

Organic Agriculture: Prospects, Problems and Constraints

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ABSTRACT

Organic agriculture is found to be superior than conventional farming 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 and maintaining soil health and environment. Indian agriculture for long remained sustainable only because of the low external input factors. Zero budget farming appears to be superior to both conventional farming and organic farming since it solves the problem of labour shortage and marketing which are perennial problem in agriculture. Conventional agriculture based on concept of fertilizing the crop which is organic agriculture, it is for 'fertilizing the soil' in regular addition wherein organic fertilizer improves the soil health and quality. The loss of nutrient in organic manure is less due to its slow release. Furthermore, organic standard restricts the use of off-farm organic fertilizer as it may contain pollutants wherein it is always better to use on farm inputs to make success of organic agriculture.

Keywords: Organic agriculture; spreads, advantages, importance, constraints

Introduction

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. In this context, a major thrust towards organic cultivation, however, will require a number of other initiatives and infrastructural support. Active involvement in studying crops and their diseases, development of organic manure, natural pesticides, training of farmers, and provision of storage and connectivity are all important areas to look into.

Organic farming has become increasingly important in agriculture given the rising number of concerns that use of chemical fertilizers and pesticides are throwing up. GMO (genetically modified) crops may provide an excellent yield but their long-term effects are as yet untested and people are not quite ready to trust these foods. Apart from this, there has been a significant rise in the demand for organic food across the world. Promoting these organic-farming techniques only leaves India best poised to cash in on the immense export potential of these foods.

Concept of organic agriculture and its coverage

Organic farming system 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 (bio-fertilizers) to release nutrients to crops for increased sustainable production in an eco friendly pollution free environment. Rameh *et.al*, (2005) stated the popularity of organic farming is gradually increasing and now organic agriculture is practiced in almost all countries of the world, and its share of agricultural land and farms is growing. As per a recent report of International Federation of Organic Agriculture Movements (IFOAM) the total organically managed area is more than 24 million hectares world-wide. Organic farming is practiced in approximately 130 countries of the world and the area under organic management is continually growing. Although production of organic crops is increasing across the globe, sales are concentrated in the industrialized parts of the world.

India is one of the agricultural based nation, with more than 58 % of the population out of 1150 million pertains to agricultural sector. The share of agriculture in the Gross Domestic product (GDP) registered a steady decline from 50% in 1950-51, 36.4% in 1982-83, 18.5% in 2006-07, 13% in 2008- 09. Even though large number of farmers and farm labours are migrating from this sector, survey indicated that 52% of the people are still in farming contributing only 13% to GDP (Bajaj, 2008). This revealed clearly that there is no chance to have growth in income of farmers and farm labours. The existing farming practice is called conventional farming (CF) or (Chemical Farming) using chemical fertilizers, pesticides, herbicides, mechanical implements for various processes and modern agricultural science and holds 98% of share in farming. Prior to 1965, our country followed 100% natural farming or organic farming (OF) practice without chemical fertilizers and pesticides.

The overarching goal of Organic Agriculture is defined as follows: “The role of organic culture, whether in farming, processing, distribution, or consumption, is to sustain and enhance the health of eco systems and organisms from the smallest in the soil to human beings.” as per International Federation of Organic Agriculture Movement (IFOAM) in the Principles of Organic Agriculture (Aiyar (2007). It is a remarkable thing to note that prior to Green Revolution agriculture, in India our fore fathers followed organic farming with additional features like Integrated farming system(IFS), cover cropping, multi-cropping, mulching, green manure , crop rotation, self content with required infrastructure facilities in villages and value addition after harvesting (Zaman, 2012). Leading agricultural scientists from developed countries remarked that the farming system followed in India was superior, most efficient and effective one, prior to Green Revolution. Wendell Berry in his book “The Gift of Good land” writes as given below. “An Organic farm, properly speaking is not one that uses certain methods and substances and avoids others; it is farm whose structure is formed in limitation of the structure of a

natural system that has the integrity, the independence and the benign dependence of an organism” (Aiyar, 2007). In this article, about 16 major factors are considered which poses challenging problems in the existing conventional farming.

