



## ORGANIC FARMING AND CLIMATE-SMART AGRICULTURE: FARMER'S BOON OR BANE?

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### **Abstract**

India is one of the agricultural based nations and India's agriculture sector continues to be the lifeline of its people and a key factor in the economy's overall productivity. Agricultural development strategy therefore need to be geared towards increasing the productivity of land under cultivation, with reduced cost, higher efficiency use of inputs with little or no harm to both human and the environment. A new strategy of promoting eco-friendly farming is through the modification of the present systems of farming in the area of soil nutrient restoration to encourage the use of organic materials, termed Organic farming (OF). Organic farming is a production system that sustains the health of soils, ecosystems and the people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic farming combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved. The Millennium Development Goals (MDGs) target the environmental sustainability explicitly, and Organic farming is regarded as being a relevant strategy to meet many goals. Hence A global development strategy is needed that explicitly includes future generations, ecosystems, biodiversity and plant and animal species threatened by eradication.

In this article, a study is made about Organic farming, Conventional Farming, Organic farming and Climate-smart agriculture, present status, marketing and advantages of organic farm practices which will overcome the current issues of the Conventional farming (CF).

**Key words: Organic farming, Conventional Farming, Climate-smart agriculture, Sustainable, Ecology, Development strategy, Millennium Development Goals (MDGs).**

### **Introduction**

*“Organic agriculture, a holistic system that focusses on improvement of soil health, use of local inputs and relatively high intensity use of local labor, is a admirable fit for dry lands in many ways and the dry land offer many benefits that would make it relatively easy to implement.”*

~ **Bharat ratna Dr.A.P.J. Abdul Kalam**

The concept of organic farming is not new in India. It is something that has been practised since ancient times. Around the world, the dependency on land and other natural resources is inevitable to meet human needs and long term survival. Since the past decade, organic farming was promoted and adopted by the government as a way for maintaining a sustainable agriculture due to its less dependence on external factors. In the eleventh Malaysian Plan (2016- 2020), the focus of the government included promoting the agro-food subsector in order to achieve the targeted sufficiency level of key food commodities. In contrary, conventional farming has been a common practice among farmer in improving productivity to meet the increasing demand. However, this form of farming has been dependent on the high usage of synthetic fertilizers, pesticides and herbicides that have raised pertinent environmental concerns which affect the biodiversity (Lupwayi *et al.*, 2001). This method is based on the research conducted by Jenkins *et al.*, 2010; Gasparatos *et al.*, 2011 and Arnhold *et al.*, 2014.

India is a leading developing country, making economic progress through agricultural development. Farming is the major source of employment and livelihood in rural areas, where about 65-70% of the people are living. However, the agricultural production has not reached the expected stage because of lack of resources such as water, nutrients, good quality planting material, plant protection and post harvest management. Over 75% of the farmers hold less than 2 ha. land and about 72% of the area under agriculture is dependent on rainfall, whereby return on investment is not assured due to failure of rains and other calamities. The small and marginal farmers who spend over 85% of their income on food alone have no opportunity to make any savings. In the absence of cash reserves, the poor farmers are unable to procure necessary inputs for crop production. As against the world average of 172 kg/ha chemical fertilisers, Indian agriculture consumes only about 70 kg/ha. The average fertiliser consumption is even lower, if fertilisers applied for three important crops like paddy, wheat and sugarcane are not considered in the average. Thus a majority of the crops suffer from nutritional deficiency. Under such conditions, organic farming can be a boon, as the farmers can enrich their soil and manage their crops better, without depending on expensive external inputs.



The hallmark of a truly sustainable system is its ability to regenerate itself. When it comes to farming, the key to sustainable agriculture is healthy soil, since this is the foundation for present and future growth. Organic farming is far superior to conventional systems when it comes to building, maintaining and replenishing the health of the soil. For soil health alone, organic agriculture is more sustainable than conventional. When one also considers yields, economic viability, energy usage, and human health, it's clear that organic farming is sustainable, while current conventional practices are not. As we face uncertain and extreme weather patterns, growing scarcity and expense of oil, lack of water, and a growing population, we will require farming systems that can adapt, withstand or even mitigate these problems while producing healthy, nourishing food. Here, we examine the performance of organic farming in light of four key sustainability metrics: productivity, environmental impact, economic viability and social wellbeing.

