

Organic Farming in Vegetables- The Indian Scenario

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ABSTRACT: A quite languid, but deliberate shift from the traditional farming methods to the vogue, newly tailored organic agriculture is being undertaken from the past few years, though it has not been there for so long. New methodologies and techniques are being worked out, put to test and shared by the organic farmers since 1950's. For safeguarding the environment and achieving a sustainable, future driven agricultural production, reliable alternatives to chemical intensive traditional agricultural practices need to be devised. The area under organic farming is currently 73.2 million ha with the participation of around 187 countries. Through the various efforts and schemes initiated by the government for strengthening this sector, the area under organic farming has expanded swiftly from 0.58 thousand ha in 2003-04 to 26.6 thousand ha in 2020-21. Organic agriculture is picking up quite a pace in India with 43.8% contribution to the total number of organic farmers in the world, but the area is still quite less *i.e.*, 4.7%. An urgent need to increase the area, production and productivity is being felt, which can only be accomplished through enhanced technological intervention. One such system was adopted in Umiam, Meghalaya and Thiruvananthapuram, Kerela generating a net return of 171,867/ha and 433,490/ha respectively via integrated organic farming system. Salubrious and flourishing environment and soil, plant, animal and human health is generally regarded as the key concern of organic farming. It aims towards the provision of adequate and nourishing food supply with minimum deleterious effects on the environment. The major constraints in organic farming in India would be lack of awareness, marketing issues, shortage of biomass, inadequate supporting infrastructure, high input costs, marketing problems of organic inputs and low yields. As of now, the organic farming techniques are more precisely suited to the small and marginal farmers in order to minimize the risk and maintain sustainable food security. For the establishment of organic farming practices as a regular exercise in the food production industry, round the clock standardized efforts by various stakeholders such as research institutions, new age farmers, developmental organisations, input dealers and processors, etc. are required.

Keywords: Vegetable farming, Organic, India, Biological Control, Organic export.

INTRODUCTION

The traditional methods being adopted for agricultural production requiring heavy doses of chemical fertilisers and pesticides are surrounded by several drawbacks including declining agricultural growth rate, factor productivity, farm income, shrinkage in net cultivable area, depleting ground water table, static or decline in food production as well as increasing malnutrition, environmental pollution, cost of production and unemployment. Various types of cancers and other disorders in humans as well as animals are being

reported due to the consumption of pesticide and fertiliser-laden food. During the pre-green revolution period (upto 1960's), the total agricultural production and productivity was not in a position to cater to the needs of the ever-growing population and hence the food prices started showing heavy inflation rates. This demand became the major driving force for the development and large-scale commercialisation of new high yielding varieties of various crops which were highly fertiliser and water intensive. The results of this revolution were euphoric, with the total food grain production being enhanced from a meagre 50.83

million tonnes in 1950-51 to 303.34 million tonnes in 2020-21 (DES, 2021) through the cultivation of HYVs as well as introduction of other green revolution technologies (Ravisankar *et al.*, 2021) The gross irrigated area has also amplified from 22.56 million ha in 1950-51 to 94.46 million ha in 2014-15. Chemical fertilizers playing a primary role in this movement have also witnessed a sharp rise in usage from 0.07 million tonnes in 1950-51 to 29.37 million tonnes in 2018-19 (DES, 2020). All these factors combined have proved to be a total game changer for India with its status being changed from a food importer to food exporter in terms of various major commodities. But as wise men say, "Everything comes with a price", this statement holds true for green revolution in India as well. Our chemical fertiliser and pesticide consumption now stands at an all time high of 137.9 kg/ha and 0.6kg a.i /ha (DES, 2021) which is expected to cause nothing but devastation for human, plant and environment health. Bringing down the consumption of these chemicals appears to be the need of the hour for striking a balance between meeting the food demands and maintaining the health of mother earth and its various components. Recent studies have established that the combined use of chemical fertilizers along with organic manures is beneficial in improving the overall efficacy of the latter by bringing about significant improvement in the physical, chemical and biological properties of the soil (Panwar *et al.*, 2021). By the year 2025, a total nutrient potential of 32.41 million tonnes is being expected to be contributed by a multitude of organic resources. In addition to this, other statistics point towards the expected demand of 400 million tonnes of food by 2050 in order to satiate the hunger of the projected population of 1.7 billion by that year. Considering these facts and figures, the expansion of organic agriculture in all parts of the country is not a very smart and practical idea, keeping in view the problems arising in the handling of bulky organic manures and their low nutrient content. It has been estimated that around 15 million tonnes of nutrients can be safely and viably provided through organic sources. Hence it is better to go for niche area and crop specific approach for the popularisation of organic farming, making use of integrated crop production models combining the use of organic and inorganic resources for sustainable production and productivity, taking optimum care to not incur any sort of damage to the environment.

