Organic farming in India: Concept, applications and Perspectives

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ABSTRACT-- Organic farming is acknowledged as crop production system which can sustain health of soils, ecosystems and people by combining tradition, innovation and improved farm technology. Major components generally adopted by farmers include untreated seed, biomanures and biofertilizers, biopesticides, manurecompost/vermicompost and crop diversification. Availability of organic farm inputs, certification and marketing network being the constraints for an average farmer, Indian government launched the movement by establishing national centre and regional sub-centres. In coming years, with changing pattern in consumerism, organic farming may help in providing people with foods and food products without chemicals and toxins.

Keywords-- APED A, biomanures, bio pesticides, NPOP, organic farming, organic production, soil health.

1. INTRODUCTION

Organic farming is a crop production system that excludes use of synthetic compounds such as, fertilizers, pesticides, growth regulators and livestock food additives. It can sustain the health of soils, ecosystems and people by combining tradition, innovation and science because it combines crop management and animal husbandry in the agro-ecosystems which are socially acceptable and ecologically sustainable. Therefore, this system minimizes the use of external inputs and knowledge, and aims at optimization of crop productivity rather than its maximization through renewal and strengthening of ecological processes and functions of farm ecosystems (Shukla et al., 2011). The major domains included in organic farming are: improved packages of practices, market network, organic standards and certification/regulatory mechanism.

According to the Codex Alimentarius Commission, organic farming should be holistic food production system which promotes and enhances health of agro-ecosystems through biodiversity and soil biological activity, and emphasizes on the use of comprehensive management practices excluding synthetic inputs to improve soil health and to restore ecological balance. Thus, main objectives of organic farming include utilization of the available biomass of crops left in the field to enrich soil fertility, supply of balanced nutrients to the plants and improvement in the soil microbial activity, reduction in the cost of production as well as environmental pollution in ecofriendly manner that promotesFormerly Tech. Advisor (FAO) (rtgahukar@gmail.com)and enhances biological activity to develop subsequently the sustainable agriculture system for guaranteed adequate food production. Further, this system promotes self sufficiency by relying upon locally available natural resources and searching an ecofriendly strategy to safeguard biodiversity and other biological processes such as, reducing the use of fossil energy and by providing opportunities to farmers to earn their livelihood satisfactorily.

2. Need for organic farming

With the Green revolution introduced in late sixties for increasing food production in the country, plant nutrition- responsive crop hybrids with greater potential in crop yields, application of synthetic agrochemicals, farm mechanization and improved cultural practices were adopted by farmers.
Consequently, crop productivity could be increased 3-4 fold and crop security was achieved to some extent along with environmental security (Sinha, 2008; Gahukar 2011). In recent years, the claim of higher crop production has however been disappointing due to reduction or stagnant crop productivity, soil salinity/alkalinity, decreasing soil fertility levels and susceptibility of crops to pests and diseases (Gahukar, 2010a). The crops cultivated in low external inputs sustainable agriculture are less attacked by insects, mites and other pests, and pathogens causing soil-borne, seed-borne and foliar diseases (Biswas, 2011). Also, disease incidence is less in soil mixed with soil antagonists such as, *Trichoderma* spp. and fluorescent *Pseudomonas fluorescens* (Chandra et al., 2007).

Apart from certain disadvantages, environmental problems and risk to human health cropped up in many areas. Awareness in consumerism is increasing with preference to organic foods over those containing toxic chemicals posing health hazards. Food products produced from organic agriculture contain no artificial flavours, preservatives or contaminants. The consensus among consumers, though evidences are dispersed and not easily available, is that food from organic crops is tastier and healthier than those from chemically grown crops. This may probably be attributed to nutritional properties. Pollution of ground water and air with synthetic fertilizers and pesticides is avoided and natural degradation of environment is automatically reduced.

For the first 3-4 years, organic farming is not cost-effective but later economical benefits increase every year since it reduces the production cost by 25-30%, and enhances or at least maintains soil fertility levels while preventing soil erosion. It has positive effect on ecosystem including survival of wildlife in the lowlands and pasture for grazing animals. Likewise, medium and long term effects of agricultural interventions have positive impact on the restoration and maintainence of the natural ecological balance. Cultural practices such as, crop rotations, mix-/inter- cropping, symbiotic associations, cover crops, organic fertilizers and minimum tillage are focusing points of organic farming.

The adverse effects of climate change are becoming more and more problematic since conservation of environment and biodiversity is perceived by people as an important criterion to attain food sufficiency and save our planet from disasters (Gahukar, 2010 b). Organic farming contributes to mitigating the Green houses gases (GFIG) and global warming through its ability to sequester carbon in the soil. Many cultural practices adopted to increase return of carbon in the soil, raising productivity and favouring carbon storage (Gahukar, 2010). Local genotypes/cultivars of several crops are preferred due to their resistance to pests, diseases, and the resilience to climatic stress. Similar findings were reported by Kasturi, Das 2007, Lotter 2003 and Escobar et al., 2007.
Components:

Use of external farm inputs is kept to minimum and following components are combined as their compatibility adds to synergistic effect.

