Prospects of Organic Farming as Financial Sustainable Strategy in Modern Agriculture

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Ruchi Soni and Sarita K. Yadav

Abstract

Organic farming is an approach of agriculture that involves the cultivation and propagation of crops and livestock without the use of chemical fertilizers, pesticides, genetically modified organisms, antibiotics and growth hormones etc. Organic farming system avoids the use of the chemical synthetic inputs and maximizes the practices of crop rotations, use of animal manures, organic wastes and biological system of micro-macro nutrient mobilization and plant protection in an eco-friendly manner. From last few years, there has been a significant sensitization of the global community on environmental conservation and safe food which relied on agriculture practices based on biological inputs instead of applying synthetic inputs of chemical fertilizers and pesticides. Organic farming has emerged as the only remedy to bring a long lasting sustainability to agriculture. Organic agriculture exhibits the use of traditional agricultural practices that have been known to the farming communities over the decades. As a result this approach not only provides good quality food without chemical constituents but at the same time possess a healthy and cost effective approach to the agriculturists to cultivate an abundance of chemical-free food. The application of organic traditional inputs plays a key role in establishing an economic farming system in the modern agriculture. This chapter will be an attempt to explain the significance of organic farming and application of traditional, indigenous and cost effective approaches in the agriculture so that it will be beneficial to the farmers to perform low-input farming.

Keywords

Organic farming · Organic inputs · Manures · Soil fertility · Sustainability

R. Soni (✉) · S. K. Yadav
Regional Centre of Organic Farming, Department of Agriculture and Cooperation, Ministry of Agriculture and Farmers Welfare, Government of India, Nagpur, Maharashtra, India

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12.1 Introduction

Agriculture is the origin for ensuring nutrient and livelihood security globally, hence this sector is becoming resilient to increasing climatic variability. Excess use of chemical fertilizers and pesticides has been proved important tools to facilitate increased crop production in agriculture (Singh et al. 2011). Due to intensive use of chemical inputs including fertilizers, herbicides, and pesticides from the past few decades has led agriculture with various adverse effects (Gattinger et al. 2012). The sustainable agriculture is a recent concept and denotes the maintenance of crop productivity at levels necessary to meet the requirement of increasing population, without deteriorating the environment and the natural resources. Experiencing the destructive and unsafe effects of synthetic input on agriculture, the concept of organic agriculture is gaining thrust.

Organic agriculture is a holistic production management system which endorses and stimulates agro-ecosystem health including biodiversity, biogeochemical cycles, and soil biological and microbial activity. Organic farming system relies on animal manures, crop rotations, crop residues, green manures, legumes, bio-inoculants/bio-fertilizers, safe off-farm organic wastes and aspects of biological pest control management to maintain soil health and crop productivity and limiting use of synthetic inputs and growth regulators in the agriculture to improve soil health and fertility by conserving organic matter level in the soil (Yadav et al. 2013). In order to promote organic farming in agriculturally important and high valuable crops, the use of biological inputs are important in restricting the soil degradation, environmental pollution and also ameliorating the problem of low productivity. In current scenario, the total area in the world under organic certification is 5.71 M ha which includes 26% cultivable area with 1.49 M ha and rest 74% (4.22 M ha) forest and wild area for collection of minor forest produces. The demand for organic produce is rapidly increasing world-wide both in the developed and developing countries with an annual average growth rate of 20–25%.

Excess exploitation of natural resources has forced the human-beings to again adopt the traditional ways of farming. Organic farming emphasizes the application of management practices preferably the use of off-farm inputs, and the indigenous conditions which prefer locally adapted farming systems. This eco-friendly farming system involves the use of economic approaches which helps the farmers to get benefits in agriculture by reducing the cost of expensive synthetic inputs. Keeping in view the above factors, the present chapter emphasizes on prospects of organic farming and its application as cost effective and financial sustainable approach in modern agriculture.

12.2 The Principles of Organic Farming

Organic farming is based on a holistic production management system that depends on promotion and enhancement of agro-ecosystem health along with preserving biodiversity, environmental biological pathways and cycles and biological activities

of soil (http://agritech.tnau.ac.in/org_farm/orgfarm_principles.html). The basic principles of organic agriculture are based on.