The problems of food and nutritional security can be combated through the cultivation and inclusion of vegetables in our diet. Acting as fairly rich sources of protective vitamins, minerals, fibre and considerable number of proteins, the demand for these commodities is elevating every now and then in the domestic as well as export market. India produced 191769 thousand MT of vegetables during 2019-20 as against only 15 million tonnes prior to independence. It is a well-known fact that India is the second largest producer of vegetables

in the world, closely following China. However, from the productivity point of view, India still lags behind. Moreover, the per capita availability is only 210g per head per day, though the recommended consumption is quite high, *i.e.*, 285g per head per day. Owing to the ever-increasing population pressure and the shrinkage of agricultural land, vertical expansion appears to be the only potent solution to tackle the problems of inadequate food supply. We can also aim at increasing the productivity per unit area and time through the exploitation of the available resources and technology that still remain unexplored. We need to adopt such practices which will enable the production of more nutritionally rich vegetables from less land, less water, less chemicals and no detrimental effects on the soil and environment health. Through organic vegetable production, sustainability can be achieved in terms of maintaining the various beneficial properties of the soil as well as induction of resistance to various biotic and abiotic stresses. An increase in profit to the tune of 10 to 50% can be expected from the sale of organic products over the conventional ones. Advanced countries such as USA, Japan, EU and Australia are currently having largest market for these types of commodities and the growth rate of this industry is quite high. India too is slowly picking up pace and beautifully inculcating the art of organic vegetable production in its agricultural setup.

Basic concept of organic farming

1. It focuses on enriching the biological fertility of the soil so that plants can easily acquire the essential nutrients they require and still do not over exploit it and rip off soil of its basic essential components.
2. Control of pests, diseases and weeds is primarily attained through the establishment of a careful ecological balance within the system and by the judicious use of bio pesticides. Certain cultural practices such as mixed cropping, crop rotation, etc., also provide for the effective management of several crop-damaging entities.
3. Organic farmers believe in minimum wastage and try to re-use and recycle all the farm wastes and by-products in the form of organic manures and other resources. However, the export of products from the farm results in a rapid loss of essential nutrients.
4. In a situation where conservation of energy and resources is deemed as important, any community or country would leave no stone unturned to recycle and replenish all urban and industrial wastes back to agriculture. Thus, the system would require only few inputs of new resources in order to "top up" soil fertility.

Definitions of Organic Farming. Various scientists and organisations have attempted to describe and explain the meaning and core values associated with organic farming at their own levels, but all of them ultimately agree to assert one basic fact, *i.e.*, organic farming is a system that believes in management of the

ecosystem itself rather than the incorporation of external agricultural inputs. It aims to minimise the dependence on chemically derived fertilisers and pesticides, veterinary drugs, genetically modified seeds and breeds, preservatives, additives and irradiation in order to mitigate and minimize the devastation of the ecosystem and disturbance of natural ecological balance.

According to the definition of FAO/WHO Codex Alimentarius commission (1999), “*Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity. It emphasises the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system*”.

Need for organic farming of vegetables in India

- Most of the vegetable crops are eaten raw as salad, or used in boiled or cooked form; hence, any

contamination or presence of any sort of chemical residue may invite various types of diseases and health concerns.