### **Need of Organic Farming**

With the increase in population, our compulsion would be not only to stabilize agricultural production but also increase it further in a 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.

### **Objectives of the Study**

This paper analyses the dynamics of structural transformation of the Indian agricultural economy and major drivers of transformation, giving an overview of the achievements of Organic farming and climate-smart agriculture and the future prospects in Indian agriculture, finally identifying the key policy issues and strategies to accelerate sustainable broad-based growth in the agriculture sector in the country.

### **Methods and Materials of the Study**

This paper is based on secondary data, primarily through literature, study of journals, articles and textual analysis, and websites. Overall, this exploratory research explores the sustainable development of Organic farming and Climate-smart agriculture in India. Qualitative research approaches and procedures have been applied to explore pertinent information for this study

### **Conventional Farming**

A crop can be classified as conventional if synthetic chemicals are used to maintain the plants. A significant amount of chemical and energy input is required in conventional agriculture to produce the highest possible yield of crops. Conventional agriculture was developed to make farming more efficient, but achieves that efficiency at a major cost to the environment. The goal of conventional agriculture is to maximize the potential yield of crops. This is achieved through the application of synthetic chemicals, genetically modified organisms, and a number of other industrial products. Production of these crops is beneficial to nothing but food security and economy. Since the goal of conventional agriculture is to maximize yields, environmental health and biodiversity are usually not preserved.

### **Organic Farming**

Organic farming is a form of agriculture that relies on sustainable techniques to enhance the natural fertility of a farm, including crop rotation, companion planting, biological pest control, and naturally-sourced fertilizers such as compost, manure, green manure, and bone meal. Pest-control measures such as mixed crops and fostering natural insect predators are employed, while it excludes the use of synthetic petrochemical fertilizers and pesticides, plant growth regulators such as hormones, antibiotic use in livestock, genetically modified organisms, human sewage sludge, and nanomaterial. The agricultural approach emphasizes sustainability, openness, independence, health, and safety. Organic farming has a history of being contentious and is considered by some as an inefficient approach to food production. Yet organic foods and beverages are a rapidly growing market segment in the global food industry. Organic farming systems produce lower yields compared with conventional agriculture. However, they are more profitable and environmentally friendly, and deliver equally or more nutritious foods that contain less (or no) pesticide residues, compared with conventional farming. Moreover, initial evidence indicates that organic agricultural systems deliver greater ecosystem services and social benefits. Although organic agriculture has an untapped role to play when it comes to the establishment of sustainable farming systems, no single approach will safely feed the planet. Rather, a blend of organic and other innovative farming systems is needed. Significant barriers exist to adopting these systems, however, and a diversity of policy instruments will be required to facilitate their development and implementation.



### **The Key Characteristics Of Organic Farming**

1. Protecting the long term fertility of soils by maintaining organic matter levels, encouraging soil biological activity, and careful mechanical intervention
2. Providing crop nutrients indirectly using relatively insoluble nutrient sources which are made available to the plant by the action of soil micro-organisms
3. Nitrogen self-sufficiency through the use of legumes and biological nitrogen fixation, as well as effective recycling of organic materials including crop residues and livestock manures
4. Weed, disease and pest control relying primarily on crop rotations, natural predators, diversity, organic manuring, resistant varieties and limited (preferably minimal) thermal, biological and chemical intervention
5. The extensive management of livestock, paying full regard to their evolutionary adaptations, behavioural needs and animal welfare issues with respect to nutrition, housing, health, breeding and rearing
6. Careful attention to the impact of the farming system on the wider environment and the conservation of wildlife and natural habitats.