12.2.1 Health

Organic agriculture is based on sustainability, soil health enhancement, along with human-animal and plant health improvement by implementing maximum use of natural resources.

12.2.2 Ecology

Organic agriculture emphasizes on living ecological organizations and ecological pathways in order to their accomplishment and sustainability.

12.2.3 Harmony with Nature

Organic agriculture maintains relationships and harmony between nature and human being and other creatures of earth that ascertains fairness and justice with respect to the nature and different life opportunities existing on earth.

12.2.4 Care of Natural Resources

Organic agriculture is managed properly in a defensive and conscientious manner to protect current and future generation's health and well-being along with the maintenance of environment.

12.3 Organic Agriculture as Cost Effective Farming System

Organic farming is considered as en easily accessible tool for obtaining sustainable agriculture. It is a rapidly developing agricultural sector world-wide and it works with respect to harmony with nature and implement approaches to the agriculture are 'environmentally friendly' (Roychowdhury et al. 2013). There are various factors which reveal that organic farming is much beneficial than conventional system in modern agriculture (Table 12.1). Nowadays, many farmers are revolving around low input or organic farming as a strategy for economic performance. There are some important aspects of organic agriculture which makes this farming system financial sustainable and economic to the agriculturists:

Table 12.1 Advantages of growing crops through organic farming system than conventional

Factor affecting	Organic farming	Conventional framing
Economy	Low cost for input hence low financial risks	High production cost
	Satisfying yield once soil health is improved	High financial risk
Environment	Increased biodiversity	Pesticides kill beneficial insect-pests
	Eco-balance between beneficial pests-insects	Pollution of soil and water
	No pollution	Resistance of pests
Health	No health risks	Accident with pesticides
	Healthy organic food	Chronic diseases (cancer, infertility, weakness etc.)
Soil	Improved soil health and fertility and crop rotation regularly	Risk of declining soil fertility and poor crop rotation
	Positive relation between buyer and farmer	Lack of buyer's honesty to the farmers
Market	High market value for organic produce	Dependency of farmers of general market rates
	Framers recognized as groups	Individual farmer

(i) It emphasizes the creation of a profitable mode of augmenting life with natural systems.
(ii) It stimulates the production of high quality food in sufficient quantity in an eco-friendly manner.
(iii) It encourages the application of soil beneficial microbes and involvement of plants and animals and organic residues, within biological cycles to sustain agriculture.
(iv) It improves, maintains and enhances the soil fertility.
(v) It maintains and prevents the loss of genetic diversity of plant–animal habitats.
(vi) It establishes proper usage of natural resources.
(vii) It emphasizes a relation between the crop production and animal husbandry.
(viii) It maximizes the use of renewable resources and minimizes the usage of renewable resources leading to reduce environmental pollution.

12.4 Relevance of Conversion of Inorganic Farming to Organic

Conversion to agriculture from inorganic to organic depicts the process of adopting and implementation of natural and eco-friendly ways in the farm to achieve sustainability of the environment. The process of farming may vary from farm to farm and depend on the local circumstances of the area and the tendency of the individual farmer or the farmer community. The conversion process totally depends upon the

keen knowledge, concepts, practices and experience of the framer for organic farming. Generally, organic farming system does not depend on particular land conditions, but in case soil condition is not good then it may require great efforts and need more patience to establish a sustainable organic production system. The organic techniques and practices are progressively applied in the farm following a well-organized plan because the alteration from a conventional farming to an organic system requires a transition period. Raddy (2010) stated that during the period of organic agriculture it is an important factor to be carefully analysing the actual condition of the farm in terms of soil, hygiene and level of inorganic fertilizers used and categorize different actions to be taken. The analysis of conditions involves:

- Farm characteristics include crops distribution, type of crops to be sown, size of plots along with plants, animals surrounding incorporated in the farm system.
- Soil analysis comprised of an evaluation testing of the structure of soil, level of nutrients, level of erosion, contamination in soil and organic matter content.
- Climatic condition including frost risks, humidity, rainfall distribution and quantity and temperature variation.
- Organic matter and manure sources and their management.
- Presence of animal and livestock's housing system management.
- Limiting factors may be considered like investments, manpower and market access.