- Mostly, poor, small and marginal farmers are engaged in vegetable cultivation in India.
- The productivity potential and fertility status of soil has declined over years due to the indiscriminate use of chemical fertilisers
- There are not many scientific breakthroughs in recuperating the quality and production of vegetable crops.
- Increasing rates of environmental pollution and damage to the ecosystem.
- The prices of various inputs required in traditional chemical intensive farming practices, such as fertilisers, pesticides, irrigation facilities are skyrocketing day by day. Even though government has announced massive subsidies on these commodities, still the farmers find it very difficult to keep up with the demand. We can easily avoid such issues through the adoption of organic farming which cuts down the usage of such inputs (Singh *et al.*, 2014).

Table 1: Historical perspective of organic farming.

Oldest practice	10,000 years old, dating back to Neolithic age, practiced by ancient civilization like Mesopotamia, Hwang–Ho basin etc.
Ramayana	All dead things – rotting corpse or stinking garbage returned to Earth are transformed into wholesome things that nourish life. Such is the alchemy of mother Earth (interpreted by C. Rajagopalachari)
Mahabharata (5500 BC)	Mention of Kamadhenu, the celestial cow and its role on human life and soil fertility
Kautilya-Arthashastra (300 BC)	Mentioned several manures like oil–cake, excreta of animals.
Brihad–Sanhita (by Varahmihir)	Described how to choose manures for different crops and the methods of manuring.
Rig Veda (2500–1500 BC)	Mention of organic manure in Rig Veda 1, 161, 10, 2500–1500 BC, is green manure in Atharva Veda II 8.3, (1000 BC). In Sukra (IV, V, 94, 107–112) it is stated that to cause healthy growth the plant should be nourished by dungs of goat, sheep, cow, water as well as meat. A reference of manure is also made in Vrksayurveda by Surpala (manuscript, oxford, No 324 B, Six, 107–164)
Holy Quran (590 AD)	At least one–third of what you take out from soils must be returned to it implying recycling or post– harvest residue

Source: Bhattacharya and Chakraborty (2005)

Organic farming in India. In India, fertilisers are being used only on 30 percent of the cultivable area where optimum irrigation facilities are available, while a large chunk, i.e., 70 percent of the arable land is mainly rain-fed in nature and only a meagre quantity of chemical fertilisers is being used here. The nutritional requirement of crops in these areas is mainly being fulfilled through the use of locally available organic manures, either produced in situ or procured from the nearby farms. The inhabitants of the north-eastern regions of our country are deeply connected with nature and hardly rely on the use of chemical inputs. As a consequence, this area provides immense scope for development of organic farming systems. Around 18 million hectares of chemical devoid land is available in

the NE regions which can successfully be employed for organic production. India has tremendous potential to emerge as a global leader in the production and supply of organic products since vast areas here are under organic cultivation. In the year 2001, a report generated by the Task Force on Organic Farming recruited by the Government of India also stated that the diverse regions of the country where chemical inputs are used to the minimum extent possible, but face the problem of low productivity could successfully be utilised for the commercialisation of organic agriculture. Organic agriculture will prosper in India and will contribute in feeding 1.5 billion people by 2030. According to statistics by Assocham and TechSci, the organic

farming market in India will reach around \$1.36 billion by 2020 with a growth rate of 25-30% per year.

In India, mostly three kinds of farmers are associated with organic production:

- Farmers who mainly employ their indigenous knowledge and expertise developed over the past thousands of years. They largely cultivate crops for their own consumption and have little surplus for meeting the market demand.
- Farmers with small to medium sized land holdings constitute the second category. These can be classified into two groups: those functioning to renew and revitalize the Vedic practices, together with Ayurvedic tradition of health system with scientific elucidation; and others who follow modern organic agriculture systems, such as Steiner's biodynamic agriculture or Fukuoka's "nature farming", for example. They typically have market surplus and sometimes export their goods.
- Private companies that have realised the value of organic goods and provided for the large-scale conversions to organic systems are the third major group. They have closely studied the patterns of market demand, especially in the northern areas and are in the process of enhancing the economic value of crops. Their key concern is to promote the export of organic commodities.

