOAM, 2002). All these, however, primarily focus on ecological principles as the basis for crop production and animal husbandry. To promote organic agriculture and to ensure fair practices in international trade of organic food, the Codex Alimentarius Commission, a joint body of FAO/WHO framed certain guidelines for the production, processing, labeling and marketing of organically produced foods, with a view to facilitate trade and prevent misleading claims (FAO,1999). The Codex Alimentarius Commission defines organic agriculture as a holistic food production management system, which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system.

Why Organic farming?

To meet the food, fiber, fuel, fodder and other needs of the growing population, the productivity of agricultural land and soil health needs to be improved. 'Green Revolution' in the post-independence era has shown path to developing countries for self-sufficiency in food but sustaining agricultural production against the finite natural resource base demands has shifted from the"resource degrading" chemical agriculture to a "resource protective" biological or organic agriculture.'Green Revolution Technologies' such as greater use of synthetic agrochemicals like fertilizers and pesticides, adoption of nutrient-responsive, high-yielding varieties of crops, greater exploitation of irrigation potentials etc. has boosted the production output in most cases. However, continuous use of these high energy inputs indiscriminately now leads to decline in production and productivity of various crops as well as deterioration of soil health and environments (Maity and Tripathy, 2005). The most unfortunate impacts of Green Revolution Technologies' on Indian agriculture are as follows:

- Polluted ecosystems
- Depleted natural resources
- Lost biodiversity
- Less diverse diets
- Lost soil fertility/ Soil Fertility Depletion
- Dependence on industrial inputs
- Imbalance/Reduction in production
- Diminishing economic returns for farmers
- Increase in pesticide use
- Unscientific water management and distribution
- Reduction in quality of the produce

All these problems of green revolution lead to not only reduction in productivity but also deterioration of soil health as well as natural ecosystem. Moreover, today the rural economy is now facing a challenge of over dependence on external inputs and day-by-day increase in price of these inputs. Further, Indian Agriculture will face the market competition due to globalization of trade as per World Trade Organization (WTO). Thus, apart from quantity, quality will be the important factor. Such varieties of concern and problems of modern Indian agriculture gave birth to various new concepts of farming such as organic farming, natural farming, biodynamic agriculture, do-nothing agriculture, eco-farming, etc. The essential concept of these practices remains the same, i.e., back to nature, where the philosophy is to feed the soil rather than the crops to maintain soil health and it is a means of giving back to the nature what has been taken from it (Funtilana, 1990). Therefore, for sustaining the productivity of the crop, maintaining the soil health and healthy ecosystem, there is need for adoption of an alternative farming system, may be the 'Organic Farming'.

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