12.5 General Practices Implemented in Organic Conversion

Organic conversion involves implementation of organic practices for soil and weed management instead of following harmful chemical inputs. Implementation of a planned crop rotation like use of weed suppressing green manure and other feed crops in agriculture practices. Further recycling of farm nutrients can be achieved by using animals and crop waste residues to improve farm condition and soil fertility and compost includes one of the best examples of them (Erhart and Hartl 2010). Soil nutrient losses can be avoided by using animal waste and manures. Organic conversion emphasizes the use of healthy seeds and seeds free from pesticide-treatments for sowing. Accurate knowledge and implementation of natural approaches and methods for disease and pest control is required. Knowledge about beneficial insects and regular monitoring of pest-insect population dynamics during crop growth is also an important aspect in organic farming. Some important examples of recommended organic practices intervention include.

12.5.1 Mulching

In this process soil surface is covered with dead plant residues and is proved an easy alternative to manage weeds and defend the soil during annual crop cultivation. This practice can be applied into a wide range of cropping systems (Pupaliene et al.

2015). In this conservation process, the nutrients of bio-waste are recycled naturally and organic wastes are reused as mulches. The refurbishment of soil plant nutrients to the soil, maintenance of soil temperature and moisture, improvement of the beneficial microbial population and ultimately the increase in total organic carbon content are achieved in this process.

12.5.2 Intercrop System for Agriculture Sustainability

The process emphasizes on the cultivation of two different annual crops together, more likely a leguminous crop or a green manure crop with alternating rows with an another cereal or vegetable crop and considered as a common practice in organic agriculture for diversify crop production with maximum land benefit (Barbieri et al. 2017). But during the combination of different crops, competition for light, nutrients and water may be a major limiting factor in this case.

12.5.3 Organic Waste Management (Composting)

It has been found that application of compost in the fields have a major effect on crop growth and yield. Enough plant materials in combination with animal manure are used in this process. To initiate compost production, enough plant material and animal manure will be farmer's major requirement (Chatterjee et al. 2017). In this case, farmers must produce enough plant materials in their farm by sowing fast growing green leguminous plants that result into a lot of biomass and integration and some livestock and animal keeping systems on their farm for manure production. Some experienced persons are needed to instruct farmers and make them practically sound for the preparation of composts. Compost production is totally based on low investments and proper knowledgeable and experienced manpower.

12.5.4 Green Manuring

This is the practice of cultivating a leguminous crop such as calliandra, gliricidia and sesbania etc. to produce a huge biomass and its application in the soil to improve its physical and chemical health. These green leguminous crops also provide nitrogen through nitrogen fixation and act as a favourable source of fodder for livestock. Green manures can be grown in field in combination and rotation with other cereal or vegetable crops. Important aspect is the proper and accurate knowledge about green manure crops species and their utility in organic farming.

12.5.5 Organic Pest Management

It deals with the associations of plants and animals and their management in order to prevent disease outbreak and insect-pest attack in the crop. Initially, bio-control

agents/biopesticides were used and applied in fields but nowadays organic pest management is proven as best alternative to achieve and establish an insect-pest balance in the ecology. While, on the other hand the role and choice of resistant crop is always supreme and for that, other prevention methods may include these following factors for organic farming are: selection of appropriate sowing times which will be responsible for less pest outbreaks, improvement of soil health by means of organic practices to resist soil pathogens, crop rotation, applying natural biopesticides/biocontrol agents for biological control of insect-pests, disease and weeds, use of physical barriers for protection against animals, birds, insect-pests and by applying pheromone attractants to trap pests.

12.5.6 Use of Appropriate Seeds for Plantation

Crop production in organic agriculture is achieved by using healthy and disease free seeds as planting material so as to bust up cultivation through improved cultivars. In general, local and indigenous cultivated seeds are preferred because they are better adapted and resilience to the native conditions.

12.5.7 Cultivation of Farm Animal Feed

In this aspect, available foods for the livestock is improved in organic manners such as growing grass in farmer's field, cultivating leguminous fodder crops in combination with other crops or in rotation. As animal feed in an organic process must belong to organic origin and feed sources obtained from the farm are considered as best source of fodder for animals and live stocks.