India essentially produces primary organic products, and not much attention is being paid towards processed products. Coffee, tea, spices, fruits, vegetables and cereals as well as honey and cotton are the most important commodities being cultivated in the diverse agro-climatic zones of the country. As of now, there is no concept of organic animal husbandry, poultry, and fisheries. The market for organic foodstuff is still behindhand in India. Consumers are also not much aware of the benefits and usage of such kinds of products. As far as the domestic market is concerned, organic food is generally sold directly via the farmers or by means of specialised shops and restaurants serving organic items. India has mainly emerged as an exporter and by far has not imported organic products. The focal market for exported products is the European Union and lately, the trend of organic food is rising in the USA. Recently India has applied to be included as a member of the "EU-Third-Country-List". It has been estimated that approximately 700 MT of agricultural wastes are generated in the country every year, but a large fraction of it is discarded and not put to judicious use. This implies a theoretical availability of 5tonnes of organic manure/hectare of arable land/year, which is equivalent to about 100 kg NPK/ha/year (Tondon, 1997). But practically, only a minimal portion of this huge quantity is available for actual field application. A considerable number of substitutes for chemical fertilisers have been developed over the recent years for optimised nutrient supply to the crops. These include

organic sources like vermicompost, bio fertilizers, green manures etc. Advanced technologies have been introduced that aim towards the bulk production of nutrient-rich compost and manures, thereby bridging the gap between nutrient demand and supply. With advancement in research methodologies, crop specific manures and organic fertilisers are being prepared for various fruits, vegetables, oilseeds, pulses, etc.

Organic Farming in India on specific situation. Bearing in mind the facts mentioned above, one needs to be very careful and consider the use of organic sources alone only in cases where they are most economical. At the same time, it must be ensured that the quality of the produce is being maintained from health point of view. In case of the Indian society, organic farming can be commercially exploited under the following conditions where the maintenance of quality is to be given priority over quantity:

- Fruits and vegetable crops where use of elevated doses of chemical fertilizers (especially N causing higher NO content) may result in imbalanced nutrition of crops.
- Plantation crops like tea, coffee, cashew nut etc where the nutrient loss is minimum and salvaging of these through leaf abscission is high.
- High export potential bearing horticultural crops having considerable demand in international markets like spices.
- Premium quality local varieties of different crops having significant export potentials.
- Neem, dried nuts, oilseeds, pulses, cotton, basmati rice etc possessing export potentials.
- Soils having high fixation capacity of various nutrients such as the calcareous, acidic & alkali soils.

Objectives of Organic Farming in Vegetable crops

1. To produce adequate quantity of highly nutritious food.
2. To promote the diverse biological cycles within farming arrangements by encouraging the utilisation of microorganisms, soil flora & fauna, plants and animals.
3. To perpetuate and enhance the long-term fertility and vitality of soil and allow the soil biodiversity to flourish.
4. To stress over the usage of renewable resources in locally organized production systems.
5. To operate within a closed system with respect to organic matter and nutrient elements.
6. To minimise to the maximum extent possible, all sorts of pollution and environmental damage that might occur from the use of traditional agricultural techniques and methodologies.

Technology packages for Organic Vegetables

1. Timely preparation of soil to a fine tilth with 2-3 ploughings to remove all debris, stubbles, stones etc and to avoid infestation of ants and termites. However, minimum tillage is considered as an important component of organic farming.

2. Use of organic manures as basal dose @ 25-38 t/ha via FYM, poultry manures, fish manures, sheep composts etc. Organic cakes prepared from neem, groundnut and pongamia are considered extremely beneficial for enhancing the soil properties.

3. Raising of green manure crops like sesbania or dhanicha and their timely ploughing back into the soil, besides using biomass of other plant species.