Seeds: Instead of Genetically modified (GM) seeds, certified organic/non-GM seeds are used. These seeds are untreated or treated with cow urine, animal dung, biofertilizers and biofungicides.

Biomanures: Farm yard manure (FYM) containing durng, urine, straw and farm waste; concentrated organic manures made from non-edible oil cake, edible oil cake, fish mealbones, poultry, sheel/goat manure etc. are a rich source of nutrients and organic matter besides serving as a soil conserving material. Green manuring in situ with plants such as, dhaincha, berseem, sunhemp, cowpea, green gram, glyricidia or sesbania increases green plant mass into the soil which improves its physical and chemical properties and fertility level. Green manuring with leguminous crops can substitute FYM to some extent.

Compost: Conventional compost is prepared from aerobically decomposed products of organic waste left over in the field such as, animal dung, plant debris, crop and fodder residues, weeds left in the field and on the field borders or bunds raw manure, decaying and rotting vegetables whereas vermicompost is a metabolic product of earthworms. Decomposition is quicker when Trichoderma or “Panchagavya” is added to organic matter and this process results in compost of greater nutritive value.

Crop diversification: Yearly crop rotations, inter-/mix cropping and cover crops are routinely followed. Border rows of the main or subordinate crops prevent drift of the chemical sprays or pollens of GM crops from surrounding fields. Trap crops attract and trap insect pests. These crop patterns reduce the incidence of pests and diseases, maintain soil fertility (when used with pulse crops) and optimize the balance of plant nutrients.

Soil solarization: Mulching with polyethylene during the period of intense solar radiation, and spreading of dried weeds or crop residues around plant base reduces water evaporation resulting in retention of soil moisture.

Biofertilizers and microbial inoculants: Nitrogen fixers (Azotobacter, Azolla, Rhizobium, Azospirillum, blue-green algae, phosphate solubilizing bacteria and fungi, phosphate mobilizers (vesicular arbuscular mycorrhizae) and other micro-organisms help reduce the dose of other fertilizers.

Microbial pesticides: Pesticides containing microorganisms such as bacteria (Bacillus subtilis, B thuringiensis, Pseudomonas fluorescens) and fungi (Trichoderma viride, T. harzianum) are sometimes as effective as synthetic pesticides.

Botanical pesticides: Application of naturally available indigenous plant materials and their products such as, neer- seed kernel extract, water extract of leaves of neem, nirgunc bulb of garlic and onion, chillies, medicinal plants etc. have been recommended for several crops (Gahukar, 2010 a Use of these pesticides being safe to environment, facilitates the survival, conservation and augmentation of natural enemies of pests (predators, parasitoids, parasit: nematodes, disease pathogens).

Naturally occurring salts: Calcium salts such as, gypsum (Calcium sulphate) and lime (Calcium oxide) are mixed into soil to correct soil pH.

3. Applications

Global area under organic crops is about 26 m ha whereas only 1,08650 ha in India is under organic farming spread over 10 states (Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Rajasthan, Sikkim, Tamil Nadu and Uttarakhand) where 5,48045 farmers produce 17.11 lakh tonnes of food (Kulkarni, 2011). Madhya Pradesh has the maximum area of 1.1 m ha followed by Maharashtra (0.96 m ha) and Odisha (0.67 m ha). In fact, Madhya Pradesh and Uttarakhand have
been declared as organic states. Among organic productions, cotton represents about 75% whereas the cereals, vegetables, fruits and animal products under certified organic production accounts only 25% (Barik, 2011). The crops include cereals (paddy, wheat), pulses (pigeonpea, black gram); oilseeds (mustard, sesame, castor, sunflower); vegetables (aubergine, okra, garlic, onion, potato, tomato); spices (black pepper, cardamom, ginger, turmeric, vanilla, tamarind, clove, cinamom, nutmeg); plantation crops (tea, coffee, cashew nut, walnut) and fruit crops (mango, banana, pineapple, grapes, oranges). The farmers are supported with farm inputs and guided for technology packages, value of organic production, premiums and export potential. There are various models to connect producers with buyers. Generally, organic production is planned from sowing to harvest and certified organic farms maintain comprehensive records of the production methods. After signing the contract between farmers and certifying agency, all norms of cultivation are strictly followed. One year later, products can be sold with label as conversion to organic agriculture. Annual crops can be sold after two years and perennial crops after three years. The certification programme consisting of standards, inspection and certification is executed by the accredited certifying agencies.