The importance of Organic Agriculture

1. Crop produced with chemicals is not good for health, contains heavy metals that causes several diseases due to excess amount of NO_3 , NO_2 concentration that pollutes environment;
2. The compound annual growth rate in yield of important crops in India is going to decline gradually even after use of chemicals;
3. The efficiency of fertilizer is not more than 50% and the remaining is lost;
4. The industrial nitrogen fixation (INF) is around 40 mt/year, which contributes only 15.3 % of total nitrogen fixation; On the other hand, the quantity of biological nitrogen fixation (BNF) is 175 mt/year, which contributes about 67.3% of the total amount;
5. Plant also uses nutrients from organic sources through mineralization and billions of microorganisms are available in soil for this activities;
6. Excess and indiscriminate use of inorganic fertilizer has already deteriorated the soil badly with deficiency of macro and micronutrients;
7. Organic produce contains more vitamins, minerals, enzymes, trace elements and even cancer fighting antioxidants as compared to conventionally grown food crops. In a two years study in western suburbs of Chicago, it has been observed that the average levels of minerals were much higher in the organically grown than in the conventionally grown food. Calcium is 63% higher, Iron 73%, Magnesium 118%, Molybdenum 178%, Phosphorus 91%, Potassium 125% and Zinc 60%;
8. The productivity of organic farming may be less in initial years, but the yields increased progressively under organic farming equating the yields under inorganic farming by sixth year;
9. A long term experiment conducted by ICRISAT also sustains the view that yield of different crops in low cost sustainable system, the annual productivity (rainy + post rainy season yield) in particular is comparable to that in the conventional system; and
10. Several bio-pesticides (*Trichoderma viridi*, *Bacillus thurengiensis* BT, NPV, GV and others like these) botanical pesticides (Neem), bio-control agents (*Trichogramma*, *Cryptolaemus*, *Chrysoperla* etc.) are capable of controlling pests and diseases as recorded in the study under Integrated Pest Management (IPM) programme.

Organic agriculture: Its relevance to Indian farming

Only 45% of India's total cultivable area is covered with fertilizers where irrigation facilities are available and in the remaining 55% of arable land, which is mainly rain-fed, negligible amount of fertilizers are being used. Farmers in these areas often use organic manure as a source of nutrients that are readily available either in their own farm or in their locality. The north-eastern region of India provides considerable scope and opportunity for organic farming due to least utilization of chemical inputs. It is estimated that 18 million hectare of such land is available in the North-East, which can be exploited for organic production. Sikkim has been declared as first organic state of the country (2015). With the sizable acreage under naturally organic/default organic cultivation, India has tremendous potential to grow crops organically and emerge as a major supplier of organic products in the world's organic market. Need is for putting up a clear strategy on organic farming and its link with the markets.

Possibly, the greatest impact of organic agriculture is on the mindset of people. It uses traditional and indigenous farming knowledge, while introducing selected modern technologies to manage and enhance diversity, to incorporate biological principles and resources into farming systems, and to ecologically intensify agricultural production. Instead of being an obstacle to progress, traditions may become an integral part of it. By adopting organic agriculture, farmers are challenged to take on new knowledge and perspectives, and to innovate (Gosavi, 2009). This leads to an increased engagement in farming which can trigger greater opportunities for rural employment and economic upliftment. Thus through greater emphasis on use of local resources and self-reliance, conversion to organic agriculture definitely contributes to the empowerment of farmers and local communities.