4. Use of crop residues is a vital practice in organic vegetable production, which boosts the soil organic matter content, conserves soil fertility levels, and ultimately enhances the crop yield. Studies conducted by Upadhyay and Sharma (2000) reported that application of five groups of crop residues like bhang (*Cannabis sativus*) leaves, parthenium weeds, gulmohar and peepal leaves to the soil @ 15t/ha each before planting cowpea crop in a cowpea-potato-cucumber rotation and subsequently adding the crop residues of cowpea, potato (haulms) and cucumber in succession after harvest of each crop and before sowing of succeeding crop resulted a positive effect on the yield of crops and enriched the soil with organic matter.

5. Make sure to incorporate leguminous crops like beans, peas, cowpea etc in the crop rotation that in addition to elevating the soil fertility by fixing the atmospheric nitrogen also increase the yield up 13 to 30-35%. Inoculation of the legume crops with specific rhizobial strains can further perk up their N fixing ability.

6. Choice of vegetable varieties should be based on climate and market preference; adopting optimum spacing and timely planting, raising plants/seedlings with enough organic manures and bio-fertilizers and using only vigorous seedlings for better establishment, growth and yield.

7. Application of bio-fertilizer is of great significance in organic farming as they play a nutritional, stimulatory and the therapeutic role in improving growth, yield and quality of vegetable crops. Inoculations of vegetable crops with different bio-fertilizers have displayed a heartening response both in terms of increasing yield, quality and soil fertility. The field response of *Rhizobium* is encouraging as reported by a number of research workers. *Azotobacter* and *Azospirillum* depicted a significant influence on vegetable crops, resulting in nitrogen economy of 25-50% and increase in yield from 1-42%. Similarly, phosphorus solubilizers can also save in general 40% phosphorus fertilizers and can enhance the crop yields from 4.7-51%.

8. Use of locally available mulching materials or polythene sheets to reduce moisture loss and minimize weed growth.

9. Use disease resistant varieties that suit the ecosystem, keep the weed growth in check and remove all parts attacked by pests and diseases. Also raise trap plants to attract insects and follow crop rotation.

10. Use bio-pesticides and bio-control methods for control of various pests and diseases. Natural products like garlic extract potentially act as broad-spectrum pesticides. Neem, Sabadilla and Pyrethrum derivatives show similar properties. Besides this, bio-fertilizers like *Azotobacter*, *Azospirillum*, PSM, and phosphorus mobilizers have antifungal activities without any residual or toxic effect, hence the quality of vegetables grown is not compromised. Crop inoculated with mycorrhizal fungi exhibits improved resistance to *Rhizoctonia solani* and *Fusarium oxysporum*. Damping off of tomato caused by *Phythium* is minimised by induction of mycorrhiza formation. Mycorrhized tomato plants exhibit higher resistance to nematode infection.

Table 2: Quantity of N fixed by legumes Crop N fixed (kg/ha).

Crop	N fixed (kg/ha)
Cowpea	80-85
Cluster bean	37-196
Fenugreek	44
Pea	52-57
Black gram	50-55
Chick pea	85-100
Pigeon pea	168-200

(Source: Palaniappan and Annaduari, 1999)

Table 3: Natural or Botanical pesticides.

Botanical pesticide	Source	Nature of the product	Against which pests
Allicin	Garlic	Broad spectrum pesticide	Act as antibacterial & antifungal biopesticide
Nicotine sulphate	Tobacco	Insecticides	Aphids, thrips, spider, mites & other sucking insects
Sabadilla	Sabadilla lily	Insecticides	Caterpillars, leaf hoppers, thrips, sink bug and squash bugs
Nemacide	Neem tree	Insecticides	Potato beetle, grass hopper, moth
Pyrethrum	Chrysanthemum	Insecticides	Aphids and ectoparasites of live stocks

Effective Bio-agents

Predators

- Ladybird beetles on aphids and mealy bugs
- *Chrysoperla* on aphids and other soft bodied insects
- Carabids and staphylinid beetles on vast range of insect hosts