12.6 Application of Economical Supplements in Organic Farming

A large number of products generally referred as soil and plant organic additives are of non-traditional characteristics and available to be used as eco-friendly alternative in the organic farming system. These products belong to different categories including microbial based biofertilizers and soil inoculants which contain exclusive and beneficial soil micro-organisms like phosphate solubilizers, nitrogen fixers, siderophore producers etc. (Soni et al. 2017), microbial activators that contains particular amount of chemicals or busters for enhancing the population and activity of microflora beneficial for soil health, and soil conditioners that balance and improve soil's physical and chemical conditions that further result in improved plant growth and crop productivity.

12.6.1 Advantages of Bio-fertilizers in Organic Agriculture

Biofertilizers are carrier-based formulation of plant growth promoting bacteria which actively colonizing plant roots and result into increasing the plant growth and improving crop productivity. The *Azospirillum, Azotobacter, Bacillus, Pseudomonas* and *Serratia* genus belong to this beneficial group of bacteria (Glick 2012) It has been reported that they are helpful in improving plant growth and have ability to increase crop yield by 20–25% (Bakonyi et al. 2013). They are low-cost, eco-friendly inputs which reduce the consumption of chemical fertilizer in crop cultivation. They have a role in making easy accessibility and availability of atmospheric nitrogen to the plants by fixing it. The group of soil microbe's phosphate solubilizers solubilize soil phosphorus and increase its uptake to the plants (Soni et al. 2017). They have also been reported to enhance plant growth by excreting plant beneficial hormones such as auxins, gibberellins, cytokines and vitamins etc. (Kloepper 2003). As a result they improve soil fertility and other soil characteristics and sustain the soil health. They also have been found to control and suppress soil borne diseases and thus play suitable role in organic farming. Different types of biofertilizers are described in Table 12.2 (Schutz et al. 2018).

12.6.2 Use of Traditional and Indigenous Solid-Liquid Manures in Organic Farming

They are important in providing all the essential nutrients that are required by plants and helps in maintaining C:N ratio in the soil. Besides that, they have been proven to improve the physico-chemical and biological properties of the soil which further increases its fertility and crop productivity. They play a key role in improving both the structure and texture of the soils, conserve moisture and increase its water holding capacity. They increase in the biological activity by augmenting population of microflora so as to make fix nutrients available to the plants. It's a financial sustainable farming system and farmers will get positive results in a cost effective manner. The following traditional cow product-based organic inputs/organic manures are prepared in a less-expensive manner and are very effective in maintaining the soil health in organic farming (Table 12.3) (Source National Centre of Organic Farming (NCOF), Ghaziabad India:

12.7 An Introduction to Agnihotra and Home Therapy

Agnihotra is basically HOMA fire practices wrought in the ancient Vedic sciences in order to maintain bioenergy, biogenetics, psychotherapy, medication and farming and to balance climatic variation and astronomical communication (Lahoty and Rana 2013). It is a process of purifying the air by means of particularly prepared fire. Since it also works harmony with nature and possesses a direct relation with organic farming practice. Its process involves a small fire in a gold or copper