### **Classification of Organic Farming**

Organic farming has been classified into three categories for reducing the inorganic system

1. Pure Organic Farming: In this method, application of synthetic fertilizers and pesticides has been completely replaced by organic fertilizers and bio-pesticides.
2. Integrated Green Revolution Farming: It is a method in which production and yield have been increasing by application of hybrid varieties of seeds, sufficient irrigation, mechanized field operation and skilled labor involvement and the minimum damage to the environment and human health. Integrated Nutrient Management (INM) and Integrated Pest Management (IPM) both are coming under this farming.
3. Integrated Farming System: Farming is totally dependent upon the local and natural resources like recycling of agricultural wastes, tree leaves, crop residues, food wastes etc. for improving the quality of produce without depleting the ecosystem.

### **Organic Farming and Climate-Smart Agriculture**

In agriculture, it seems that we have passed 'green' (too reminiscent of the green revolution and its controversies) and 'sustainable' (too vague and multi-faceted) and arrived at 'climate-smart agriculture' (CSA). Climate-smart agriculture that fits into global climate action, is quantifiable (via CO<sub>2</sub>-equivalent emission savings) and can encompass both mitigation and adaptation actions, making it a catch-all for a plethora of initiatives that can satisfy both the global North and South in their aims. So far, so good.

Thus, at the UN Secretary General's Climate Summit in New York on 23<sup>rd</sup> September 2014, 180 senior officials and stakeholders attended the inaugural meeting of the Global Alliance for Climate-Smart Agriculture. The Alliance aspires to be a "food security and nutrition focused, agriculture-driven and action-oriented coalition of entities committed to incorporating climate-smart approaches encompassing all scales and types of agriculture systems, across all climates and approaches to farming, including crop, livestock, fishery and forestry activities, providing farmers an innovative toolbox of options from which to choose". Its goals (which match the FAO definition of CSA) are to contribute simultaneously to "sustainable and equitable increases in agricultural productivity and incomes; greater resilience of food systems and farming livelihoods; and reduction and /or removal of greenhouse gas emissions associated with agriculture (including the relationship between agriculture and ecosystems), where possible".

According to a number of research projects, organic farming can indeed contribute to climate change mitigation. First and foremost, its use of nitrogen-fixing rotations, cover crops and organic compost increases the carbon sequestration potential of soils and boosts their carbon content. There are also secondary effects, such as lower fossil fuel use, a lesser reliance on imported feed concentrate and the transportation and land use change consequences stemming from it, and a decrease in methane emissions from landfills. Thus, organic farming and the Climate-Smart Agriculture (CSA) idea should be born allies.

### **Organic Farming in India**

Organic farming is a holistic production management system which promotes and enhances health of agro-ecosystem related to bio-diversity, nutrient bio-cycle and soil biological and microbial activities. India's organic food market has the potential to grow more than 30 percent annually to touch \$1.36 billion by 2020, provided there is more awareness about these products and the government incentives region-specific organic farming to ensure consistent growth in future.



India is bestowed with lot of potential to produce all varieties of organic products due to its various agro climatic regions. In several parts of the country, the inherited tradition of organic farming is an added advantage. This holds promise for the organic producers to tap the market which is growing steadily in the domestic market related to the export market. India is world's third highest producer of Organic products. As per the available statistics, India's rank in terms of World's Organic Agricultural land was 15 as per 2013 data (Source FIBL & IFOAM Year Book 2015). The total area under organic certification is 5.71million Hectare (2015-16). This includes 26% cultivable area with 1.49 million Hectares and rest 74% (4.22 million Hectare) forest and wild area for collection of minor forest produces.