Parasitoids

- *Trichogramma* sp. on Lepidopteran pests
- *Apanteles* sp. on Lepidopteran larvae
- *Trichospilus pupivora* on pupa of a caterpillar pest

Pathogens

- Bacteria: *Bacillus thuringiensis* (Bt) against DBM
- Fungi: *Beauveria bassiana* on various crop pests
Metarhizium anisopliae, *Nomouraeva rileyi* on *Helicoverpa armigera*

Viruses

- NPV (Nuclear Polyhedrosis virus)
- NPV of *Helicoverpa armigera*
- NPV of *Spodoptera litura*

Nematodes

- *Steinernema glaseri* on soil insects

Indian domestic market and export

As contrary to the popular belief that organic food consumption is just a trend being followed in the developed countries, the organic food market is slowly but steadily picking up pace in India as well. Most people are of the opinion that India is only interested in the export of organic products and its consumption is next to none. However, the actual facts and figures suggest otherwise. Although it is well established that about 50% of the organic food prepared in India is directed towards export, but the domestic intake cannot be neglected. People nowadays prefer organic food items in order to minimize health scare to children, with around 66% of the parents trying to replace traditional food with comparatively healthy organic food. Even though organic foods are priced slightly higher, i.e., around 25% more than the non organic ones, a number of parents are happily agreeing for their purchase due to the anticipated positive effects these have on the health and general well being. The popping up of new organic stores every now and then is an enough proof of the rising growth of the organic food market in the country. The first organic food store in India was established in Mumbai in 1997 and now, almost every large city has its own organic food stores and restaurants. The status of India as a leading organic food exporter is also elevating day by day with a greater number of farmers being engaged in organic farming activities. Organic spices, organic herbs, organic basmati rice, etc. are readily exported by India to countries such as USA and UK, which is strengthening this industry to the maximum extent possible. In a developing country like India where the average per capita income is a mere 800 USD, the higher premium offered by the sale of organic products is a huge sigh of relief and an indicator for future prosperity. Organic agriculture offers trade opportunities for farmers in the developing

and developed countries. (Ummyiah *et al.*, 2017a). In addition, the Indian government is truly actively engaged in the promotion of the organic food industry by offering great deal of support and facilitating smooth marketing of products. Since the domestic market is not in a position to absorb all the organic stuff produced, the sale abroad remains a prime concern for both farmers as well as the government agencies (Ummyiah *et al.*, 2017b).

Issues and strategies of organic vegetable farming in India

The size of the land holdings under organic cultivation and availability of non-chemical inputs such as manures and bio-pesticides, coupled with scientifically backed packages of practices are the key factors governing the hereinafter success of organic vegetable cultivation in India. The methods of organic food production should be clearly distinguishable from the traditional approaches. The below mentioned problems and their potent solutions should be borne in mind in order to develop organic vegetable cultivation into a sprightly and flexible system, always ready to cater to the changing consumer demands both at domestic as well as international levels.

1. There needs to be on system-based research for vegetable organic farming. It must be integrated one and must not be looked at in isolation.
2. The goal of research should be to develop techniques and methods, which not only enhance food production, but also generate a greater number of jobs and elevate the income of people involved. There must therefore be a triple aim of more food, more jobs and more income.
3. The research for organic farming should be focused on developing farmer friendly technologies which may attract the vegetable growers to adopt them, keeping in view the small sizes of land holdings and few resources available to the poor and marginal farmers.
4. Long-term evaluation of different organic sources should be carried out in order to realise their true potential.
5. For any given cropping system, the most appropriate and beneficial cover crops and smother crops should be identified.
6. All sorts of depletion in ground water quality should be very well determined with special reference to heavy metal toxicity and nitrate pollution.
7. The kind of crops which are able to improve the physical properties of soil in a given agro-climatic zone should be specified.
8. Evaluation of soil conservation practices for disease management, change in the habitat for beneficial insects and suitability of trap crops in organic culture and identification of nematode repellent cover crops especially from various vegetable crops should be given due prominence.
9. Development of techniques for modifying fertilizer recommendations for new crop rotations using different cover crops and foolproof technology for

transformation of traditionally used chemicals inputs farm into a successful organic farm.