Pest control in organic farming begins by taking right decisions at right time, such as growing crops that are naturally resistant to diseases and pests, or choosing sowing times that prevent pest and disease outbreaks. Careful management in both time and space of planting not only prevents pests, but also increases population of natural predators that have natural capability to control insects, diseases and weeds. Other methods generally employed for the management of pests and diseases are: clean cultivation, improving soil health to resist soil pathogens and promote plant growth; rotating crops; encouraging natural biological agents for control of diseases, insects and weeds; using physical barriers for protection from insects, birds and animals; modifying habitat to encourage pollinators and natural enemies of pests; and using semi-chemicals such as pheromone attractants and trap pests. I would emphasize to search for non-monetary inputs arising from natural resources for control of biotic stresses.

Soil-borne root diseases are generally less severe on organic farms than conventional farms; while there have been no consistent differences in foliar diseases between the two systems. The successful control of root diseases in organic systems is likely to be related to the use of long and diverse crop rotations, crop mixtures and regular application of organic amendments. Increased levels of soil microbial activity leading to increased competition and antagonism in the

rhizosphere, the presence of beneficial root-colonizing bacteria and increased levels of vesicular-arbuscular mycorrhizal colonization of roots have all been identified as contributing factors; in the control of root diseases. This is an unexplored area where native organisms provide protection against other harmful organisms.

Basic steps of Organic Agriculture

The followings are basic approaches involves the five principles:

1. Conversion of land from conventional management to organic management;
2. Management of the entire surrounding system to ensure biodiversity and sustainability of the system;
3. Crop production with the use of alternative sources of nutrients such as crop rotation, residue management, organic manures and biological inputs;
4. Management of weeds and pests by better management practices, physical and cultural means and by biological control system; and
5. Maintenance of live stock in tandem with organic concept and make them an integral part of the entire system.

Advantages of Organic Agriculture

In comparison to chemical farming, organic farming enables a farmer to register a three-fold increase in turnover. Some of the major benefits are:

1. This does not pollute the soil or result in wastage of water. As a result, the farmer's income increases to a great extent;
2. The quality of food products improves with organic farming, the farmer /producer/ marketer tends to have a better say in the market;
3. Provide health back to the consumer;
4. Organic manures produce optimal conditions in the soil for high yield and good quality crops;
5. Supply all the nutrients required by the plant (N, P, K secondary and micro nutrients);
6. Improve plant growth and physiological activities of plants;
7. Improve the soil physical properties such as granulation and good tilth giving good aeration easy root penetration and improved water holding capacity;
8. The aeration of fibrous portions of the organic matter with its high carbon content promotes soil aggregation to improve the permeability and aeration of clay soil while its ability to absorb moisture helps in the granulation of sandy soils and improve their water holding capacity. The carbon in the organic matter is the source of energy for microbes which help in aggregation;
9. Improve the soil chemical properties such as supply and retention of soil nutrients and promote favourable chemical reactions;
10. Reduce the need for purchased inputs;

11. Most of the organic manures are wastes or byproducts which on accumulation may lead to pollution. By way of utilizing them for organic farming, pollution is minimized;
12. Organic fertilizers are considered as complete plant food. Organic matter restores the pH of the soil which may become acid due to continuous application of chemical fertilizers;
13. Organically grown crops are believed to provide more healthy and nutritionally superior food for man and animals than those grown with commercial fertilizers;
14. Organically grown plants are more resistant to diseases and insects and hence only a few chemical sprays or other protective treatments are required;
15. There is an increasing consumer demand for agricultural products which are free of toxic chemical residues. In developed countries consumers are willing to pay more for organic foods;
16. Organic farming helps to avoid chain reaction in the environment from chemical spray and dusts;
17. Organic farming helps to prevent environmental degradation and can be used to regenerate degradation;
18. Since the basic aim is diversification of crops much more secure income can be obtained than when they rely on only one crop or enterprises;
19. Some evidence suggests that organic produce may be higher in certain antioxidants but there appears to be no nutritional advantage to organic milk and wheat;
20. Farmers in developing countries who switch to organic agriculture achieve higher earnings and so a better standard for living. It also reduces the health risks posed by fertilizers, chemicals and pesticides and benefits the environment with the improved soil management;
21. Organic farming offers more employment opportunities because it is more labour intensive. In Karnataka, for example the demand for female labour for crops like tea and spices has increased many times. Creating more jobs in areas with high unemployment can get more revenues and reduce migration from rural to urban;
22. Shifting to organic production may provide a way out of poverty for our small and marginal farmers. They need to be educated about the techniques and benefits of organic farming;
23. Organic farming is a market oriented agriculture involving proper certification and the farmers are advised to ascertain the marketability of their products and the likely profits before venturing into it.