### **Growing Area**

Organic farming in India started receiving focused attention from 2004-05 when National Project on Organic Farming (NPOF) was launched. In 2004-05, area under organic farming was 42,000 hectares. By March 2010 area under farming had increased to 1.08 million hectares. In addition, 3.40 million hectares is wild forest harvest collection area. Thus total area under organic certification process by March, 2010 was 4.48 million hectares which is 25 fold increase in 6 years. India produced around 1.35 million MT (2015-16) of certified organic products which includes all varieties of food products namely Sugarcane, Oil Seeds, Cereals & Millets, Cotton, Pulses, Medicinal Plants, Tea, Fruits, Spices, Dry Fruits, Vegetables, Coffee etc. The production is not limited to the edible sector but also produces organic cotton fiber, functional food products etc. Among all the states, Madhya Pradesh has covered largest area under organic certification followed by Himachal Pradesh and Rajasthan. The total volume of export during 2015-16 was 2, 63,687 MT. The organic food export realization was around 298 million USD. Organic products are exported to European Union, US, Canada, Switzerland, Korea, Australia, New Zealand, South East Asian countries, Middle East, South Africa etc.

### **States Adopting Organic Farming**

Organic farming is practised mainly in 12 States in about 4.72 million hectares of the country in 2013-14. Twelve States have drafted organic farming policies. Out of these, four States viz; Uttarakhand, Nagaland, Sikkim and Mizoram have declared their intention to go 100 percent organic. Sikkim has become India's first fully organic state by converting around 75,000 hectares of agricultural land into sustainable cultivation. Sikkim has already converted nearly 90 percent of its total cultivated area under organic and has set target to convert entire State to organic by December 2016. In Manipur, northeastern India, 30,000 hill farmers have gone organic, meaning that the state could soon become a leading organic producer in the country.

Recently Andhra Pradesh government has set a target of bringing 10 lakh hectares under organic farming in the next five years. Agriculture Department of Andhra Pradesh, organic farming is being planned in 130 clusters covering 1.25 lakh hectares across the State in the next three years by involving 1.5 lakh small and marginal farmers, where a majority of them have been practicing agro ecology approaches for more than three years. Currently, certified organic farming is being practiced in about 5,000 hectares in the State. Other States have also designed schemes to promote organic farming. Bihar has sanctioned a scheme worth Rs. 256 crores for promotion of organic farming.

### **Promotion of Organic Farming**

Organic farming is being promoted under National Project on Organic Farming (NPOF), National Horticulture Mission (NHM), Rashtriya Krishi Vikas Yojana (RKVY) and National Programme for Organic Production (NPOP). Promoting organic farming through Parmparagat Krishi Vikas Yojana (PKVY) is a welcome step to help reduce cost of production and in turn reduce farmers' financial burden.

### **Organic Farming and the Millennium Development Goals**

Organic farming will contribute both directly and indirectly to achieving the Millennium Development Goals (MDGs) is the scope of this dossier. Although organic farming plays an important role in achieving individual MDGs, its impact is far greater when considered holistically due to the interrelationships among the MDGs. In many cases, the positive impact of organic farming in achieving one MDG in turn has a positive impact on achieving other MDGs. Thus, the old adage "the whole is greater than the sum of its individual parts" has much relevance to the topic of organic farming's contribution to achieving the following eight Millennium Development Goals (MDGs).

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat human immunodeficiency virus/acquired immune deficiency syndrome (HIV/



- AIDS), malaria, and other diseases  
7. Ensure environmental sustainability  
8. Develop a global partnership for development.

Although the contribution of organic farming to the MDGs depends on local agro-ecological and socioeconomic contexts, in general it provides a long-term solution to poverty and food insecurity. Moreover, it has the ability to empower women, improve human health, promote environmental sustainability and enhance and preserve biodiversity. The contribution of organic farming to achieving the MDGs is even greater when entire communities, as well as indirect benefits are considered.