10. Developing suitable varieties or hybrids for organic cultivation.

11. Appropriate package of technologies are to be developed for organically grown vegetables.

12. Large scale multiplication of bio-fertilizers, vermicompost, bio-control agents and their distribution to the farmers at reasonable rates.

13. There should be proper research efforts for production and commercialization of bio-pesticides and extension services to educate the farmers to use them.

14. Organic foods are proven to be superior in terms of health and safety, but there is no scientific evidence to back their superiority in terms of taste and nutrition, as most of the studies are often indecisive and full of loopholes. Therefore, stringent evaluation of quality parameters and packaging of organic foods should be carried out using well framed strategies.

15. Efforts should be made to select suitable cropping systems or more precisely, farming systems specific to those agro climatic zones having higher productivity under Organic Farming. The Government should provide ample infrastructure facilities to make the Organic Farming, a profitable venture.

16. There is need for marketing research for organically produce for export potential. There should be proper planning for marketing of organically grown fruits, vegetables and food grains that should help farmers to get a better price for their produce. This, in turn, should motivate them to invest more in Organic Farming.

17. Organic vegetable growers should be rewarded with alluring incentives.

18. Extension scientists must frame well-knit strategies to generate interest in small and marginal farmers to take up organic farming technologies for cultivating vegetable crops.

Why total adoption of organic Farming of vegetable crops is not feasible/ viable in India?

Though Organic Farming is one of the best approaches to achieve sustainability in the crop production, its adoption on a full-fledged scale under Indian conditions remains a question due to the following major reasons:

1. Organic farming is highly knowledge intensive and requires careful evaluation and deep understanding of the crop and soil dynamics. One has to keep pace with the laws of nature to augment the biological productivity of the soil.

2. There is no well-thought-out extension machinery to dissipate the proven technologies and in many cases, the basic information itself is not available.

3. Reduction of yield in the initial few years of conversion from pure chemical farming to organic farming disturbs the farmers and they are not in a position to take such a big risk.

4. Organic inputs may be difficult to generate on the farm.

5. The organic produce may not find an early market as most of the vegetables are perishable in nature, leading to spoilage and loss to the concerned grower.

6. Shifting to pure organic farming is a very time consuming and laborious task.

7. Nowadays, a smaller number of people are involved in cattle rearing, hence scarcity of FYM is on the rise.

8. Nutrient content of organic sources is generally quite low. Varied nutrient content is present in organic materials, so it becomes difficult for farmers to calculate the actual number of organic substrates to be added to the soil.

9. Collection and processing of organic wastes is a difficult and time-consuming task.

10. Cattle dung, urine and farm wastes are to be handled manually, which many people do not prefer doing.

11. The consumer needs protection and safety assurance, so the Certification and Inspection programmes have to be conducted on a national level.

12. Export of organic produce requires adherence to pre-specified organic standards, which should be conformed to International Market demand as well.

13. There is a dearth of optimum research & development backup as well as training concerning Organic Farming in India.

14. There is less provision of availability, transportation, and application of biological materials to meet the nutrient demand of the crops.

15. Biological pest control is very knowledge intensive and not everyone has the required skill to go for it.

16. Since the farmers are more interested in cultivating crops of commercial significance, green manuring crops are becoming less common as they do not fit in the commercial crop sequences.

17. Green leaf manuring also has become limited due to the over exploitation of shrubs and trees.

18. Package of practices revolving around organic farming are not clearly understood and sometimes do not go along the lines of cost-benefit ratio for various crops.

19. Farmers are usually hesitant to adopt organic farming in case no monetary assistance is provided by the government or other developmental agencies because of a fair possibility of yield losses during the early years of adoption.