Table 12.2 Categorization of different microbial inoculants as biofertilizers

Category	Groups	Examples
N2 fixing biofertilizers	Free-living	*Azotobacter, Beijerinkia, Clostridium, Klebsiella, Anabaena, Nostoc,*
	Symbiotic	*Rhizobium, Frankia, Anabaena azollae*
	Associative symbiotic	*Azospirillum*
P solubilizing biofertilizers	Bacteria	*Bacillus megaterium* var. *phosphaticum, Bacillus subtilis Bacillus circulans, Pseudomonas striata, Arthrobacter chlorophenolicus, Bacillus firmus, B. megaterium, B. mucilaginous, Burkholderia caryophylli, Enterobacter asburiae, Microbacterium arborescens, Paenibacillus sp., P. polymixa, Providencia sp., Pseudomonas aeruginosa, P. argentinensis, P. cepacia, P. chlororaphis subsp. aurantiaca, P. diminuta, P. fluorescens, P. fragi, P. jesseni, P. marginalis, P. paleroniana, P. putida, P. striata, P. syringae, P. tolasii, Serratia marcescens, Staphylococcus saprophyticus*
	Fungi	*Aspergillus awamori, Penicillium sp, Penicillium bilaii*
P mobilizing biofertilizers	Arbuscular mycorrhiza	*Glomus sp.,Gigaspora sp.,Acaulospora sp.*, *Scutellospora sp. & Sclerocystis sp.*
	Ectomycorrhiza	*Laccaria sp., Pisolithus sp.*, *Boletus sp.*, *Amanita sp.*
	Ericoid mycorrhizae	*Pezizella ericae*
	Orchid mycorrhiza	*Rhizoctonia solani*
N fixers and P solubilizes	Bacteria	Strains of *Bacillus megaterium*, *B. polymixa*, *Enterobacter* sp., consortia of P solubilizers and N fixers
Biofertilizers for micro-nutrients	Silicate and Zinc solubilizers	*Bacillus* sp.
Arbuscular mycorrhiza fungi	Fungi	*Entrophosphora colombiana, Glomus caledonium, G. clarum, G. etunicatum, G. fasciculatum, G. hoi, G. intraradices* (*new name: Rhizophagus irregularis*), *G. mosseae, Gigaspora rosea*

pyramid using dried cow-dung cakes and adding some rice grains with pure ghee into the fire accurately at the time of sunrise and sunset in addition to two chants. Basically it is adjusted to the biorhythm in consistent to sunrise and sunset. Copper is a good conductor for restrained energies and at morning all the energies are attracted to the pyramid. Agnihotra homa therapy is a holistic approach to heal the atmosphere and soil and can be used concurrence with organic farming system.

One study revealed that growth parameters of rice in terms of germination rate, root-shoot length, fresh weight and dry weight were significantly higher in Agnihotra treatment sacrifice with *mantra* in comparison to the treatments of Agnihotra without chanting mantras and the rice seeds germinated in the normal conditions (Devi et al. 2004). Although a very less literature is available about this strategy and its implementation in organic farming and as such no scientific validations or

Table 12.3 Some commonly used indigenous organic formulations in organic farming

Organic input	Purpose	Ingredients used	Methods of preparations	Mode of application	Reference
Panchagavya	Plant growth and soil enrichment	Cow dung slurry, fresh cow dung, cow urine, cow milk, curd and cow butter oil (4:1:3:2:2:1)	Mix all the ingredients thoroughly and ferment for 7 days with twice stirring per day	Soil and seed treatment	Somasundaram and Amanullah (2007)
Enriched panchagavya	Plant growth and soil enrichment	Fresh cow dung, cow urine, cow milk, curd, cow deshi ghee, sugarcane juice, coconut water (1:3:2:2:1:3:3) enriched with banana paste of 12 fruits	Same as above	Soil and seed treatment	Gopakkali and Sharanappa (2014)
Beejamrut	Plant growth	Cow dung, cow urine, cow milk, lime, water (5:5:1:0.25:100)	Mix all the ingredients and keep it for overnight. Dry in shade before sowing	Seed treatment	Gore and Sreenivasa (2011)
Matka khaad	Plant growth and soil enrichment	Cow dung, cow urine, water and jaggery (1:1:1:0.25)	Mix all the ingredients in a earthen pot and incubate for 10 days at room temperature	Soil and seed treatment	Soni et al. (2017)
Vermiwash	Plant growth and protection	Cow dung 12–15 kg and earthworm 200–300 no	Fill a pitcher with a layer of sand along with a layer of dry biomass and a thick covering of cow dung, adult earthworms were added and hanged under a shady area. Another pitcher filled with water placed over it and another empty pitcher was placed below it to collect the brown colored leachate	Seed treatment and foliar spray	Soni and Sharma (2016)
Sanjivak	Soil enrichment	Cow dung, jaggary, cow urine and water (2:0.005:1:3)	Mix all the ingredients in a drum and ferment for 10 days	Soil treatment	Bhat et al. (2017)
Jeevamrit	Soil enrichment	Cow dung, cow urine, jaggary, gram flour, soil and water (1:1:0.2:0.2:0.1:20)	Mix this solution well with wooden stick and keep this solution for fermentation for 5–7 days	Soil treatment	Gore and Sreenivasa (2011)
Amrutpani	Soil enrichment	Cow dung, honey, cow desi ghee and water (1:0.5:0.25:20)	Mix all the ingredients and preserve for 10 days at room temperature.	Soil treatment	Bhat et al. (2017)