Nutrient management in organic farming

1. Organic farming is often understood as a form of agriculture with use of only organic inputs for the supply of nutrients and management of pests and diseases. In fact, it is a specialized form of diversified agriculture, wherein problems of farming are managed using local resources alone.

The term organic does not explicitly mean the type of inputs used; rather it refers to the concept of farm as an organism. Often, organic agriculture has been criticized on the grounds that with organic inputs alone, farm productivity and profitability might not be improved because the availability of organic sources is highly restricted. True organic resources availability is limited; but under conditions of soil constraints and climate vagaries, organic inputs use has proved more profitable compared to agrochemicals.

2. Nitrogen availability from organic resources often limits to realize full yield potential of cereals under organic production system. Under restricted water availability or rainfed conditions, the differences in crop yields between organic and conventional production narrow down to between 10-15%. FYM used in these experiments usually contains N, 0.5-0.8%, P, 0.2-0.4% and K, 0.8-1.0% with no mention of quality of organic matter/manure or alternative methods of efficient use. This nutrient rich manure helps to raise crop productivity even at lower application rates (5-10 t ha⁻¹) compared to the use of 15-20 t/ha FYM with and without chemical fertilizer. In addition, use of liquid manures prepared through fermentation of green leafy materials, cattle urine and other locally available resources are common. The differences in quality of manures used are probably the reason for wide difference reported in crop yields under organic and conventional system of crop production. There is however a need to scientifically evaluate the nutrient supplies methods in organic vs conventional systems. Their efficient use is an area of future research investigation.
3. Livestock keeping at farms is an age old practice. Livestock play major role in organic agriculture as the intermediary between the utilization of crop residues or fodder produced at the farm and the return of nutrients as manure. Dairying in particular has helped number of small and marginal farmers to improve their income. Field survey revealed that marginal and small farmers, even in progressive states like Punjab, have helped to raise farm profitability as well as availability of cattle dung in sufficient amounts. Storage and application of their resources seldom attract proper attention of the farmers resulting in 40-60% losses in nutrients, especially N. Leaching of NO₃-N polluting the ground and surface water resources is usually observed from cattle dung pits. Organic farmers and farming methods take adequate care in minimizing these losses through adoption of technologies on composting, vermi composting etc. These not only improve the nutrients availability from organic sources but also prevent potential hazard of ground water pollution. I would suggest harnessing the power of micro-organisms in ameliorating such adversaries in soil.
4. Organic farming systems rely on the management of soil organic matter to enhance the chemical, biological and physical properties of the soil.

One of the basic principles of soil fertility management in organic systems is that plant nutrition depends on 'biologically-derived nutrients' instead of using readily soluble forms of nutrients; less available forms of nutrients such as those in bulky organic materials are used. This requires release of nutrients to the plant via the activity of soil microbes and soil animals. Improved soil biological activity is also known to play a key role in suppressing weeds, pests and diseases. What is now required is to harmonize and bind the components in a system synergy and all round complementarily.