### **Benefits of Organic Technologies**

Various organic agricultural technologies have been used for about 6000 years to make agriculture sustainable while conserving soil, water, energy, and biological resources. The following are some of the benefits of organic technologies identified in this investigation:

- Soil organic matter (soil carbon) and nitrogen were higher in the organic farming systems, providing many benefits to the overall sustainability of organic agriculture.
- Although higher soil organic matter and nitrogen levels were identified for the organic systems, similar rates of nitrate leaching were found to those in conventional corn and soybean production.
- The high levels of soil organic matter helped conserve soil and water resources and proved beneficial during drought years.
- Fossil energy inputs for organic crop production were about 30% lower than for conventionally produced corn.
- Depending on the crop, soil, and weather conditions, organically managed crop yields on a per-ha basis can equal those from conventional agriculture, although it is likely that organic cash crops cannot be grown as frequently over time because of the dependence on cultural practices to supply nutrients and control pests.
- Although labor inputs average about 15% higher in organic farming systems (ranging from 7% to 75% higher), they are more evenly distributed over the year in organic farming systems than in conventional production systems.
- Because organic foods frequently bring higher prices in the marketplace, the net economic return per ha is often equal to or higher than that of conventionally produced crops.
- Crop rotations and cover cropping typical of organic agriculture reduce soil erosion, pest problems, and pesticide use.
- The recycling of livestock wastes reduces pollution while benefiting organic agriculture.
- Abundant biomass both above and below the ground (soil organic matter) also increases biodiversity, which helps in the biological control of pests and increases crop pollination by insects.
- Traditional organic farming technologies may be adopted in conventional agriculture to make it more sustainable and ecologically sound

### **Organic Farming is Better Than Conventional Farming**

Farmlands have become increasingly dependent on chemical fertilizers which have short term benefits but contribute to soil depletion over time. But while today's large scale food producers continue to profit and consumers see supermarket shelves overflowing with farm products, the unseen costs of our dependence on agribusiness exert a mounting toll. Farmlands have become increasingly dependent on chemical fertilizers which have short term benefits but contribute to soil depletion over time. Water retention is diminished in nonorganic farmland, resulting in erosion of topsoil with chemical residues entering watersheds. We consumers have quietly accepted these changes in farming practices as the cost of feeding a growing nation, and because there seem to be no practical alternatives. Recent experiments in small organic farming practices have shown this reasoning to be fundamentally flawed. Organic farming, both large and small scale, is more productive than 'conventional' chemical dependent farming. Organic farming is not only the best way to feed the world it is the only way to feed the world in a sustainable way. Organic farms, contrary to conventional wisdom, outperform conventional farms in these ways:

1. Organic farms are more profitable than conventional farms the bottom line for farmers, regardless of the practices used. Organic systems are almost three times as profitable as conventional systems. The average net return for the organic systems was \$558/acre/ year versus just \$190/acre/year for the conventional systems. This figure is skewed because of the higher price organic farmers receive for their produce, but the higher food costs alone cannot account for the difference in profitability. Lower input costs for organic farm systems are credited with significant cost savings for the farmer.
2. Organic yields equal or surpass conventional and genetically modified (GM) yields. Contrary to fears that there are insufficient quantities of organically acceptable fertilizers, the data suggest that leguminous cover crops could fix enough nitrogen to replace the amount of synthetic fertilizer currently in use. In a review of 286 projects in 57



countries, farmers were found to have increased agricultural productivity by an average of 79%, by adopting “resource conserving” or ecological agriculture (Pretty et al., 2006).