Recently, the Indian government has established a National Programme on Organic Production (NPOP). The activity is coordinated by the National Centre for Organic Farming based at Ghaziabad (Uttar Pradesh) with regional sub-centres at Bangalore, Bubaneshwar, Hisar, Imphal, Jabalpur and Nagpur. Facilities for certification are available through NPOP framed under the Foreign Trade (Development & Regulation) Act 1992, and its regulatory framework. There are 16 NPOP accredited certifying bodies in India. The standards and procedures are formulated in a harmony with international standard prescribed by CODEX and International Federation of Organic Agriculture Movement. This certification assures the buyer of quality of the farm produce and encourages payment of premium prices to farmers. The Agricultural and Processed Food Products Export Development Authority (APEDA) has been actively involved in promoting organic farming through its certification programme. At present, credentials set up by NPOP and APEDA have been well accepted by European Union, USA and other importing countries where appreciation of organic products has gone up tremendously owing to the enhanced awareness for healthy foods among consumers. In India, demand for organic foods is increasing due to issues of adulteration and contamination in food, growing incomes of middle class citizens, initiative by private sectors in opening retail outlets and technological innovations.

**Constraints**

The major challenges include quality and certification credibility, food safety, myth to change from conventional farming and GM crops contamination (Kulkarni, 2011). Of course, there is awareness in consumers in cities and towns who accept to pay higher premiums for organically produced farm commodities, but rural population cannot afford to do so. Also, it is not sufficient to incentivize production but there is also a need to create market demand. Crop yields are rather low in the beginning. Skilled labour is needed and high wages are to be paid. Organic manures are costly and not easily available. Cost of certification is not affordable for small farmers. It is difficult to obtain non-treated seeds because general cultivation is done with seeds treated with synthetic insecticides and fungicides. In some states this treatment is mandatory for sale of seeds. With increasing use of GM crops in conventional agriculture and due to gene transmission through pollen, separating fields with organic crops is necessary but poses problems as surrounding areas are mostly under GM crops or chemically-grown crops making it uncertain to ensure that organic products are entirely GM free in nature. Transparency in the supply chain is required. Therefore, farmers need to be organized in a group/association for crop cultivation such as, Organic Farming Association of India, Institute of Natural Organic Agriculture.

**Perspectives**

1. Although organic farming is labour intensive, it provides an opportunity for rural employment and for achieving long term improvement in natural resources. For example, integration of animal husbandry into organic farming provides ready manure and organic materials. Organic
fabric is being appreciated and organic farming proved to be beneficial for sericulture (Babu and Dandin, 2009). This concept may be extended to other allied industrial products.

2. Adoption of organic farming may be gradual and can be supported by a sound research and development network that would result in sustainable agriculture which seems to be appropriate to Indian farming conditions in order to make the country self sufficient in food production. Therefore, policy makers should promote organic farming for good quality of life, restoration of soil health, generation of national economy and creation of better environment. Subsidy may be given to encourage farmers. The premium fixed on organic products is not attractive to farmers to go for it. For this purpose, contract farming can be an appropriate solution (Gahukar, 2007). By this way, farmers will be encouraged to implement organic practices and use green inputs in agriculture.

3. In areas where water pollution is on increase, conversion to organic farming should be highly encouraged as a restorative measure.

4. There is scanty information on organic technology for all crops. Systematic research on development of suitable varieties/hybrids, plant nutrition and IPM techniques may lead to the increasing demand of organic produce both in retail marketing and export.

5. Under “Bhudan Movement”, waste and fallow lands have been distributed by the government. These areas can probably be brought under organic crops for increasing area and production of food crops. Thus, seed production by public agencies like National Seed Corporation, local agricultural universities and private seed companies could be initiated. Subsequently, authentic and reliable data should be made available for promotion of organic farming through location-specific processes need standardization. Also, there is urgent need to introduce labelling for organic produce as it has been mooted for GM crops.

5. Separate minimum support price for organic produce would encourage and motivate farmers for more crop production. For this purpose, organic zones may be separated from other areas to maintain distance for isolation especially for seed production.

6. Indian standards are to be revised from time to time in accordance with changes in global standards so that organic produce from India will not be rejected by importing countries. Till date, 58,408 tonnes of farm produce have been exported to Europe (70% of production) followed by USA (20%) and South-East Asia (5%) (Kulkarni, 2011). India exported 135 organic products in 15 categories during 2009 valued at $112 million; cotton being at the top followed by basmati rice and honey (Kulkarni, 2011).

7. Farmers can take help and advantage of farmer-centric certification system known as “Participatory Guarantee System”. With this scheme, organic farming in India has grown 25-fold in the past seven years because of combined efforts of farmers, NGOs, government interventions and push from other market forces (Kulkarni, 2011). Further development would certainly create awareness about organic farming which would transform it with future market potential.

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