5. Animal dung, crop residues, green manure, bio-fertilizers and bio-solids from agro-industries and food processing wastes are some of the potential sources of nutrients of organic farming. While animal dung has competitive uses as fuel, it is extensively used in the form of farmyard manure. Development of several compost production technologies like Vermi composting, Microbe Mediated, Phospho composting, N-enriched Phospho composting, etc. improves the quality of composts through enrichment with nutrient-bearing minerals and other additives. These manures have the capacity to fulfil nutrient demand of crops adequately and promote the activity of beneficial macro-and micro-flora in the soil.
6. Presently, only 30% of total cultivable areas in the country have irrigation facilities where agrochemicals use is higher compared to rain-fed zones. It is here that ingenuity and efforts are required to increase crop productivity and farm production despite recurrence of environmental constraints of drought and water scarcity. The basic requirement in organic farming is to increase input use efficiency at each step of the farm operations. This is achieved partly through reducing losses and adoption of new technologies for enrichment of nutrient content in manure. Technologies to enrich the nutrient supply potential from manure, including farmyard manure three to four times are being widely used in organic farms. According to a conservative estimate, around 600 to 700 million tonnes (mt) of agricultural waste is available in the country every year, but most of it is not used properly,. We must convert waste into wealth by converting this biomass into bio-energy, nutrients to starved soil and fuel to farmers. India produces about 1800 mt of animal dung per annum. Even if two thirds of the dung is used for biogas generation, it is expected to yield about 440 mt per year of manure, which is equivalent to 2.90 mt N, 2.75mt P₂O₅ and 1.89 mt K₂).
7. Organic farms and food production systems are quite distinct from conventional farms in terms of nutrient management strategies. Organic systems adopt management options with the primary aim to develop holistic farms, like a living organism with balanced growth, in both crops and livestock holding. Thus nutrient cycle is closed as far as possible. Only nutrients in the form of food are exported out of the farm. Crop residues burning is prohibited, so also the unscientific storage of animal

wastes and its application in the fields. It is, therefore, considered more environments friendly and sustainable than the conventional system. Farm conversion from high-input, chemical-based system to organic system is designed after undertaking a constraint analysis for the farm with the primary aim to take advantage of local conditions and their interactions with farm activities, climate, soil and environment, so as to achieve (as far as possible) closed nutrient cycles with less dependence on off-farm inputs. This implies that the only nutrients leaving the farm unit are those for human consumption. I would suggest to minimize the loss of nutrients, which otherwise continues without any let off.

8. Crop rotations and varieties are selected to suit local conditions having the potential to sufficiently balance the nitrogen demand of crops. Requirements for phosphorus, potash, sulphur and micronutrients are met with local, preferably renewable resources. Organic; agriculture is therefore, often termed as knowledge-based rather than input-based agriculture. Furthermore, organic farms aim to optimise the crop productivity under a given set of farm conditions. There are ample evidences to show that agrochemical-based, high input agriculture is not sustainable for long periods due to gradual decline in factor productivity, with adverse impact on soil health and quality. Harnessing the varietal potential by appropriate biotechnology input is neglected area and needs adequate attention.
9. The impact of organic agriculture on natural resources favours interactions within the agro-ecosystem those are vital for both agricultural production and nature conservation. Ecological services derived include soil forming and conditioning, soil stabilization through buffering and structural improvement, waste recycling, carbon sequestration, nutrient cycling, predation, pollination and habitats. The environmental costs of conventional agriculture are substantial, and the evidence for significant environmental amelioration via conversion to organic agriculture is over-whelming. There are also high pre-consumer human health costs to conventional agriculture, particularly, in the use of pesticides. It is estimated that 25 million agricultural workers in developing countries suffer from pesticide poisoning each year.

Safety and quality of organically produced food

There is a growing demand for organic foods driven primarily by the consumer's perceptions of the quality and safety of these foods and to the positive environmental impact of organic agriculture practices. It has been demonstrated that organically produced foods have lower levels of pesticides and medicinal and hormonal residues and in many cases lower nitrate contents. Nitrates are significant contaminants of foods, generally associated with intensive use of nitrogen fertilizers. Studies that compared nitrate contents of organic and conventional products found significantly higher

nitrate in conventional products. Quality after storage has been reported to be better in organic produce relative to chemical based produce after comparative tests. 'Organic' in organic agriculture is a labelling term that denotes products that have been produced in accordance with certain predefined parameters and certified by a duly constituted certification agency or authority. The organic label is therefore a process claim rather than a product claim. Organic standard will not exempt producer and processors from compliance with general regularity requirements such as food safety regulation, pesticide registration, general food and nutrition labelling rules.