Organic input	Purpose	Ingredients used	Methods of preparations	Mode of application	Reference
Fermented butter milk	Plant protection	Butter milk, cow urine and water (1:1:20)	Ferment the mixture in an earthen pot for 15–21 days	Foliar spray, useful against strong pest repellent	Bhat et al. (2017)
Dashparni extract (Ten plant's extract)	Plant protection	Leaves of neem, Chinese chastetree, pipevine, papaya, guduchi, custard apple, karanja, castor, oleander, rubber bush, green chilly paste, garlic paste, cow dung, cow urine and water (5:2:2:2:2:2:2:2:2:2:0.25:3:5:200)	Crush all the ingredients and ferment for 1 month in shade and cover with gunny bag. Shake regularly three times a day and can be stored up to 6 months	Foliar spray, useful against strong pest repellent	Bhat et al. (2017)
Neemastra	Plant protection	Neem leaves, cow urine and cow dung (5:5:2)	Ferment the mixture for 24 h with intermittent stirring, filter squeeze the extract and dilute to 100 l	Foliar spray useful against sucking pests and mealy bugs	Source NCOF, Ghaziabad
Brahmastra	Plant protection	Cow urine, leaves of neem, custard apple, papaya, pomegranate, guava (10:3:2:2:2:2)	Mix the ingredients and boil 5 times at some interval till it becomes half ferment the mixture for 24 h, filter squeeze the extract and dilute to 100 l	Foliar spray, useful against sucking pests, pod/fruit borers.	Source NCOF, Ghaziabad
Agneyastra	Plant protection	Ipomea (besaram) leaves, hot chilli, garlic, neem leaves, cow urine (1:0.5:0.5:5:10)	Boil the suspension 5 times till it becomes half, filter and squeeze the extract. Store in glass or plastic bottles, 2–3 l extract diluted to 100 l	Foliar spray useful against leaf roller, stem/fruit/pod borer	Source NCOF, Ghaziabad

reasoning is mentioned in previous studies. This ancient Vedic farming practice can be used by farmers which capacities in enhancing crop productivity with minimal input costs, well treating the atmosphere, soil, plants and animals and resolve pests and disease problems in the agriculture.

12.8 Significance of Biodynamic Farming in Organic Agriculture

Biodynamic (BD) farming was proposed by Steiner (1924) as one of the oldest organic agricultural farming approaches which is determined for long-term diversified farms which could offer natural, cost-effective and substantial sustainability for mankind. The BD method also focuses on a holistic approach toward agriculture and has become the topic of keen interest of the agriculturists during the past decades. BD preparations including use of animal manures, cow horns, composting, plant material and silica etc. (Turinek et al. 2009) (Table 12.4) contribute toward the fortification of the ecology; conserve biodiversity and ultimately betterment of livelihoods of farmers. Basic principles of biodynamic farming are focused on treating a farm as a single entity or an organism. It should remain as enclosed from their surrounding ecosystems as if possible. The farms are structured around lunar and astrological cycles which are supposed to affect the biological and ecological systems. They are constructed in a way to integrate all the living entities together including plants, livestock and farmers and the soil is treated as the central constituent of all biodynamic farms (https://www.bellamysorganic.com.au/blog/what-is-the-difference-between-biodynamic-and-organic-farming/).

Table 12.4 Details of BD preparations, their major ingredients, mode of application and role in organic agriculture

Name of preparation	Major ingredients	Mode of application	Role in soil health
BD 500	Cow manure	Field spray	Soil biological activity
BD 501	Silica	Field spray	Plant resilience
BD 502	Yarrow flowers (*Achillea millefolium* L.)	Compost preparation	K and S processes
BD503	Chamomile flowers (*Matricaria recutita* L.)	Compost preparation	Ca and K processes
BD 504	Stinging nettle shoots (*Urtica dioica* L.)	Compost preparation	N management
BD505	Oak bark (*Quercus robur* L.)	Compost preparation	Ca processes
BD 506	Dandelion flowers (*Taraxacum officinale* Web.)	Compost preparation	Si management
BD 507	Valerian extract (*Valeriana officinalis* L.)	Field spray, compost preparation	P and warmth process