3. Organic crops are more resilient than conventionally grown and genetically modified (GM) crops Organic corn yields were 31 per cent higher than conventional yields in years of drought. These drought yields are remarkable when compared to genetically modified (GM) “drought tolerant” varieties, which showed increases of only 6.7 per cent to 13.3 per cent over conventional (non drought resistant) varieties. The effects of climate change bring more uncertainty to farming, with increased drought predicted for some parts of the country. It has become obvious that weather patterns are changing, and looking to the future, food crops will need the resilience to adapt.
4. Organic farming is more efficient than conventional farming. Conventional farming requires large amounts of oil to produce transport and apply fertilizers and pesticides. Nitrogen fertilizer is the single biggest energy cost for conventional farming, representing 41% of overall energy costs. Organic systems used 45% less energy overall than conventional systems. Production efficiency was 28% higher in the organic systems, with the conventional no till system being the least efficient in terms of energy usage.
5. Organic farming builds healthier soil while short term benefits are realized with the use of chemical fertilizers and mechanized production methods; every gardener knows that soil health cannot be compromised in the long term. Eventually, soil depleting practices take their toll as soil structure weakens, microbial life declines and erosion removes valuable topsoil from farmland. Overall soil health is maintained with conventional systems, but soil health is improved when using organic farming practices. Organic farming practices improve moisture retention which creates water ‘stores’ which plants can draw on during times of stress due to drought and high winds.
6. Organic farming keeps toxic chemicals out of the environment. But Conventional farming relies heavily on pesticides (herbicides, insecticides, fungicides) many of which are toxic to humans and animals. Many studies link low level exposure of pesticides to human Inactive ingredients in pesticide and herbicide formulations have been found to be as toxic as active ingredients, but are not tested for human health impacts.
7. Organic farming creates more jobs. Conventional farming has replaced human hands with machines and chemical inputs. One important aspect to consumer support of conventional farming practices is the cost of food. Organic produce and meat is higher priced than nonorganic counterparts. But we get what we pay for, “We spend around 10% of our income on food and some 16% on health care, and it used to be the reverse.” Our current food production system is in need of repair. We need to promote organic systems which respect the integrity of soil health and sustainable systems. Until recently it was thought that our national and global food needs were too big to be met with natural, organic food production systems. Recent studies confirm, however, that organic farming is the way of the future. We need, both collectively and as individuals, to support the organic food movement to enable the process to move forward with the research, on seed development and farming practices needed to feed a hungry world.

### **Future Prospects**

The movement started with developed world is gradually picking up in developing countries. But demand is still concentrated in developed and most affluent countries. Local demand for organic food is growing. India is poised for faster growth with growing domestic market. Success of organic movement in India depends upon the growth of its own domestic markets. India has traditionally been a country of organic agriculture, but the growth of modern scientific, input intensive agriculture has pushed it to wall. But with the increasing awareness about the safety and quality of foods, long term sustainability of the system and accumulating evidences of being equally productive, the organic farming has emerged as an alternative system of farming which not only addresses the quality and sustainability concerns, but also ensures a debt free, profitable livelihood option.

### **Suggestions and Recommendations**

- The farmers are to be provided with scientific information about organic farming.
- Govt. has to provide proper and scientific information on its less cost to farmers.
- Public sector and private sector have to establish the research institutes for the research on organic farming.
- Govt. has to determine higher prices for organic products than for inorganic products.
- Govt. and private authorities have to simplify certification facility to organic farming products for exports.
- Govt. has to encourage organic farming through subsidies and easy credit facilities its lower rate of interest.
- Agriculture Universities, colleges and private institutions have to play important role in research on organic farming.
- Govt. and NGOs have to organize conferences, workshops, seminars, and study tours to farmers on organic farming methods.



### **Concluding Remarks**

The Organic farming can be a boon, as the farmers can enrich their soil and manage their crops better, without depending on expensive external inputs. The Organic Farming method is found to be superior than Conventional Farming method on account of increased human labour employment, lower cost of cultivation, higher profits, better input use efficiency and reduced risk leading to increased income, enhanced self reliance and livelihood security of the farmers.

The boon of organic farming is that it safeguards the environment pollution by reducing the residual effects of synthetic inputs and substituting the same with proper organic inputs like Farmyard manure (FYM), Compost, Biofertilisers, Biopesticides etc. The organic market is currently booming in India. Organic is a niche market, people especially in cities and metropolitan cities are moving towards organic products.

Further Organic Farming has positive impact on soil, human health improvements, conservation and water use efficiency demonstrating substantial potential for sustenance of soil and water resources. Organic farming, not only promises to give us and our family a healthy meal, as they are not genetically modified and also do not contain any preservatives, but also help us in saving the environment and the ecosystem.

Hence, it is found that need for Organic farming is important and found to be fit in all respects in agriculture in India. Therefore, it is to be encouraged in India by all stakeholders.

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