Pest and disease management in organic farming

Pest control in organic farming begins by taking right decisions at right time, such as growing crops that are naturally resistant to diseases and pests, or choosing sowing times that prevent pest and disease outbreaks. Careful management in both time and space of planting not only prevents pests, but also increases population of natural predators that have natural capability to control insects, diseases and weeds. Other methods generally employed for the management of pests and diseases are: clean cultivation, improving soil health to resist soil pathogens and promote plant; growth; rotating crops; encouraging natural biological agents for control of diseases, insects and weeds; using physical barriers for protection from insects, birds and animals; modifying habitat to encourage pollinators and natural enemies of pests; and using semi-chemicals such as pheromone attractants and trap pests. I would emphasize to search for non-monetary inputs arising from natural resources for control of biotic stresses.

Organic farmers have long maintained that synthetic fertilizers and pesticides increase crop susceptibility to pests. Organic crops have been shown to be more tolerant as well as resistant to insect attack. Organic rice is reported to have thicker cell walls and lower levels of free amino acids than conventional rice. Plant susceptibility to insect herbivory has been shown in numerous studies to be associated with high plant N levels on account of high inputs of soluble N fertilizers. Organic N is available slowly as the plant grows at thus acts as a self-control against the disease.

Soil-borne root diseases are generally less severe on organic farms than conventional farms, while there have been no consistent differences in foliar diseases between the two systems. The successful control of root diseases in organic systems is likely to be related to the use of long and diverse crop rotations, crop mixtures and regular application of organic amendments. Increased levels of soil microbial activity leading to increased competition and antagonism in the rhizosphere, the presence of beneficial root-colonizing bacteria and increased levels of vesicular-arbuscular mycorrhizal colonization of roots have all been identified as contributing factors, in the

control of root diseases. This is an unexplored area where native organisms provide protection against other harmful organisms.

Impacts of different organic nutrient management in agriculture

A. Soil physical properties

Bulk density, water holding capacity, capillary pore space, percentage of soil aggregate are influenced significantly with different organic packages. Among the organic packages, application of recommended nitrogen through FYM, vermicompost and neem cake by one third each coupled with nitrogen containing biofertilizers (*Azospirillum* to paddy, *Azotobactor* to potato and *Rhizobium* to groundnut) and phosphorus solubilizing bacteria (PSB) with rock phosphate to all crops recorded highest increases of all physical parameters over initial. However, exclusive use of chemical fertilizers showed poor performance. Integrated use of organic and chemical fertilizer (50:50) was found to perform better over exclusive fertilizer use.

B. Soil chemical properties

After sixth crop in groundnut rice–potato sequence, enrichment of soil nutrient in respect of total N, available P and K and organic carbon content was found higher over initial in organic package containing neem cake, FYM, vermicompost, biofertilizer, rock phosphate and PSB, while integrated use of organic and inorganic nutrients exhibited moderate performance, followed by exclusive use of chemical fertilizers. Available potassium content was found lower in both exclusive fertilizer and integrated nutrient use.

C. Soil biological properties

1. Like nutrient content in soil, bacterial population was found increase in organic packages significantly followed by integrated use and exclusive chemical fertilizer, where very lower magnitude of enhancement of bacterial population was noticed.
2. The exclusively chemical fertilizer treatment produced highest rice grain, potato tuber and net energy return but occurrence of increased *Aspergillus* infection in groundnut seed, weed, insect-pest and disease incidence in all crops with lower values of all physical, chemical properties and microbial population in soil except in soil pH was noticed.
3. Integration of chemical fertilizer and FYM resulted the highest pod yield of groundnut but lowered values of 7.28% net energy return, 5.88% net return, 8.83% weed, 2.70% disease and 4.46% insect-pest while increase of all physico-chemical properties and microbial population, energy ratio over exclusive chemical fertilizer.
4. Organic treatment although produced comparatively lower rice equivalent yield but recorded highest values of all soil physico-chemical properties and microbial population, benefit cost ratio, energy input-output ratio whereas showed lowest incidence of weed, disease, insect-pest, *Aspergillus* infestation in kernel of groundnut.