Suggestions for promotion of Organic Farming in India

The following suggestions if well understood and applied to the maximum extent possible can help the organic cultivation industry in India to flourish and prosper (Anonymous, 1998):

1. Establishment of centres of excellence and nationwide network for optimising research on Organic Farming.

2. Documentation and written records of all the available indigenous technological knowledge (ITK) and other technologies developed by various public

sector research centres/NGO/individuals on the various aspects of Organic Farming in India.

3. Introduction of core courses on the concepts and methods used in Organic Farming in the curriculum of under-graduate and post-graduate degree programmes at different SAUs and other Agricultural Institutes.

4. Standardization of mechanisms or methods for judging the suitability of Organic Farming practices.

5. Formulation of appropriate package of practices of productions of different crops under Organic Farming Systems.

6. Expert teams, comprising of renowned agricultural as well as social scientists and progressive farmers may be constituted for visiting farms of successful farmers associated with organic farming practices.

7. Dissemination of beneficial knowledge and information on Organic Farming through Krishi Vigyan Kendras (KVKs), field demonstrations, TV programmes and other suitable mass media etc.

Scope of Organic farming in India:

- Organic food is in high demand with rising domestic market.

- Organic farming has emerged as an alternative system of farming that may not only address quality and sustainability concerns, but also ensures a debt-free future.

- Organic farming is appropriate for small farmers in developing countries like India.

- Organic agriculture helps to reduce poverty and ensures food security through a variety of factors like; Increasing yields in locations with low inputs, Biodiversity and natural resources conservation on the farm and in the surrounding environment; Increasing revenue and/or lowering costs; Creating food that is both safe and diverse; Having a long-term sustainability.

CONCLUSION

Sustainability in agricultural production and non-disruption of the ecological balance are the primary objectives of organic farming. It aims to mitigate the negative impacts incurred to the human health and environment by the continuous use of chemicals for crop production. For achieving these goals, certain rules and principles are to be followed by the organic growers as well as consumers with no scope of any flexibility or lenience. Practicing organic farming as the sole method of cultivation is not really possible in a heavily populated country like India where the demand for vegetables is ever increasing and the organic resources are scarce. To describe the situation, it would be fair to quote the Nobel Laureate Dr. Norman Borlaug (2002) who had stated, "Switching on food production to organic would lower crop yields. There are 6.6 billion people on the planet today. Which 2 billion would volunteer to die?" This statement implies that the output generated by organic farming is not enough to sustain the whole population and the

traditional farming methods involving the use of high yielding varieties and chemical fertilisers and pesticides cannot be ignored. In view of the problems associated, certain fertile areas with optimum soil flora and fauna can be dedicated towards organic vegetable production in order to obtain high quality vegetables for export purpose. Hence currently the modus operandi of organic agriculture in India involves partial adoption of organic methods in case of vegetables highly suited for export. In context to Indian agriculture, it is not practically feasible to eliminate the use of chemical fertilisers and pesticides once for all. Rather their use can be minimised or limited. Various experiments and scientific findings have concluded that the combined use of organic and inorganic sources has a beneficial effect on the crop growth and yield. It enhances the productivity and ultimately brings more profit to the grower. As stated above, it is foolish to consider the nationwide adoption of organic farming due to a number of constraints. These include low productivity, elevated cost of cultivation, lack of awareness among farmers and non availability of sufficient quantity of good quality organic inputs. From a practical perspective, adoption of integrated green revolution farming, a modified form of organic farming is possible to a large extent in India. In this system, the core principles governing green revolution such as development of high yielding varieties, heavy irrigation, increased use of external inputs, mechanisation, etc. are kept intact, however conscious efforts are made to multiply their efficiency and minimize the risk to environmental safety and human and plant health. Various integrated systems each offering solution to a different problem have been developed over the years by combining organic techniques with high input technology. The best examples of such amalgamation are Integrated Disease Management (IDM), Integrated Pest Management (IPM), etc., the proper use of which reduces the dependence on chemicals and invites sustainability.

Conflict of Interest. None.

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