12.9 Economic Benefits of Organic Farming to Farmers

Many farmers have adopted organic farming as low input agricultural strategy for economic endurance. Several comparisons between organic and conventional farming showed that former one exceeds the next in economic performance. However, organic farming necessitates more intensive and concrete management than conventional farming. A diversified cropping system in organic farms can provide many economic benefits because cultivating different crops in same farm posses' significant protection from sudden price change in single commodity coupled with an improved seasonal distribution of inputs. Organic farmers grow variety of crops on a farm and generally the entire cultivation seem invulnerable to the same pests or seasonal climatic impacts (Fess and Benedito 2018). If there is a total crop failure, organic growers suffer comparatively less economic damage as they invest less in purchasing chemical inputs during conventional approach. Organic farmers suppose to invest fewer funds because they need not to buy chemical inputs like fertilizer, fungicides and pesticides etc. and moreover, the costs and income are equally distributed on diversified organic farms annually.

Some farmers claimed that the field soils have superior tilth and less compaction after using organic inputs. Altered soil structure, along with enhanced ground cover, reduced runoff by about 10–50% and improved infiltration by about 10–25% (Gerhardt 2012). All these factors lead to lessen soil erosion in the fields cultivated organically by at least two-fifths, and sometimes over four-fifths (Cacek 1984). It has been noticed that the crops are generally less susceptible to drought and other natural calamities when organic practices are properly established in the fields because organically cultivated soils absorb significantly more available rainfall, facilitating protection from drought (Cacek 1984). However, the disinclination of organic farmers to apply prophylactic antibiotics reduces the probability of confinement feeding systems. Organic farmers require less irrigation because they use more crop rotations leading to higher soil permeability (Cacek and Linda 1986). It was previously believed that organic farmers' avoidance to use chemical fertilizers may result into depletion of phosphorus, potassium, and other micro-elements, and the deficiency can cause adverse long-term biological and economic impacts (USDA 1980). But latest research revealed that the organic farming is a better approach for the management of soil physico-chemical characteristics because of continues use of manure recycling (Fess and Benedito 2018). However, more studies based on research plots and economic models are required to identify optimum economic performance of organic farms in comparison to conventional farming.

12.10 Scope of Organic Farming in Modern Agriculture

The awareness about the adverse effects due to excessive use of chemicals in agriculture, the people have become more conscious about the food quality and hence increasing the demand in organic products in market. The resilient sustainability for environment coupled with increase in crop yield and the organic farming has emerged

as an eco-friendly and long-lasting tool in agriculture. The movement of organic farming started with developed world is gradually followed by the developing countries. For any country, success of organic farming movement only depends upon the growth of its own domestic markets. In organic agriculture, the role of modern, intensive and scientific approaches in agriculture traditional farming is missed off. There is a need to develop a proper and well-defined marketing channel to ensure premium price of the organic-product to boost up the interest of organic farming in the mankind. There are some measures to be recommended to promote organic farming like improvement in the marketing channels, guarantee in regular supply and premium price for the organic products, creation of standards for packaging and branding of organic products, establishment of organizations world-wide to promote organic farming. It will not only compensate the quality and sustainability concerns, but also endow a less-expensive and a profitable livelihood for framers.

12.11 Conclusions

Organic farming emphasizes at defending agricultural agro-ecosystem by promoting the eco-friendly practices in agriculture that facilitates natural soil fertility, conserving the environmental biodiversity and limiting the use of harmful chemical products. It relies on holistic approach for the cultivation of organic crops that integrates various elements including social, environmental, economic, and technological aspects. The crop productivity is reported as significantly improved through organic farming at lower input levels, which can make it more profitable to the farmers. The greater profitability is also due to less labor requirement and to greater market demands for organic produce that provide a premium price to the organic growers. Moreover, higher profitability of organic farming and use of environmentally sustainable organic inputs in the agriculture practices during the farming system make farms more competitive and climate-friendly. This low input agriculture strategy is not only helpful in improving food quality but also provide a great opportunity to the farmers to perform a low budget farming.

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