Constraints in Organic Agriculture

1. There are number of firms, where vegetables, fruits, plantation crops, spices and tea are grown organically and export to Netherlands and Germany. Usually farmers associated with big exporters do not have to worry about the sale of their products and their certification, small and marginal farmers are a harrowed lot. The marketability of organic produces is not well developed in our country.
2. An aggressive strategy demanding free access needs to be adopted. In Argentina farmers and Government joined hands in the early 90's and established the state of the art principles for organic farming which was recognized by the European Union for exports. Recently under a National Programme for Organic Production, Ministry of Commerce, Government of India has formulated and circulated National Standards for Organic Production. But we are still far away to reach the goal.
3. Marketing is the main problem for organic produce. The lack of awareness among people is the main hurdle in selling organic products. Further the cost of the organic products is high which only the elite and foreigners can afford. The organic marketing in most of the countries is still relatively small and on an average it is less than half a percent of the total agricultural sector except in Germany and Austria, where 2-3 per cent of their agriculture area is under organic production.

Conclusion

Organic agriculture implies growing of agricultural and horticultural crops without chemical fertilizer, herbicide and pesticides. Agricultural practices followed in organic farming are governed by the principles of ecology and are within the ecological means.

Organic agriculture is a production system that avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators, livestock feed additive and genetically modified organisms. Organic farmers rely on crop rotation, green manures, compost, biological pest control, and mechanical cultivation to maintain soil productivity and control pests as far as possible and practicable.

Organic agricultural methods are internationally regulated and legally enforced by many nations, based in large part on the standards set by the International Federation of Organic Agriculture Movements (IFOAM), an international umbrella organization for organic organizations established in 1972. Most of developed countries and few developing countries are returning to harmless Organic Agriculture practice during the last 15 years or more due to various severe and hazardous problems arise in conventional farming. It is found in developed countries; the growth of Organic Farming practice is fast and up to 10 to 15 percent already converted. But in India, organic farming practice is less than 2 percent since Government, Agricultural Universities and Research Institutes are not prepared to support organic agriculture in whole heartedly.

References

1. Gosavi , P. (2009), Organic Farming – some Economic Aspects; A Micro Study” Southern Economist August 15, 2009 pp 11-14;
2. Kushagra Bajaj (2008), Improving agricultural productivity is crucial - The economic times (Chennai) July 21, 2008;
3. Mahalingam (2007), Agriculture in India: Paradoxes Galore- KISAN WORLD, May 07’ pp 3-7;
4. Pallavi Aiyar (2007), Agriculture : Where India and China stand published The Hindu (Coimbatore) September 3, 2007;
5. Rai Mangala, (2010), Organic Farming: Potentials and Strategies. Net. Wikipedia “OF”, <http://en.Wikipedia.org>;
6. Rajendra, P (2007): Organic Farming: A Fresh Thrust Needed, the Analyst Special Issue, The Icfai University Press pp. 47-48;
7. Rajendran, T. R., Venugopalan, M. V. and Tarhalkar, P. P. (1999). Technical Bulletin No. 1/2000, CICR, Nagpur, 37;
8. Ramesh P, Singh M, Rao AS (2005). Organic farming: Its relevance to the Indian context. Current Science India, 88(4): 561-568.
9. Staff Report “Farmers urged to eliminate input costs Zero Budget Farming can make cultivation a profitable occupation” - The Hindu (Coimbatore), December 30, 2007;
10. Zaman, A. (2012). More crop and income with less water under sustainable agriculture: Strategic Vision: 10: Green Farming; 3(4):: 10;